

2021 IEEE 8th Workshop on Wide Bandgap Power Devices and Applications (WiPDA 2021)

**Virtual Workshop
7 – 11 November 2021**



**IEEE Catalog Number: CFP21WBP-POD
ISBN: 978-1-6654-0183-8**

**Copyright © 2021 by the Institute of Electrical and Electronics Engineers, Inc.
All Rights Reserved**

Copyright and Reprint Permissions: Abstracting is permitted with credit to the source. Libraries are permitted to photocopy beyond the limit of U.S. copyright law for private use of patrons those articles in this volume that carry a code at the bottom of the first page, provided the per-copy fee indicated in the code is paid through Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923.

For other copying, reprint or republication permission, write to IEEE Copyrights Manager, IEEE Service Center, 445 Hoes Lane, Piscataway, NJ 08854. All rights reserved.

****** This is a print representation of what appears in the IEEE Digital Library. Some format issues inherent in the e-media version may also appear in this print version.***

IEEE Catalog Number:	CFP21WBP-POD
ISBN (Print-On-Demand):	978-1-6654-0183-8
ISBN (Online):	978-1-6654-0182-1
ISSN:	2641-8274

Additional Copies of This Publication Are Available From:

Curran Associates, Inc
57 Morehouse Lane
Red Hook, NY 12571 USA
Phone: (845) 758-0400
Fax: (845) 758-2633
E-mail: curran@proceedings.com
Web: www.proceedings.com

CURRAN ASSOCIATES INC.
proceedings
.com

WIPDA 2021 Table of Contents

SiC Devices 1: Device Reliability & Robustness

Date: Monday, November 8, 2021
Time: 09:20 - 11:00
Room: Room 1
Chair: Aivars Felis; *U.S. Army Research Laboratory*

Comparison of Gate Oxide Lifetime Predictions with Charge-to-Breakdown Approach and Constant-Voltage TDDDB on SiC Power MOSFET 1

Shengnan Zhu, Tianshi Liu, Limeng Shi, Michael Jin, Hema Lata Rao Maddi, Marvin White, Anant K. Agarwal
Ohio State University, United States

Impacts of Area-Dependent Defects on the Yield and Gate Oxide Reliability of SiC Power MOSFETs 5

Tianshi Liu, Shengnan Zhu, Michael Jin, Limeng Shi, Marvin White, Anant K. Agarwal
Ohio State University, United States

A Static, Switching, Short-Circuit Characteristics of 1.2 kV 4H-SiC MOSFETs: Comparison Between Linear and (Bridged) Hexagonal Topology 9

Dongyoung Kim², Nung Jun Yun², Skylar DeBoer², Junchong Fan¹, Susanna Yu¹, Adam J. Morgan², Minseok Kang¹, Seung Yup Jang², Woongje Sung², Anant K. Agarwal¹
¹*Ohio State University, United States*; ²*State University of New York Polytechnic Institute, United States*

Excellent Static and Dynamic Scaling of Power Handling Capability of the BaSiC(DMM) Topology with 1.2 kV SiC Power MOSFETs 14

Ajit Kanale, B Jayant Baliga
North Carolina State University, United States

Investigation on the Accuracy of the VSD-Method for Different SiC MOSFET Designs Considering Different Measurement Parameters 18

Felix Hoffmann, Nando Kaminski
Universität Bremen, Germany

GaN Power Devices 1: Performance, Trapping, Robustness

Date: Monday, November 8, 2021
Time: 09:20 - 11:00
Room: Room 2
Chair: Matteo Meneghini; *University of Padova*

650V/780A GaN Power HEMT Enabling 10kW-Class High-Efficiency Power Conversion 24

Carl Neufeld¹, Yifeng Wu¹, Steven Wienecke¹, Peter Smith¹, Yulu Huang¹, Masamichi Kamiyama², Jun Ikeda², Tsutomu Hosoda², Brian Swenson¹, Ron Birkhahn¹
¹*Transphorm Inc., United States*; ²*Transphorm Japan Inc., Japan*

Evaluation of 650V, 100A Direct-Drive GaN Power Switch for Electric Vehicle Powertrain Applications 28

Qihao Song¹, Joseph Kozak¹, Ming Xiao¹, Yunwei Ma¹, Boyan Wang¹, Ruizhe Zhang¹, Roman Volkov², Kurt Smith², Tamara Baksht², Yuhao Zhang¹
¹*CPES, Virginia Polytechnic Institute and State University, United States*; ²*VisIC Technologies, Israel*

