

Opening Session

Monday May 23rd, 2022

8:30 – 9:00

Chair: Wai Tung Ng (University of Toronto)
David Sheridan (Alpha Omega Semiconductor)

Plenary Sessions

Monday May 23rd, 2022

Plenary I

9:00 – 10:20

Chair: Wai Tung Ng (University of Toronto)
David Sheridan (Alpha Omega Semiconductor)

8:40 – 9:20 Power Semiconductors - Key Enabler for EV Industry
Alan Zeng (NIO, China)

9:20 – 10:00 Recent Progress and Future Challenges of GaN Vertical Power Devices
Jun Suda (Nagoya University, Japan)

Plenary II

10:40 – 12:00

Chair: Wai Tung Ng (University of Toronto)
David Sheridan (Alpha Omega Semiconductor)

10:20 – 11:00 The Role of Hydrogen in the Future Energy and Mobility System
Juergen Rechberger (AVL, Germany)

11:00 – 11:40 Paradigm Shift of Power Supply Technology with GaN Devices
Yan-Fei Liuk (Queens University, Canada)

Oral Sessions

Monday May 23rd, 2022

Session 1: LVT/PK

13:30 – 15:10

Chair: Amit Paul (onsemi, USA)

Ichiro Omura (Kyushu Institute of Technology, Japan)

13:30 – 13:55 Charge Balance and UIS Robustness of Trench Field Plate Power MOSFETs

Tanuj Saxena, Christian Torrent, Vishnu Khemka, Ganming Qin, Mark Gibson
NXP Semiconductors Inc., United States

13:55 – 14:20 Novel Hybrid SiGe-Silicon 5V pLDMOS on 28nm HKMG Technology

Ruchil Jain, Felix Holzmueller, Peter Baars, Alban Zaka, Elodie Ebrard, Ketankumar Tailor, Tom Herrmann, Damien Angot
Globalfoundries, Germany

14:20 – 14:45 Investigation of Stability and Oscillations at Power Modules with Low Stray Inductance

Sven Bütow, Matthias Spang
Semikron Elektronik GmbH & Co. KG, Germany

14:45 – 15:10 Impact of the Chip Properties on the Power Cycling Performance of Silicon Carbide MOSFETs at Different Temperature Swings

Felix Hoffmann, Nando Kaminski
Universität Bremen, Germany

Tuesday May 24th, 2022

Session 2: SiC Power Devices

13:30 – 15:10

Chair: Sei-Hyung Ryu (Wolfspeed)

Andrei Mihaila (Hitachi ABB Power Grids)

13:30 – 13:55 Experimental Demonstration, Challenges, and Prospects of the Vertical SiC FinFET

F. Udrea¹, K. Naydenov¹, H. Kang¹, T. Kato², E. Kagoshima², H. Fujioka², H. Tomita², T. Nishiwaki², H. Fujiwara², T. Kimoto³

¹University of Cambridge, United Kingdom; ²MIRISE Technologies Corporation, Japan; ³Kyoto University, Japan

13:55 – 14:20 Overcurrent Turn-Off Robustness and Stability of the Switching Behavior of SiC MOSFET Body Diodes

Shanmuganathan Palanisamy¹, Thomas Basler¹, Xing Liu¹, Clemens Herrmann¹, Rudolf Elpelt², Paul Sochor²

¹Technische Universität Chemnitz, Germany; ²Infineon Technologies AG, Germany

14:20 – 14:45 Fabrication Aspects and Switching Performance of a Self-Sensing 800 V SiC Circuit Breaker Device

Norman Boettcher¹, Taro Takamori², Keiji Wada², Wataru Saito³, Shin-Ichi Nishizawa³, Tobias Erlbacher^{1,4}

¹Fraunhofer Institute for Integrated Systems and Device Technology IISB, Germany; ²Tokyo Metropolitan University, Japan; ³Kyushu University, Japan; ⁴Friedrich-Alexander University, Germany

14:45 – 15:10 Modeling of In-Chip Current-Temperature Distribution of SiC Power MOSFETs During Fast Switching Events

Salvatore Race¹, Ivana Kovacevic-Badstuebner¹, Roger Stark¹, Alexander Tsibizov¹, Ulrike Grossner¹, Dan Popescu², Bogdan Popescu²

¹Advanced Power Semiconductor Laboratory, ETH Zürich, Switzerland; ²Infineon Technologies AG, Germany

