

## Tuesday, November 8, 2022, 1:30 PM – 2:50 PM

### **1.A. SiC Devices - Novel Devices**

#### **Session Chairs: Aivars Lelis and Victor Veliadis**

- 1:30 PM – 1:50 PM (ID 3054) A New Cell Topology for 4H-SiC Planar Power MOSFETs  
*Shengnan Zhu, Tianshi Liu, Arash Salemi, Marvin White, Hema Maddi, David Sheridan, Anant Agarwal*
- 1:50 PM – 2:10 PM (ID 3058) Exploring Optimum Designs for 1.2kV 4H-SiC JBS Diode-Integrated MOSFETs (JBSFETs)  
*Stephen Mancini, Seung Yup Jang, Dongyoung Kim, Woongje Sung*
- 2:10 PM – 2:30 PM (ID 3063) Design Optimization and Surge Current Capability of 4H-SiC Lateral Deep P+ JBS Diode on Thin RESURF Layer  
*Atsushi Shimbori, Alex Huang*
- 2:30 PM – 2:50 PM (ID 3007) Characterization of Near Conduction Band SiC/SiO<sub>2</sub> Interface Traps in Commercial 4H-SiC Power MOSFET's  
*Hema Lata Rao Maddi, Suvendu Nayak, Vishank Talesara, Yibo Xu, Wu Lu, Anant Agarwal*

### **1.B GaN Devices – Advanced Characterization**

#### **Session Chairs: Robert Kaplar**

- 1:30 PM – 1:50 PM (ID 3006) Reverse Breakdown Time of Wide Bandgap Diodes  
*Jack Flicker, Emily Schrock, Robert Kaplar*
- 1:50 PM – 2:10 PM (ID 3014) Symmetrical VTH/RON Drifts Due to Negative/Positive Gate Stress in p-GaN Power HEMTs  
*Nicolò Zagni, Marcello Cioni, Maria Eloisa Castagna, Maurizio Moschetti, Ferdinando Iucolano, Giovanni Verzelles, Alessandro Chini*
- 2:10 PM – 2:30 PM (ID 3046) Peak Channel Temperature Determination for an AlGa<sub>N</sub>/Ga<sub>N</sub> HEMT with Raman Thermography and MTF Extraction for Long Term Reliability  
*Cristina Miccoli, Leonardo Gervasi, Viviana Cerantonio, Ferdinando Iucolano, Martin Kuball, James Pomeroy*
- 2:30 PM – 2:50 PM (ID 3068) High Temperature Robustness of Enhancement-Mode p-GaN-Gated AlGa<sub>N</sub>/Ga<sub>N</sub> HEMT Technology  
*Mengyang Yuan, Qingyun Xie, John Niroula, Mohamed Fadil Isamotu, Nitul Rajput, Nadim Chowdhury, Tomás Palacios*

## Tuesday, November 8, 2022, 3:10 PM – 4:30 PM

### **1.C SiC Devices - Device Reliability and Robustness**

**Session Chairs: Aivars Lelis and Victor Veliadis**

- 3:10 PM – 3:30 PM (ID 3069) Effects of Oxide Electric Field Stress on the Gate Oxide Reliability of Commercial SiC Power MOSFETs  
*Limeng Shi, Tianshi Liu, Shengnan Zhu, Jiashu Qian, Michael Jin, Hema Lata Rao Maddi, Marvin H White, Anant K Agarwal*
- 3:30 PM – 3:50 PM (ID 3067) A Comparison of Ion Implantation at Room Temperature and Heated Ion Implantation on the Body Diode Degradation of Commercial 3.3 kV SiC Power MOSFETs  
*Jiashu Qian, Tianshi Liu, Jake Soto, Mowafak Al-Jassim, Robert Stahlbush, Naeemulah Mahadik, Limeng Shi, Michael Jin, Anant Agarwal*
- 3:50 PM – 4:10 PM (ID 3052) A Comparison of Short-Circuit Failure Mechanisms of 1.2 kV 4H-SiC MOSFETs and JBSFETs  
*Dongyoung Kim, Skylar Deboer, Seung Yup Jang, Adam Morgan, Woongje Sung*
- 4:10 PM – 4:30 PM (ID 3036) Failure Rate Calculation Due to Neutron Flux with SiC MOSFETs and Schottky Diodes  
*Dennis Meyer, Xuning Zhang, Reenu Garg, Bruce Odekirk, Steve Chenetz, Ehab Tarmoom, Kevin Speer*

### **1.D GaN Devices – Industry and Others**

**Session Chairs: Robert Kaplar**

- 3:10 PM – 3:30 PM (ID 3055) Scaling of EPC's 100 V Enhancement-Mode Power Transistors  
*Gordon Stecklein, Jordan Green, Christopher Wong, Joe Cao, Bob Beach*
- 3:30 PM – 3:50 PM (ID 3034) Advancement in Integration for GaN Power ICs: Autonomous Protection and Loss-Less Sensing  
*Tom Ribarich, Stephen Oliver, Marco Giandalia, Llew Vaughan-Edmunds*
- 3:50 PM – 4:10 PM (ID 3020) Threshold Voltage Behavior and Short-Circuit Capability of p-Gate GaN HEMTs Depending on Drain- and Gate-Voltage Stress  
*Thorsten Oeder, Martin Pfost*