Quick Thermal Performance Estimation of Chip Scale Packaged GaN FETs Using a Simple Circuit Model	34
Assaad El Helou, John Glaser, Michael de Rooij <i>Efficient Power Conversion Corporation, United States</i>	
On-Wafer Investigation of Avalanche Robustness in 1.3 kV GaN-on-GaN P-N Diode Under Unclamped Inductive Switching Stress	40
Bhawani Shankar ² , Ke Zeng ² , Brendan Gunning ¹ , Kwang Jae Lee ² , Rafael Perez Martinez ² , Chuanzhe Meng ² , Xin Yu Zhou ² , Jack Flicker ¹ , Andrew Binder ¹ , Jeremy Ray Dickerson ¹ , Robert J. Kaplar ¹ , Srabanti Chowdhury ² ¹ <i>Sandia National Laboratories, United States; </i> ² <i>Stanford University, United States</i>	
Extreme GaN – What Happens When eGaN® FETs Are Exposed to Voltage Levels Well Above Data Sheet Limits	44
Alex Lidow, Robert Strittmatter, Alejandro Pozo <i>Efficient Power Conversion Corporation, United States</i>	

ITRW 1

Date: Tuesday, November 9, 2021
Time: 09:20 - 10:40
Room: Room 1
Chair: Andrew Binder; *Sandia National Laboratories*

Switching Behavior and Dynamic On-Resistance of Lateral β-Ga₂O₃ MOSFETs Up to 400 V	52
Carsten Kuring ³ , Kornelius Tetzner ¹ , Andreas Popp ² , Sören Heucke ³ , Oliver Hilt ¹ , Saud Bin Anooz ² , Joachim Würfl ¹ , Sibylle Dieckerhoff ³ ¹ <i>Ferdinand-Braun-Institut, Germany; </i> ² <i>Leibniz-Institut für Kristallzüchtung, Germany; </i> ³ <i>Technische Universität Berlin, Germany</i>	
Reverse Recovery and Rectification Characteristic of β-Ga₂O₃ Schottky Barrier Diode	58
Inhwan Lee, Sudipto Saha, Uttam Singiseti, Xiu Yao <i>University at Buffalo, United States</i>	
Study of Voltage Balancing Techniques for Series-Connected Wide-Bandgap Semiconductors Devices	62
Alinaghi Marzoughi <i>Enphase Energy, United States</i>	
Diamond Integration on GaN for Channel Temperature Reduction	70
Mohamadali Malakoutian ¹ , Runjie Xu ¹ , Chenhao Ren ² , Shubhra Pasayat ³ , Islam Sayed ³ , Eric Pop ¹ , Srabanti Chowdhury ¹ ¹ <i>Stanford University, United States; </i> ² <i>University of California, Davis, United States; </i> ³ <i>University of California, Santa Barbara, United States</i>	

GaN RF 1: Devices

Date: Tuesday, November 9, 2021
Time: 09:20 - 10:40
Room: Room 2
Chair: Ferdinando Iucolano; *ST Microelectronics*

Low Contact Resistance CMOS-Compatible RF GaN-on-Silicon HEMTs	75
Hao Lu, Zeyan Si, Bin Hou, Ling Yang, Xiaohua Ma, Yue Hao <i>Xidian University, China</i>	
Microstructural Degradation Investigations of OFF-State Stressed 0.15 μm RF AlGaIn/GaN HEMTs: Failure Mode Related Breakdown	79
Prabha Sana ¹ , Andreas Graff ¹ , Michél Simon-Najasek ¹ , Susanne Hübner ¹ , Veronica Zhan Gao ³ , Fabiana Rampazzo ³ , Carlo De Santi ³ , Benoit Lambert ² , Gaudenzio Meneghesso ³ , Enrico Zanoni ³ , Matteo Meneghini ³ , Frank Altmann ¹ ¹ <i>Fraunhofer Institute for Microstructure of Materials and Systems, Germany; </i> ² <i>United Monolithic Semiconductors, Germany; </i> ³ <i>University of Padova, Italy</i>	

Best Practices to Quantify Linearity Performance of GaN HEMTs for Power Amplifier Applications 85