Wednesday May 25th, 2022

Session 3: WBG Power Devices

10:40 – 12:20

Chair: Oliver Hilt (Ferdinand-Braun-Institut, Berlin)

10:40 – 11:05 Demonstration of BaTiO₃ Integrated kV-Class AlGaN/GaN Schottky Barrier Diodes with Record Average Breakdown Electric Field

Mohammad Wahidur Rahman, Chandan Joishi, Nidhin Kurian Kalarickal, Hyunsoo Lee, Siddharth Rajan

The Ohio State University, United StatesWahidur

11:05 – 11:30 Role of Free Holes in nBTI Degradation in GaN-on-Si MOS-Channel HEMTs

W. Vandendaele¹, M.-A. Jaud¹, A.G. Viey¹, B. Mohamad¹, C. Le Royer¹, L. Vauche¹, A. Constant², R. Modica², F. Iucolano², R. Gwoziecki¹

¹CEA-Leti, France; ²STMicroelectronics, Italy

11:30 – 11:55 1200V GaN Switches on Sapphire Substrate

G. Gupta¹, M. Kanamura², B. Swenson¹, D. Bisi¹, B. Romanczyk¹, C. Neufeld¹, S. Wienecke¹, T. Ogino², Y. Miyazaki², K. Imanishi², J. Ikeda², M. Kamiyama², J. Guerrero¹, S. Yea¹, M. Labrecque¹, R. Prejdova¹, B. Cruse¹, J. McKay¹, G. Bolante¹, Z. Wang¹, T. Hosoda², Y. Wu¹, P. Parikh¹, R. Lal¹, U. Mishra¹

¹Transphorm Inc., United States; ²Transohorm Japan, Japan

11:55 – 12:20 Cryogenic Ultra-Fast Bias Temperature Instability Trap Profiling of SiC MOSFETs

Filip Geenen¹, Fabrizio Masin², Arno Stockman¹, Carlo De Santi², Jan Lettens¹, Dominic Waldhoer³, Matteo Meneghini², Tibor Grasser³, Peter Moens¹

¹onsemi, Belgium; ²Università degli Studi di Padova, Italy; ³Technischen Universität Wien, Austria

Roundtables

Tuesday May 24th, 2022

US/EU Roundtable

8:30 – 10:20

Gate-Geometry Dependence of Dynamic V_t in p-GaN Gate HEMTs

Ethan S. Lee¹, Jungwoo Joh², Dong Seup Lee², Jesús A. del Alamo¹

¹Massachusetts Institute of Technology, United States; ²Texas Instruments Inc., United States

Exceptional Repetitive-Short-Circuit Robustness of Vertical GaN Fin-JFET at High Voltage

R. Zhang¹, J. Liu¹, Q. Li¹, S. Pidaparathi², A. Edwards², C. Drowley², Y. Zhang¹

¹Virginia Polytechnic Institute and State University, United States; ²Nexgen Power Systems Inc, United States

On-Chip Condition Monitoring of GaN Power Devices Using TJ-Independent TON Precursor for Device Aging and Gate Leakage IGSS for Dielectric Failure

Lixiong Du, Yuanqing Huang, D. Brian Ma

University of Texas at Dallas, United States

Edge Termination and Peripheral Designs for SiC High-Voltage (HV) Lateral MOSFETs for Power IC Technology

Sundar Babu Isukapati, Adam J. Morgan, Woongje Sung

State University of New York Polytechnic Institute, United States

Implementation of a Short Channel (0.3 μm) for 4H-SiC MOSFETs with Deep P-Well Using 'Channeling' Implantation

Dongyoung Kim, Seung Yup Jang, Adam J. Morgan, Woongje Sung

State University of New York Polytechnic Institute, United States

Asia Roundtable I

15:30 – 17:30

Lifetime Control Free Cathode Side Concept for Si-Based Power Diode Targeting High-Speed Operation and High Dynamic Ruggedness

Katsumi Nakamura, Koji Tanaka, Naoyuki Takeda, Mikihiro Suzuki, Yusuke Kawase
Mitsubishi Electric Corporation, Japan

Split-Dummy-Active CSTBT™ for Improving Recovery dv/dt and Turn-on Switching Loss Tradeoff

Kazuya Konishi, Koichi Nishi, Kohei Sako, Akihiko Furukawa
Mitsubishi Electric Corporation, Japan

