



POWERAMERICA

Next Generation Power
Electronics Manufacturing
Innovation Institute

Wide Bandgap Summer Workshop

August 6-8, 2019

NC State University

James B. Hunt Library

1070 Partners Way, Raleigh, 27606 NC-Duke Energy Hall 2nd Floor

Tuesday, August 6

1:00-4:00	WBG Packaging and Module Tutorial <ul style="list-style-type: none">• Medium Voltage Packaging with Organic Substrates – Doug Hopkins, NC State University• Packaging of High-Voltage Wide Bandgap Power Semiconductors – Christina DiMarino, VA Tech• Advanced Packaging for SiC Modules: from Design to Fabrication – Fang Luo, U of AR
4:30-5:30	Membership Advisory Committee Meeting (<i>Members only</i>) NCSU Hands-on Packaging Tour (Non-Members) Hosted by Dr. Doug Hopkins, Engr. Bldg. II 890 Oval Drive, Raleigh 27606, Rm B005
5:30-7:30	Networking Reception – Hunt Library

Wednesday, August 7

8:00-8:30	Breakfast
8:30-8:45	Opening Remarks Mladen Vouk, Vice Chancellor NC State University
8:45-9:15	Industry Keynote – “GaN vs. Silicon – Overcoming Barriers to the Rise of GaN” Alex Lidow, CEO of Efficient Power Conversion Corp.
9:15-10:45	WBG Manufacturing Challenges <ul style="list-style-type: none">• Applied Materials – Llew Vaughan-Edmunds• X-FAB – John Ransom• DuPont – Rajesh Tripathi• II-VI – Andy Souzis
10:45-11:15	Poster and Hardware Networking Break – Sponsored by Silicon Power
11:15-12:00	Member Initiated Projects – Testing and Reliability <ul style="list-style-type: none">• Quantifying Power Device Reliability Due to Terrestrial and other Radiation Sources, Akin Akturk/CoolCAD Electronics

	<ul style="list-style-type: none"> Establish an Independent Testing Facility to Perform Reliability Analysis of WBG Semiconductor Devices, Stephen Bayne/Texas Tech/Group NIRE
12:00-1:00	Lunch and Networking Break
1:00-1:45	Member Initiated Projects – Design & Applications <ul style="list-style-type: none"> Short-Circuit Behavior and Protection of Next Generation 1.2 kV SiC Modules, Jin Wang/OSU High Voltage Bi-directional On-Board Charger with Integrated PCB Winding Magnetic Components, Qiang Li/Virginia Tech
1:45-2:45	WBG Applications <ul style="list-style-type: none"> Nexgen Power Systems – Dinesh Ramanathan ABB – Chris Belcastro Microchip – Avinash Kashyap
2:45-3:30	Education and Workforce Development – Victor Veliadis Graduate Student Presentations & Poster Session
3:30-4:00	Poster and Hardware Networking Break – Sponsored by Silicon Power
4:00-5:30	PowerAmerica Project Updates - Group A: Commercial Applications Iqbal Husain – Director, Power Electronics <ol style="list-style-type: none"> <u>John Deere</u>: Power-Dense Engine-Coolant 200 kW 1050 V DC Bus SiC Inverter for Heavy-Duty Vehicles <u>ABB</u>: Modular SiC based 3-phase AC/DC Front End Rectifier with 99% efficiency <u>Toshiba</u>: Development, Demonstration and Commercialization of SiC Based 1 MW Medium Voltage Motor Drive System <u>VA Tech</u>: Direct-to-Line Central Inverter for Utility-Scale PV Plants Using 10 kV SiC MOSFET Devices <u>VA Tech</u>: MV AC to Low Voltage DC Power Conversion for Data Centers <u>FL State University</u>: Transformerless Medium Voltage Central PV Inverter <u>NC State</u>: Medium Voltage Asynchronous Microgrid Power Conditioning System <u>AZ State University</u>: Isolated, Soft Switching SEPIC with Active Clamp for 480 V AC to 400 V DC Rectifier for Data Centers <u>United Technologies</u>: High Efficiency High Speed HVAC Drive <u>U of TN Knoxville</u>: Multi-Functional High-Efficiency High-Density Medium-Voltage SiC Based Asynchronous Microgrid Power Conditioning System Module <u>NC State</u>: Development of an Active Harmonic Filter using Interleaved SiC Inverter <u>U of TN Knoxville</u>: GaN-based High Efficiency Multi-Load Wireless Power Supply <u>U of Colorado</u>: Dual-Inductor Hybrid Converter For Direct 48V To Sub-1V Pol DC-DC Module

	14. <u>U of NC Charlotte</u> : Introduction of WBG Devices for Solid-State Circuit Breaking at the Medium Voltage Level 15. <u>Infineon</u> : 600V GaN dual gate Bidirectional switch
6:00-8:00	Offsite Networking Reception Trophy Brewing Co. Tap & Table 225 S. Wilmington St, Raleigh, NC 27601 – Free parking available adjacent to restaurant

Thursday, August 8	
8:00-8:30	Breakfast
8:30-9:00	SiC and GaN Market Update - Kevin Anderson – IHS Markit
9:00–10:00	WBG Commercialization <ul style="list-style-type: none"> ● Atom Power – Ryan Kennedy ● Silicon Power - Harshad Mehta ● Wolfspeed – John Palmour
10:00-10:30	JEDEC Update – Tim McDonald – Infineon
10:30–11:00	Networking Break – Sponsored by Silicon Power
11:00–12:00	PowerAmerica Project Updates - Group B: Device and Module Manufacturing – Victor Veliadis <ol style="list-style-type: none"> 1. <u>X-FAB</u>: SiC Power Device Commercial Foundry Development 2. <u>Wolfspeed</u>: Development of Manufacturable Gen3 3.3 kV/50 mΩ SiC MOSFET Fabricated on 150 mm 4HN-SiC Wafers Along With HTRB, HTGB, BDOL, TS, ESD, & TDDB Reliability Qualification 3. <u>GeneSiC</u>: 6.5 kV SiC DMOSFET Development 4. <u>Microsemi</u>: Commercialization of 3.3 kV & Technology Development of 6.5 kV Silicon Carbide Devices 5. <u>Sonrisa</u>: SiC Planar DMOSFETs and Power ICs with Enhanced Short-Circuit Withstand Time 6. <u>NC State</u>: 1.2 kV SiC Trench-Gate Power MOSFETs with P+ Shielding at Trench Bottom 7. <u>Wolfspeed</u>: Industry-Driven, Medium-Voltage SiC Power Module Manufacturing 8. <u>Naval Research Lab</u>: Developing a BPD-Free Room Temperature Al Implant/Anneal Process for P-Wells in SiC MOSFETs, and Develop a Process that Increases and Controls Drift Layer Ambipolar Lifetime. 9. <u>United SiC</u>: 100A, 6.5KV Half-Bridge Module 10: <u>GE Aviation</u>: Design And Manufacture of Advanced Reliable WBG Power Modules
12:00-1:00	Networking Lunch
1:00–2:30	PowerAmerica Technology Roadmap Review - Jim LeMunyon