Rafael Perez Martinez³, David Munzer¹, Xin Yu Zhou³, Bhawani Shankar³, Else-Marie Schmidt², Kenn Wildnauer², Barry Wu², Boris Murmann³, Srabanti Chowdhury³
¹Georgia Institute of Technology, United States; ²Keysight Technologies, United States; ³Stanford University, United States

Detrapping Kinetics in N-Polar AlGaIn/GaN MIS-HEMTs 90

Francesca Chiochetta², Claudia Calascione², Carlo De Santi², Chandan Sharma², Fabiana Rampazzo², Xun Zheng¹, Brian Romanczyk¹, Matt Guidry¹, Haoran Li¹, Stacia Keller¹, Umesh Mishra¹, Gaudenzio Meneghesso², Matteo Meneghini², Enrico Zanoni²
¹University of California, Santa Barbara, United States; ²University of Padova, Italy

SiC Devices 2: Novel Device Designs

Date: Tuesday, November 9, 2021
Time: 11:00 - 12:40
Room: Room 1
Chair: Aivars Lelis; U.S. Army Research Laboratory

Demonstration of High Voltage (15kV) Split-Gate 4H-SiC MOSFETs 95

Justin Lynch³, Nung Jun Yun³, Adam J. Morgan³, Woongje Sung³, Igal Deckman¹, Dennis Rossman¹, Sung Kim¹, Duy-son Nguyen², Jin-Ho Seo¹, Daniel Habersat², Miguel Hinojosa², Ronald Green², Aivars Lelis²
¹Analog Devices Inc., United States; ²Army Research Laboratory, United States; ³State University of New York Polytechnic Institute, United States

Increased 3rd Quadrant Current Handling Capability of 1.2kV 4H-SiC JBS Diode-Integrated MOSFETs (JBSFETs) with Minimal Impact on the Forward Conduction and Blocking Performances 101

Stephen Mancini, Seung Yup Jang, Dongyoung Kim, Woongje Sung
State University of New York Polytechnic Institute, United States

Analytical Method to Optimize the Cascaded SuperCascode Power Switch Balancing Network 107

Utkarsh Mehrotra, Douglas C Hopkins
North Carolina State University, United States

Comparison of the Capacitances and Switching Losses of 1.2 kV Common-Source and Common-Drain Bidirectional Switch Topologies 112

Ajit Kanale, Sneha Narasimhan, Tzu-Hsuan Cheng, Aditi Agarwal, Suyash Sushilkumar Shah, B Jayant Baliga, Subhashish Bhattacharya, Douglas C Hopkins
North Carolina State University, United States

Development of Isolated CMOS and HV MOSFET on an N-epi/P-epi/4H-SiC N+ Substrate for Power IC Applications 118

Sundar Babu Isukapati³, Hua Zhang², Tianshi Liu², Emran Ashik¹, Bongmook Lee¹, Adam J. Morgan³, Woongje Sung³, Ayman Fayed², Anant K. Agarwal²
¹North Carolina State University, United States; ²Ohio State University, United States; ³State University of New York Polytechnic Institute, United States

GaN Applications 1

Date: Tuesday, November 9, 2021
Time: 11:00 - 12:40
Room: Room 2
Chair: Babak Parkhideh; UNCC

Compact GaN Power Modules with Direct Bonded Liquid-Cooled Heat Exchanger Suitable for EV Applications 123

Wei Jia Zhang², Jingyuan Liang², Wen Tao Cui², Namjee Kim², Rophina Li², Andrei Catuneanu¹, Matthew Birkett¹, John Burgers¹, Wai Tung Ng²
¹Dana Canada Corporation, Canada; ²University of Toronto, Canada

Online Junction Temperature Monitoring of Wide Bandgap Power Transistors Using Quasi Turn-on Delay as TSEP	129
Kanuj Sharma ² , Kevin Muñoz Barón ² , Johannes Ruthardt ¹ , Ingmar Kallfass ² <i>¹ILEA, Universität Stuttgart, Germany; ²ILH, Universität Stuttgart, Germany</i>	
Switching Performance in a GaN Power Stage at Extreme Temperature Conditions	135
Martijn Duraij, Yudi Xiao, Gabriel Zsurzsan, Zhe Zhang <i>Technical University of Denmark, Denmark</i>	
A Generalized Circuit for Measuring GaN Dynamic Resistance	140
Michael Willhoff, John Scarpulla, Christopher Le <i>Aerospace Corporation, United States</i>	