4.5 kV Double-Gate RC-IEGT with Hole Control Gate

Ryohei Gejo ¹, Tatsunori Sakano ², Akiyo Kawakami ¹, Takahiro Kato ², Shigeaki Hayase ¹, Tomoaki Inokuchi ², Kazuto Takao ²

¹Toshiba Electronic Devices & Storage Corporation, Japan; ²Toshiba Corporation, Japan

Integrated Time and Space Carrier Controllable HiGT (i-TASC) with Widely Designable Backside Technology

Hiroshi Suzuki ¹, Tomoyuki Miyoshi ¹, Tomoyasu Furukawa ¹, Tsubasa Moritsuka ²

¹Hitachi, Ltd., Japan; ²Hitachi Power Semiconductor Device, Ltd., Japan

Improvement of the Trade-Off Between Qrr and IDSS in Trench Field Plate Power MOSFETs by Proton Irradiation of the Cathode Side

Yusuke Kobayashi ¹, Tatsuya Nishiwaki ², Akihiro Goryu ¹, Tsuyoshi Kachi ², Ryohei Gejo ², Hiro Gangi ¹, Tomoaki Inokuchi ¹, Kazuto Takao ¹

¹Toshiba Corporation, Japan; ²Toshiba Electronic Devices & Storage Corporation, Japan

Reverse Recovery Noise Reduction Using Multi-Trench-Gate Super-Junction Power MOSFETs with Floating Columns

Y. Nabuchi, A. Shimomura, M. Fujita, M. Sawada, K. Eikyu

Renesas Electronics Corporation, Japan

Large Current Output Digital Gate Driver Using Half-Bridge Digital-to-Analog Converter IC and Two Power MOSFETs

Kohei Horii ¹, Katsuhiko Hata ¹, Ruizhi Wang ¹, Wataru Saito ², Makoto Takamiya ¹

¹University of Tokyo, Japan; ²Kyushu University, Japan

Enhanced Short-Circuit Capability for 1.2 kV SiC SBD-Integrated Trench MOSFETs Using Cu Blocks Sintered on the Source Pad

Kailun Yao ¹, Fumiki Kato ², So Satoshi Tanaka ², Shinsuke Harada ², Hiroshi Sato ², Hiroshi Yano ¹, Noriyuki Iwamuro ¹

¹University of Tsukuba, Japan; ²National Institute of Advanced Industrial Science and Technology, Japan

Hybrid GaN-SiC Power Switches for Optimum Switching, Conduction and Free-Wheeling Performance

Battavshin Bayarkhuu ¹, Ravi Nath Tripathi ², Ichiro Omura ¹, Alberto Castellazzi ²

¹Kyushu Institute of Technology, Japan; ²Kyoto University of Advanced Science, Japan

Wednesday May 25th, 2022

Asia Roundtable II

8:30 – 10:20

Ultra-High Voltage BCD Technology Integrated 1000 V 3-D Split-Superjunction Devices

Nailong He¹, Sen Zhang^{1,2}, Hao Wang¹, Jingchuan Zhao¹, Long Zhang², Siyang Liu², Weifeng Sun², Quanyu Zhao³, Ning Tang³, Wentong Zhang^{1,3}, Zhaoji Li³, Bo Zhang³

¹CSMC Technologies Corporation, China; ²Southeast University, China; ³University of Electronic Science and Technology of China, China

A High-Voltage Silicon-on-Insulator Lateral IGBT with Segmented Trenches for Improved Short Circuit Ruggedness

Sen Zhang^{1,2}, Jie Ma¹, Min Luo¹, Xiaona Wang¹, Nailong He², Hua Song², Sheng Li¹, Jiaying Wei¹, Siyang Liu¹, Long Zhang¹, Weifeng Sun¹

¹Southeast University, China; ²CSMC Technologies Corporation, China

Physical Mechanism of Device Degradation & its Recovery Dynamics of p-GaN Gate HEMTs Under Repetitive Short Circuit Stress

Chaowu Pan, Qi Zhou, Z. Wu, N. Yang, P. Bai, L. Zhu, K. Chen, W. Mei, C. Zhou, X. Ming, B. Zhang
University of Electronic Science and Technology of China, China

Suppression of Current Collapse by Access-Region Carrier Enhancement Technique in GaN-MOSFETs