4:10 PM – 4:30 PM      ~~Withdrawn High Volume GaN Production and Reliability Methods~~  
~~*Anthony Schiro, Darshan Gandhi*~~

## Wednesday, November 9, 2022, 2:30 PM – 4:10 PM

### **2.A SiC Applications – 1**

**Session Chairs: Babak Parkhideh and Zhao Yuan**

- 2:30 PM – 2:50 PM      *(ID 3057) Advantages of SiC-Based Devices on the Design of Dual-Active Bridge DC/DC Converter for DC Faults*  
*Shrivatsal Sharma, Yos Prabowo, Subhransu Satpathy, Subhashish Bhattacharya*
- 2:50 PM – 3:10 PM      *(ID 3030) Active Gate Driving of Cascoded SiC JFETs*  
*Arijit Sengupta, Sima Azizi Aghdam, Mohammed Agamy*
- 3:10 PM – 3:30 PM      *(ID 3028) High Frequency High Power Integrated Transformer Design for Resonant Converters with SiC Devices*  
*Tianlong Yuan, Feng Jin, , Zheqing Li, Qiang Li*
- 3:30 PM – 3:50 PM      *(ID 3047) Short Circuit Fault Induced Failure of SiC MOSFETs in DC Solid-State Circuit Breakers*  
*Fei Lu, Hua Zhang, Reza Kheirollahi, Shuyan Zhao*
- 3:50 PM – 4:10 PM      *(ID 3021) Noise Analysis of Current Sensor for Medium Voltage Power Converter Enabled by Silicon-Carbide MOSFETs*  
*Morten Rahr Nielsen, Mathias Kirkeby, Hongbo Zhao, Dipen Narendra Dalal, Michael Møller Bech, Stig Munk-Nielsen*

### **2.B GaN Applications – 1**

**Session Chairs: Jason Zhang and Nabil Akel**

- 2:30 PM – 2:50 PM      *(ID 3011) Next Generation of GaN Single-Board High-Power Modules for Datacenter*  
*Rahil Samani, Juncheng Lu, Ignacio Galiano Zurbriggen*
- 2:50 PM – 3:10 PM      *(ID 3056) 100V GaN for Highly Efficient 1kW Motor Drive Applications*  
*Asantha Kempitiya, Hrach Amirkhanian, Srikanth Yerra, Kapil Kelkar*
- 3:10 PM – 3:30 PM      *(ID 3066) Compact Three-Level GaN Power Module Suitable for Active-Neutral-Point-Clamped (ANPC) Three-Level Converter*  
*Ziwei Liang, Liyan Zhu, Yue Sun, Hua Bai*

- 3:30 PM – 3:50 PM (ID 3008) Design of High Current, High Power Density GaN Based Motor Drive for All Electric Aircraft Application  
*Waqar A. Khan, Armin Ebrahimian, Iman Hosseini, Nathan Weise*
- 3:50 PM – 4:10 PM (ID 3053) Design of Three-Level Flying Capacitor Totem Pole PFC in USB Type-C Power Delivery for Aircraft Applications  
*Tianyu Zhao, Rolando Burgos, Bo Wen, Andrew McLean, Rodrigo Fernández Mattos*

### Wednesday, November 9, 2022, 4:30 PM– 5:50 PM

#### **SiC Applications – 2**

**Session Chairs: Babak Parkhideh and Zhao Yuan**

- 4:30 PM – 4:50 PM (ID 3024) Design of High Power Converter with Single Low Ron Discrete SiC Device  
*Alex Huang, Qingyun Huang, Chen Chen, Zibo Chen*
- 4:50 PM – 5:10 PM (ID 3051) Comparative Investigation of Current-Source Inverters Using SiC Discrete Devices and Power Modules  
*Bulent Sarlioglu, Thomas Jahns, Sangwhae Lee, Feida Chen*
- 5:10 PM – 5:30 PM (ID 3042) A Medium-Voltage Transformer with Integrated Leakage Inductance for 10 kV SiC-Based Dual-Active-Bridge Converter  
*Zihan Gao, Haiguo Li, Fred Wang*
- 5:30 PM – 5:50 PM (ID 3018) Development of a 250°C 15kV SuperCascode Switch Using SiC JFET Technology  
*David Sanabria, Randy Appert, Steven Pronko, Joshua Major, Douglas DeVoto, Jane Lehr, Nicolas Gonzalez, David Ginley, Karen Heinselman*

#### **GaN Applications – 2**

**Session Chairs: Jason Zhang and Nabil Akel**

- 4:30 PM – 4:50 PM (ID 3031) GaN Power Converter Applied to Electrocaloric Heat Pump Prototype and Carnot Cycle  
*Stefan Moench, Richard Reiner, Kareem Mansour, Michael Basler, Patrick Waltereit, Rudiger Quay, Kilian Bartholome*