GaN Applications 2

Date: Wednesday, November 10, 2021
Time: 09:20 - 11:00
Room: Room 1

GaN Devices for Motor Drive Applications.....	146
Marco Palma ² , Salvatore Musumeci ¹ , Fabio Mandrile ¹ , Vincenzo Barba ¹ <i>¹ENERG, Politecnico di Torino, Italy; ²Efficient Power Conversion Corporation, United States</i>	
Paralleling Devices in a 13.56 MHz Class Φ2 Inverter to Achieve Current Splitting and Improve Device Thermal Performance	152
Keerti Palanisamy, Kamlesh Sawant, Jungwon Choi <i>University of Minnesota, United States</i>	
A Capacitor-Based Multilevel Gate Driver for GaN HEMT Only with a Single Voltage Supply	158
Takehiro Takahashi, Junichiro Nagao, Jun Furuta, Kazutoshi Kobayashi <i>Kyoto Institute of Technology, Japan</i>	
Optimization of Self-Oscillating Power Converter Based on GaN HEMTs for Wireless Power Transfer.....	164
Dominik Koch ² , Manuel Rueß ² , David Maier ¹ , Ingmar Kallfass ² <i>¹IEW, Universität Stuttgart, Germany; ²ILH, Universität Stuttgart, Germany</i>	
An Isolated Bidirectional DC-DC Converter with High Voltage Conversion Ratio and Reduced Output Current Ripple.....	170
Zhining Zhang ¹ , Boxue Hu ¹ , Yue Zhang ¹ , Jin Wang ¹ , Jacob Mueller ² , Luciano A. Garcia Rodriguez ² , Anindya Ray ² , Stanley Atcitty ² <i>¹Ohio State University, United States; ²Sandia National Laboratories, United States</i>	

SiC Applications 1: Circuits & Systems

Date: Wednesday, November 10, 2021
Time: 09:20 - 11:00
Room: Room 2
Chair: Jiangbiao He; *University of Kentucky*

Design and Fabrication of SiC Based Stepper Motor Driver for High-Temperature Environments.....	176
Ashwin Chandwani ¹ , Ayan Mallik ¹ , Akin Akturk ² , Weijian Xian ² , Usama Khalid ² , Neil Goldsman ² <i>¹Arizona State University, United States; ²CoolCAD Electronics LLC, United States</i>	
Highly Integrated 200 kW SiC Three-Phase Dual-Active-Bridge Converter with 3D-Printed Fluid Coolers	182
David Bündgen ² , André Thönnessen ² , Niklas Fritz ² , Tobias Kamp ² , Rik Wivina Anna De Doncker ¹ <i>¹ISEA, RWTH Aachen University, Germany; ²RWTH Aachen University, Germany</i>	

SiC-Based dv/dt Generator for Insulation Testing with Fast and Adjustable Switching Transients	188
Vivien Grau ² , Marcel Reisner ² , Stefan Quabeck ² , Rik Wivina Anna De Doncker ¹ <i>¹ISEA, RWTH Aachen University, Germany; ²RWTH Aachen University, Germany</i>	
High Frequency Injection Sensorless Control for a Permanent Magnet Synchronous Machine Driven by an FPGA Controlled SiC Inverter	194
Jared Walden ² , Hua Bai ² , Bing Cheng ¹ , Fanning Jin ¹ <i>¹Mercedes Benz North America, United States; ²Mercedes Benz North America, Italy; ²University of Tennessee - Knoxville, United States</i>	
Development of a 1 kV, 500 A, SiC-Based T-Type Modular DC Circuit Breaker (T-Breaker)	199
Yue Zhang ¹ , Xiao Li ¹ , Dihao Ma ¹ , Yizhou Cong ¹ , Faisal Alsaif ¹ , Zhining Zhang ¹ , Rob Borjas ¹ , Boxue Hu ¹ , Jin Wang ¹ , Baljit Riar ² , Jeffrey Ewanchuk ² , Aritra Sur ² , Vladmir Blasko ² <i>¹Ohio State University, United States; ²Raytheon Technologies Research Center, United States</i>	

Virtual Posters 1

Date: Wednesday, November 10, 2021
Time: 11:20 - 13:00
Room: Poster 1
Chair: Babak Parkhideh; UNCC