Y. Kajiwara, H. Ono, D. Brian Kato, A. Shindome, P.-C. Huang, P.-T. Wu, M. Kuraguchi
Toshiba Corporation, Japan

First Integration of 10-V CMOS Logic Circuit, 20-V Gate Driver, and 600-V VDMOSFET on a 4H-SiC Single Chip

B.-Y. Tsui, C.-L. Hung, T.-K. Tsai, Y.-C. Tsui, T.-W. Wang, Y.-X. Wen, C.-P. Shih, J.-C. Wang, L.-J. Lin, C.-H. Wang, K.-W. Chu, P.-H. Chen

National Yang Ming Chiao Tung University, Taiwan

Dynamic Interplays of Gate Junctions in Schottky-Type p-GaN Gate Power HEMTs During Switching Operation

Han Xu¹, Zheyang Zheng¹, Li Zhang¹, Jiahui Sun¹, Song Yang¹, Jiabei He¹, Jin Wei², Kevin J. Chen¹

¹Hong Kong University of Science and Technology, China; ²Peking University, China

Wafer-Scale Fabrication of Vertical GaN p-n Diodes with Graded JTE Structures Using Multiple-Zone Boron Implantation

Yoshinao Miura, Hirohisa Hirai, Akira Nakajima, Shinsuke Harada

National Institute of Advanced Industrial Science and Technology, Japan

Low ON-Resistance Fully-Vertical GaN-on-SiC Schottky Barrier Diode with Conductive Buffer Layer

Yanjun Li¹, Shu Yang¹, Kai Liu², Kai Cheng², Kuang Sheng¹, Bo Shen³

¹Zhejiang University, China; ²Enkris Semiconductor Inc., China; ³Peking University, China

Comparative Study of Performance of SiC SJ-MOSFETs Formed by Multi-Epitaxial Growth and Trench-Filling Epitaxial Growth

Mitsuru Sometani, Kunihide Oozono, Shiyang Ji, Tadao Morimoto, Tomohisa Kato, Kazutoshi Kojima, Shinsuke Harada

National Institute of Advanced Industrial Science and Technology, Japan

Poster Sessions

Monday May 23rd, 2022

Poster Session (Live)

15:30 – 16:30

High-Voltage Fully Integrated Gate Driver IC with Galvanic Isolation Based on Embedded Coreless Transformers

J. Lehmann¹, M. Rossberg¹, O. Behr¹, R. Herzer¹, S. Bütow¹, N. Becker², D. Obernoeder¹

¹Semikron Elektronik GmbH & Co. KG, Germany; ²Technische Universität Ilmenau, Germany

A 1.2 μ W – 132 mW, 92% Peak Efficiency, All-in-One Power Management IC for Heterogeneous Combining a Single Shared Inductor

Seneke Chamith Chandrarathna, Muhammad Ali, Seong-Yoen Moon, Jong-Wook Lee

Kyung Hee University, Korea

A Dynamic Gate Driver IC with Automated Pattern Optimization for SiC Power MOSFETs

W.T. Cui¹, W.J. Zhang¹, J.Y. Liang¹, H. Nishio², H. Sumida², H. Nakajima², Yuan-Ta Hsieh³, Hann-Huei Tsai³, Ying-Zong Juang³, Wen-Kuan Yeh³, W.T. Ng¹

¹University of Toronto, Canada; ²Fuji Electric Co., Ltd., Japan; ³Taiwan Semiconductor Research Institute, Taiwan

An Electrothermal Compact Model for SiC MOSFETs Based on SPICE Primitives with Improved Description of the JFET Resistance

A. Borghese, M. Riccio, L. Maresca, G. Breglio, A. Irace

Università degli Studi di Napoli Federico II, Italy

The Smart ICeGaN™ Platform with Sensing and Protection Functions for Both Enhanced Ease of Use and Gate Reliability

Florin Udrea, Martin Arnold, Loizos Efthymiou, Zahid Ansari, Orange Fung, John Findlay, Kaspars Ledins, Giorgia Longobardi

Cambridge GaN Devices Ltd, United Kingdom

Superior Eoff –Vcesat Trade-Off of 5V-Gate-Driven 3.3kV Back-Gate-Controlled IGBTs (BC-IGBTs)

T. Saraya, K. Itou, T. Takakura, M. Fukui, S. Suzuki, K. Takeuchi, T. Hiramoto
University of Tokyo, Japan

Normally-Off 650V GaN-on-Si MOSc-HEMT Transistor: Benefits of the Fully Recessed Gate Architecture