- 4:50 PM – 5:10 PM (ID 3065) Design Considerations of a GaN-Based Three-Level Traction Inverter for Electric Vehicles  
*Subhransu Satpathy, Partha Pratim Das, Subhashish Bhattacharya, Victor Veliadis*
- 5:10 PM – 5:30 PM (ID 3043) Novel High-voltage-Gain High-Frequency Non-Isolated Three-Port dc-dc Converter with Zero Input Current Ripple and Soft-Switching Capability  
*Zahra Saadatizadeh, Pedram Chavoshpour Heris, Alan Mantooh*
- 5:30 PM – 5:50 PM (ID 3048) Comparison of Thermally Optimized SMD Packages for 100 V GaN HEMTs in 300 KHz Buck Converter High Current Applications  
*Dominik Koch, Ankit Sharma, Till Huesgen, and Ingmar Kallfass*

# Poster Presentations

Tuesday, November 8, 2020, 6:00 PM – 8:00 PM

**Session Chairs: Sameh Khalil, Robert Kaplar**

## **GaN Applications Posters**

(ID 3016) A 5 to 50 V, -25 to 225°C, 0.065 %/V GaN MIS-HEMT Monolithic Compact 2T Voltage Reference  
*Ziqian Li, Yi Shen, Ang Li, Wen Liu*

(ID 3038) Three-Level ANPC Inverter Common-Mode Voltage Analytical Characterization  
*Yang Huang, Xin Xia, Hua Bai, Fanning Jin, Xiaodong Shi, Bing Cheng*

(ID 3044) Bidirectional High Voltage Conversion Ratio High-Frequency DC/DC Converter with Low Number of Components  
*Pedram Chavoshpour Heris, Zahra Saadatizadeh, Alan Mantooth, Rahul Biswash*

(ID 3073) Analysis of a Switching Event and its Impact on Gate Drive in Gallium-Nitride Based Bi-Directional Switches  
*Mustafeez Hassan, Yuxuan Wu, Fang Luo*

## **SiC Devices - Posters**

(ID 3009) 3kV 6.7mOhm-cm<sup>2</sup> 4H-SiC BJT with Highly Effective Four-step Junction Termination Extension (JTE)  
*Xixi Luo, Alex Huang*

(ID 3059) Area-Efficient High-Voltage (HV) Lateral MOSFETs for Discrete Device Development and Power IC Integration  
*Sundar Babu Isukapati, Seung Yup Jang, Woongje Sung*

(ID 3062) A New Layout Method for Junction Field Effect Transistors (JFETs) on 4H-SiC that Provides a Significant Reduction in On-Resistance  
*Justin Lynch, Nick Yun, Seung Yup Jang, Adam J. Morgan, Woongje Sung*

(ID 3013) Source Turn-off (STO) MOSFET  
*Zhicheng Guo, Alex Huang*

(ID 3060) Short Circuit Ruggedness and Partial Discharge Evaluation of a 3.3 kV SiC MOSFET Power Module

*Ke Wang, Yizhou Cong, Pengyu Fu, Xiao Li, Qianyi Cheng, Boxue Hu, Jin Wang, Ashish Kumar, Kraig Olejniczak, Daniel Pelletier, Amit Goyal*

### **SiC Applications - Posters**

(ID 3003) A Highly Integrated Sensorless Field Oriented Control BLDC / PMSM Inverter with 99% Efficiency Enabled by an All-in-One System Integrated Full SiC Intelligent Power Module (sIPM)

*Fu-Jen Hsu, Cheng-Tyng Yen, Hsiang-Ting Hung, Guan-Wei Lin, Chih-Feng Huang, Lung-Sheng Lin, I-Chi Lin, Chih-Fang Huang, Ta-Yung Yang*

(ID 3079) In-Situ Ultrafast Isolated Sensing Techniques for Real-Time Diagnostics, Prognostics, and Protection of SiC Devices

*Ali Parsa Sirat, Chondon Roy, Daniel Evans, James Gafford, Babak Parkhideh*

(ID 3005) Series Compensation Using T-Type Modular Dc Circuit Breaker (T-Breaker) to Improve DC Microgrid Stability

*Faisal Alsaif, Yue Zhang, Nihanth Adina, Khalid Alkhalid, Jin Wang*

(ID 3012) Thermal Design and Experimental Evaluation of a 1kV, 500A T-Type Modular DC Circuit Breaker

*Baljit Riar, Jeffrey Ewanchuk, Hailing Wu, Yue Zhang, Xiao Li, Dihao Ma, Rob Borjas, Jin Wang*

(ID 3026) Embedding Solutions for Vertical SiC and GaN Power Devices

*Hoang Linh Bach, Anqi Huang, Yue Teng, Hubert Rauh, Andreas Schletz, Michael Jank, Martin März*

(ID 3064) Busbar Design and Optimization for High Power Three-Phase Inverter with WBG Device

*Yuxuan Wu, Mustafeez Hassan, Fang Luo*

(ID 3041) A Flux Balancing Strategy for 10-kV SiC-Based Dual-Active-Bridge Converter

*Zihan Gao, Pengfei Yao, Haiguo Li, Fred Wang*