Modulation Strategy Comprising TCM with Frequency Limit and DPWM for Fast Switching GaN-Inverters	205
Benedikt Kohlhepp, Thomas Dürbaum <i>Friedrich-Alexander University, Germany</i>	
Design and Performance Analysis of High Density Universal Charger Featuring GaN Based Integrated Power Stage	211
Robert Vartanian, Deepak Veerreddy <i>Infineon Technologies, United States</i>	
An Asynchronous Buck Converter by Using a Monolithic GaN IC Integrated by an Enhancement-Mode GaN-on-SOI Process	215
Shumpei Noike, Junichiro Nagao, Jun Furuta, Kazutoshi Kobayashi <i>Kyoto Institute of Technology, Japan</i>	
Modeling, Simulation and Hardware Implementation of the GaN Based Resonance Current Source for the Ultra-Fast MVDC Circuit Breaker	220
Md Rakib-Ur Rahman, Nathan Weise <i>Marquette University, United States</i>	
Three-Phase Three-Level GaN-ANPC Inverter with a 1 MHz Switching Frequency	226
Heikki Järvisalo, Juhamatti Korhonen, Juuso Rautio, Pertti Silventoinen <i>LUT University, Finland</i>	
Effect of Trap-Filling Bias on the Extraction of the Time Constant of Drain Current Transients in AlGaIn/GaN HEMTs	231
Nicolò Zagni, Marcello Cioni, Alessandro Chini <i>Università degli Studi di Modena e Reggio Emilia, Italy</i>	
Evaluation of the High Performance 650 V Cascode GaN FET Under Low Temperature	236
Yuqi Wei, Maksudul Hossain, Alan Mantooth <i>University of Arkansas, United States</i>	
Humidity Capability of Enhancement Mode GaN High Electron Mobility Transistors	242
Alexander Brunko, Marvin Gloth, Nando Kaminski <i>Universität Bremen, Germany</i>	

Dynamic ON-Resistance Characterization of GaN HEMT Under Soft-Switching Condition	246
Tianyu Zhao ² , Rolando Burgos ² , Jing Xu ¹ ¹ ABB Corporate Research Center, United States; ² CPES, Virginia Polytechnic Institute and State University, United States	
Commercially Available N-Polar GaN HEMT Epitaxy for RF Applications	250
Davide Bisi, Brian Romanczyk, Xiang Liu, Geetak Gupta, Tobias Brown-Heft, Ron Birkhahn, Rakesh Lal, Carl Neufeld, Stacia Keller, Primit Parikh, Umesh Mishra, Lee McCarthy Transphorm Inc., United States	
T-CAD Simulations Study on Drain Leakage Current and its Correlation with Gate Current for AlGaIn/GaN HEMTs.....	255
Cristina Miccoli ¹ , Viviana Cerantonio ¹ , Alessandro Chini ² , Ferdinando Iucolano ¹ ¹ ST Microelectronics, Italy; ² Università degli Studi di Modena e Reggio Emilia, Italy	
Design of Ka-Band Doherty Power Amplifier Using 0.15 μm GaN on SiC Process Based on Novel Complex Load Modulation	259
Xinyu Zhou, Rafael Perez Martinez, Bhawani Shankar, Srabanti Chowdhury Stanford University, United States	
Integration of β-Ga₂O₃ on Si (100) for Lateral Schottky Barrier Diodes	263
Manoj K Yadav, Arnab Mondal, Shiv Kumar, Satinder K Sharma, Ankush Bag Indian Institute of Technology Mandi, India	

GaN Power Devices 2: Technology

Date: Thursday, November 11, 2021
Time: 09:20 - 11:00
Room: Room 1
Chair: Matteo Meneghini; *University of Padova*