C. Le Royer¹, B. Mohamad¹, J. Biscarrat¹, L. Vauche¹, R. Escoffier¹, J. Buckley¹, S. Bécu¹, R. Riat¹, C. Gillot¹, M. Charles¹, S. Ruel¹, P. Pimenta-Barros¹, N. Posseme¹, P. Besson¹, F. Boudaa¹, C. Vannuffel¹, W. Vandendaele¹, A.G. Viey¹, A. Krakovinsky¹, M.-A. Jaud¹, R. Modica¹, F. Lucolano², R. Le Tiec³, S. Levi³, M. Orsatelli⁴, R. Gwoziecki¹, V. Sousa¹
¹CEA-Leti, France; ²STMicroelectronics, Italy; ³Applied Materials, Israel; ⁴CEA Tech Occitanie, France

Switching Noise-Loss Trade-Off Improvement of SJ-IGBTs

Wataru Saito, Shin-Ichi Nishizawa
Kyushu University, Japan

Online Poster Session I

16:30 – 18:30

On the Physics Link Between Time-Dependent Gate Breakdown and Electroluminescence in Schottky-Type p-GaN Gate HEMTs

Xi Tang¹, Yuhan Liu², Huan Wang¹, Dan Dong², Yulian Yin¹, Yan Lin², Haoran Li¹, Pingfan Chen¹, Hui Li¹, Zhen Huang¹, Wenping Cao¹, Baikui Li², Cungang Hu¹
1Anhui University, China; 2Shenzhen University, China

A Pathway to Improve the Reliability of p-GaN Gate HEMTs Through Buffer Hole Accumulation

Injun Hwang, Woochul Jeon, Sun-Kyu Hwang, Jaejoon Oh, Joonyong Kim, Jun Hyuk Park, Boram Kim, Jongseob Kim
Samsung Electronics Co., Ltd., Korea

Experimental Study on the Potential of nLDMOSFETs with Partial Drain Slit Structure

Takahiro Mori, Yuki Muto, Tatsuyoshi Ueno, Hidenori Sato, Koji Iizuka
Renesas Electronics Corporation, Japan

Collector-Gate-Controlled Lateral IGBT for Reduction of On-State Voltage and Turn-Off Loss

Kazuki Tani¹, Kenji Hara¹, Tomoyasu Furukawa¹, Kenji Sakurai², Tomoyuki Utsumi²
¹Hitachi, Ltd., Japan; ²Hitachi Power Semiconductor Device, Ltd., Japan

Correlation Between Pulse I-V and Human Body Model (HBM) Tests for Drain Electrostatic Discharge (ESD) Robustness Evaluation of GaN Power HEMTs

Jiahui Sun, Zheyang Zheng, Li Zhang, Kevin J. Chen
Hong Kong University of Science and Technology, China

Investigation of Dynamic-QGD on Enhancement-Mode AlGaIn/GaN MIS-HEMTs- with SiN_x Passivation Dielectric

Yixu Yao, Qimeng Jiang, Sen Huang, Xinhua Wang, Lan Bi, Hao Jin, Xinyue Dai, Yifei Huang, Jie Fan, Ke Wei, Jinjuan Xiang, Haojie Jiang, Junfeng Li, Wenwu Wang, Xinyu Liu
Institute of Microelectronics, Chinese Academy of Sciences, China

Novel Topology with Continuous Switching to Comprehensively Characterize Trapping-Induced Dynamics in GaN Power Devices

Ming-Cheng Lin¹, Chao-Ta Fan², Shun-Wei Tang², Tian-Li Wu², Chih-Fang Huang³
¹Device Dynamics Lab, Taiwan; ²National Yang Ming Chiao Tung University, Taiwan; ³National Tsing Hua University, Taiwan

Impact of Cell Layout on On-State and Dynamic Characteristics of N-Channel SiC IGBTs

Naoki Watanabe, Hiroyuki Okino, Akio Shima
Hitachi, Ltd., Japan

Introduction of Highly Reliable Versatile Analog Platform with Embedded NVM for Automotive Applications

Kanako Komatsu, Hiroyoshi Kitahara, Yoshiaki Ishii, Daisuke Shinohara, Koichi Ozaki, Takeshi Yamamoto, Masafumi Otsuka, Shuzo Mori, Daisuke Atsuchi, Toshihiro Sakamoto, Fumitomo Matsuoka
Toshiba Electronic Devices & Storage Corporation, Japan

Evaluation of Reliability and Lifetime of 650-V GaN-on-Si Power Devices Fabricated on 200-mm CMOS-Compatible Process Platform for High-Density Power Converter Application

Shan Yin, Yiming Lin, Ronghui Hao, Shoudong Jin, Chuan He, Weigang Yao, Xingjun Li, Qingyuan He, Xiaoqing Pu, Xiaoliang Su, Yanbo Zou, Hui Cai, Kye-Jin Lee, Mike Wang, Harry Guo, Ke Shen, Felix Wang, H.-C. Chiu, Larry Chen, Denis Marcon, Roy K.-Y. Wong
Innoscience Technology Co., Ltd., China

Experimental Study on Electrical Characteristics of Large-Size Vertical β -Ga₂O₃ Junction Barrier Schottky Diodes

Jie Wei, Yuxi Wei, Juan Lu, Xiaosong Peng, Zhuolin Jiang, Kemeng Yang, Xiaorong Luo
University of Electronic Science and Technology of China, China

Normally-Off β -Ga₂O₃ Power Heterojunction Field-Effect-Transistor Realized by p-NiO and Recessed-Gate

Xuanze Zhou, Qi Liu, Weibing Hao, Guangwei Xu, Shibing Long
University of Science and Technology of China, China

2.6 kV NiO/Ga₂O₃ Heterojunction Diode with Superior High-Temperature Voltage Blocking Capability

Weibing Hao, Qiming He, Xuanze Zhou, Xiaolong Zhao, Guangwei Xu, Shibing Long
University of Science and Technology of China, China

Demonstration of the Surge Current Capability of Embedded SBDs in SiC SBD-Integrated Trench MOSFETs with a Thick Cu Block

Yudai Kitamura ¹, Hiroshi Yano ¹, Noriyuki Iwamuro ¹, Fumiki Kato ², So Tanaka ², Takeshi Tawara ², Shinsuke Harada ², Hiroshi Sato ²

¹University of Tsukuba, Japan; ²National Institute of Advanced Industrial Science and Technology, Japan

Investigation of the Short-Circuit Failure Mechanisms in 1.2-kV SiC Trench MOSFETs with Thin N+ Substrates Using Electro-Thermal-Mechanical Analysis

Keisuke Kashiwa ¹, Kailun Yao ¹, Hiroshi Yano ¹, Noriyuki Iwamuro ¹, Shinsuke Harada ²

¹University of Tsukuba, Japan; ²National Institute of Advanced Industrial Science and Technology, Japan

Three-Level Gate Drive Technique for Enhancing Switching Loss Reduction in Triple-Gate IGBTs

Tatsunori Sakano ¹, Kento Adachi ¹, Tomoaki Inokuchi ¹, Kazuto Takao ¹, Yoko Iwakaji ², Ryohei Gejo ², Tomoko Matsudai ²

¹Toshiba Corporation, Japan; ²Toshiba Electronic Devices & Storage Corporation, Japan

300 mA/mm Drain Current Density P-Type Enhancement-Mode Oxidized Si-Terminated (111) Diamond MOSFETs with ALD Al₂O₃ Gate Insulator

Yu Fu ^{1,2}, Yuhao Chang ¹, Xiaohua Zhu ¹, Atsushi Hiraiwa ¹, Ruimin Xu ², Yuehang Xu ², Hiroshi Kawarada ¹

¹Waseda University, Japan; ²University of Electronic Science and Technology of China, China

Investigations on Unclamped-Inductive-Switching Behaviors of p-GaN HEMTs at Cryogenic Temperature

Chi Zhang ¹, Weihao Lu ¹, Sheng Li ¹, Siyang Liu ¹, Yanfeng Ma ¹, Jingwen Huang ¹, Long Zhang ¹, Jiaying Wei ¹, Weifeng Sun ¹, Chunwei Zhang ², Haijun Guo ²

¹Southeast University, China; ²University of Jinan, China

Reliability Evaluation of p-GaN Gate HEMTs in Bootstrap Circuit

Chi Zhang ¹, Weihao Yan Cheng, Han Xu, Li Zhang, Tao Chen, Junting Chen, Zheyang Zheng, Kevin J. Chen
Hong Kong University of Science and Technology, Hong Kong