Analysis of ALD Dielectric Leakage in Bulk GaN MOS Devices	268
Caleb Glaser ¹ , Andrew Binder ¹ , Luke Yates ¹ , Andrew Allerman ¹ , Daniel Feezell ² , Robert J. Kaplar ¹ ¹ Sandia National Laboratories, United States; ² University of New Mexico, United States	
Dynamic and Capacitive Characterization of 3D GaN n-p-n Vertical Fin-FETs.....	273
Thomas Bordignon ² , Manuel Fregolent ² , Carlo De Santi ² , Klaas Strempeel ¹ , Andrey Bakin ¹ , Andreas Waag ¹ , Gaudenzio Meneghesso ² , Enrico Zanoni ² , Matteo Meneghini ² ¹ Technische Universität Braunschweig, Germany; ² University of Padova, Italy	
Deep-Level Characterization of GaN-on-GaN Current Aperture Vertical Electron Transistors	277
Matthias Sinnwell ² , Philipp Doering ¹ , Rachid Driad ² , Michael Dammann ² , Michael Mikulla ² , Rüdiger Quay ² ¹ Albert-Ludwigs University Freiburg, Germany; ² Fraunhofer Institute for Applied Solid State Physics, Germany	
High Mobility in GaN MOSFETs with AlSiO Gate Dielectric and AlN Mobility Enhancement Layer	283
Matthew Smith, Yosuke Kajiwara, Hiroshi Ono, Po-Chin Huang, Daimotsu Kato, Akira Mukai, Aya Shindome, Masahiko Kuraguchi Toshiba Corporation, Japan	
Etched and Regrown Vertical GaN Junction Barrier Schottky Diodes.....	288
Andrew Binder, Greg Pickrell, Andrew Allerman, Jeremy Ray Dickerson, Luke Yates, Jeffrey Steinfeldt, Caleb Glaser, Mary Crawford, Andrew Armstrong, Paul Sharps, Robert J. Kaplar Sandia National Laboratories, United States	

SiC Applications 2: Device Characterization

Date: Thursday, November 11, 2021
Time: 09:20 - 11:00
Room: Room 2
Chair: Hua Bai; *The University of Tennessee*

Switching Behavior of a Hybrid Si-IGBT and SiC MOSFET Based ANPC Topology	293
Srikanth Lakshmeesha, Civan Lezgin Kahraman, Sebastian Rosado, Thiwanka Wijekoon <i>Huawei Nuremberg Research Center, Germany</i>	
Balancing Unequal Temperature Distributions of Parallel-Connected SiC MOSFETs Using an Intelligent Gate Driver	299
Christoph Lüdecke, Michael Laumen, Rik Wivina Anna De Doncker <i>ISEA, RWTH Aachen University, Germany</i>	
An Integrated Active Gate Driver for SiC MOSFETs	305
Dongwoo Han ¹ , Sanghun Kim ¹ , Xiaofeng Dong ¹ , Zhehui Guo ¹ , Hui Li ¹ , Jinyeong Moon ¹ , Yuan Li ¹ , Fang Z. Peng ¹ , Radha Sree Krishna Moorthy ² , Madhu Sudhan Chinthavali ² ¹ <i>Center for Advanced Power Systems, Florida State University, United States;</i> ² <i>Oak Ridge National Laboratory, United States</i>	
Liquid Metal Based Cooling for Power Electronics Systems with Inductor Integrated Magnetohydrodynamic Pump (MHD Pump)	310
Junchong Fan ² , Yue Zhang ² , Jin Wang ² , Madhu Sudhan Chinthavali ¹ , Radha Sree Krishna Moorthy ¹ ¹ <i>Oak Ridge National Laboratory, United States;</i> ² <i>Ohio State University, United States</i>	
Characterization of Electrical Parameters for Health Monitoring in SiC MOSFETs During AC Power Cycling	316
Kevin Muñoz Barón ² , Kanuj Sharma ² , Maximilian Nitzsche ¹ , Ingmar Kallfass ² ¹ <i>ILEA, Universität Stuttgart, Germany;</i> ² <i>ILH, Universität Stuttgart, Germany</i>	

Virtual Posters 2

Date: Thursday, November 11, 2021
Time: 11:20 - 13:00
Room: Poster 1
Chair: Helen Cui; *The University of Tennessee*

Experimental Validations of the SiC MOSFET Based LLC Converter Circuit and Power Loss Models	322
Yuqi Wei, Alan Mantooth <i>University of Arkansas, United States</i>	
A Balanced Current-Source Inverter and its DC-Link Shunted Variant for Common-Mode Voltage Cancellation	328
Hang Dai, Renato Amorim Torres, Thomas Jahns, Bulent Sarlioglu <i>University of Wisconsin-Madison, United States</i>	
High Temperature Application of a SiC-Ldmosfet Based DC-DC Power Converter	333
Saikat Dey ¹ , Ayan Mallik ¹ , Neil Goldsman ² , Akin Akturk ² , Zeynep Dilli ² , Chris Darmody ² , Usama Khalid ² ¹ <i>Arizona State University, United States;</i> ² <i>CoolCAD Electronics LLC, United States</i>	
Hardware Design of Medium Voltage SiC-Based Modular Multilevel Converters for Grid-Tied Applications	339
Ke Wang ² , Dihao Ma ² , Boxue Hu ² , Jin Wang ² , Akanksha Singh ¹ , Barry Mather ¹ ¹ <i>National Renewable Energy Laboratory, United States;</i> ² <i>Ohio State University, United States</i>	

Submodule Design of a 2 kV 1 MW Integrated Modular Motor Drive for Aviation Applications.....	345
Yizhou Cong, Nihanth Adina, Zhuo Wei, Haoyang You, Rob Borjas, Xintong Lyu, Pengyu Fu, Boxue Hu, Jin Wang <i>Ohio State University, United States</i>	
Impact of Soft- and Hard-Switching Transitions on VTH and RON Drifts in Packaged SiC MOSFETs.....	351
Marcello Cioni, Alessandro Chini <i>Università degli Studi di Modena e Reggio Emilia, Italy</i>	
Real-Time FPGA Simulation of Silicon Carbide MOSFETs	355
Gard Lyng Rødal, Dimosthenis Pefitsis <i>Norwegian University of Science and Technology, Norway</i>	
Critical Design Considerations for Static and Dynamic Performances on 6.5 kV 4H-SiC MOSFETs Fabricated in a 6-Inch SiC Foundry	361
Nung Jun Yun ³ , Justin Lynch ³ , Skylar DeBoer ³ , Adam J. Morgan ³ , Woongje Sung ³ , Diang Xing ¹ , Minseok Kang ¹ , Anant K. Agarwal ¹ , Victor Veliadis ² , Voshadhi Amarasinghe ⁴ , John Ransom ⁴ ¹ <i>Ohio State University, United States</i> ; ² <i>PowerAmerica institute, United States</i> ; ³ <i>State University of New York Polytechnic Institute, United States</i> ; ⁴ <i>X-FAB, United States</i>	
Performance Evaluation of 3.3 kV SiC MOSFET and Schottky Diode for Medium Voltage Current Source Inverter Application	366
Sneha Narasimhan, Ajit Kanale, Subhashish Bhattacharya, B Jayant Baliga <i>North Carolina State University, United States</i>	
Smart Universal Parameter Fitting Method for Modeling Static SiC Power MOSFET Behavior.....	372
Daniel Philipps, Dimosthenis Pefitsis <i>Norwegian University of Science and Technology, Norway</i>	
Online Junction-Temperature Extraction Method for SiC MOSFETs Utilizing Turn-on Delay	378
Sven Kalker ² , Christoph Henrik van der Broeck ² , Rik Wivina Anna De Doncker ¹ ¹ <i>ISEA, RWTH Aachen University, Germany</i> ; ² <i>RWTH Aachen University, Germany</i>	
Comparison of Short Circuit Failure Modes in SiC Planar MOSFETs, SiC Trench MOSFETs and SiC Cascode JFETs.....	384
Erfan Bashar ² , Ruizhu Wu ² , Nereus Agbo ² , Simon Mendy ² , Saeed Jahdi ¹ , Jose-Ortiz Gonzalez ² , Olayiwola Alatise ² ¹ <i>University of Bristol, United Kingdom</i> ; ² <i>University of Warwick, United Kingdom</i>	
Development and Thermal Characterization of a Low Resistance SiC Module.....	389
Xiaoqing Song, Taosha Jiang, Yu Du, Pietro Cairolì <i>ABB Corporate Research Center, United States</i>	
Thermal and Thermomechanical Analysis of a 10 kV SiC MOSFET Package with Double-Sided Cooling.....	394
Mark Cairnie, Jacob Gersh, Christina Dimarino <i>CPES, Virginia Polytechnic Institute and State University, United States</i>	
Demonstration of Cell-to-Cell Integrated 4H-SiC Lateral Bi-Directional Junction Field Effect Transistor (LBiDJFET)	400
Seung Yup Jang, Sundar Babu Isukapati, Justin Lynch, Woongje Sung <i>State University of New York Polytechnic Institute, United States</i>	