Interaction Mechanism Between CGD and CDS Based on Space Competition and Optimization Method of Dynamic Characteristic for 600V Super-Junction VDMOS

Ruidi Wang, Yibing Wang, Ming Qiao, Bo Zhang

University of Electronic Science and Technology of China, China

High Density Bidirectional Lithium Ion Battery Disconnect Switch with Ultralow Specific On-Resistance

Dong Fang ¹, Yong Chen ¹, Ming Qiao ¹, Kui Xiao ², Wenliang Liu ¹, Xingrui Long ¹, Guang Yang ¹, Zheng Bian ², Sen Zhang ², Bo Zhang ¹

¹University of Electronic Science and Technology of China, China; ²CSMC Technologies Corporation, China

Terminal Breakdown Voltage Degradation by Avalanche Stress Induced Hot-Hole Injection in Split Gate Trench Power MOSFET

Dong Fang ¹, Zhiyu Lin ¹, Kui Xiao ², Ming Qiao ¹, Zheng Bian ², Wenliang Liu ¹, Guang Yang ¹, Jun Ye³, Sen Zhang ², Bo Zhang ¹

¹University of Electronic Science and Technology of China, China; ²CSMC Technologies Corporation, China; ³China Resources Microelectronics Limited, China

Low Specific On-Resistance and Low Leakage Current β -Ga₂O₃ (001) Schottky Barrier Diode Through Contact Pre-Treatment

Hu Chen, Hengyu Wang, Ce Wang, Kuang Sheng
Zhejiang University, China

An Ultralow Specific On-Resistance 200V LDMOS for Voltage Extension of a 0.18 μ m BCD Process

Ming Qiao ¹, Wenliang Liu ¹, Liu Yuan ¹, Penglong Xu ^{1,2}, Chunxia Ma ², Feng Lin ², Kejun Liu ², Yin Guo ¹, Zhiyu Lin ¹, Sen Zhang ², Bo Zhang ¹

¹University of Electronic Science and Technology of China, China; ²CSMC Technologies Corporation, China

Lateral P-channel IGBT on SOI with Double Top RESURF Layers for Emitter Follower Type Complementary IGBT

Zijian Zhang, Okita Kazuki, Ting Kong, Zijian Feng, Suyang Liu, Masahide Inuishi
Waseda University, Japan

Novel Double MOS-Resistors SOI-LIGBT with Low Forward Voltage and High Short-Circuit Capability

Kemeng Yang, Wei Su, Jie Wei, Junnan Wang, Zhen Ma, Zhaoji Li, Xiaorong Luo
University of Electronic Science and Technology of China, China

Dynamic Rdson and Vth Free 15 V E-Mode GaN HEMT Delivering Low sFOM of 13.1 m Ω -nC and Over 90% Efficiency at 10 MHz for Buck Converter

William S.-C. Li, David C. Zhou, H. Yan, J.-F. Zhang, H.-H. Ma, C. Chen, J.-B. Huang, X.-M. Liu, W.-P. Li, Marco Wu, Larry Chen, Felix Wang, Roy K.-Y. Wong, Jeff Zhang, Mark Lee, Echo Cheng, Andy Han

Innoscience Technology Co., Ltd., China

Experimental Investigation of Dual-Gate LDMOS for Low On-Resistance

Li Lu ¹, Kui Xiao ², Jinyu Xiao ², Guiqiang Zheng ¹, Zhongxuan Yu ¹, Siyang Liu ¹, Weifeng Sun ¹, Feng Lin ², Shuxian Chen ², Chaoqi Xu ²

¹Southeast University, China; ²CSMC Technologies Corporation, China

A Fully-Integrated GaN Driver for Time-of-Flight Lidar Applications

Xin Ming, Zi-Kai Ye, Zhi-Yi Lin, Yao Qin, Qi Zhou, Bo Zhang
University of Electronic Science and Technology of China, China

High-Performance Reverse Blocking p-GaN HEMTs with Multi-Column p-GaN/Schottky Alternate-Island Drain

Ruize Sun¹, Fangzhou Wang¹, Pan Luo¹, Wenjun Xu², Yang Wang², Chao Liu¹, Wanjun Chen¹, Bo Zhang¹

¹University of Electronic Science and Technology of China, China; ²Songshan Lake Materials Laboratory, China

Experimentally Demonstrating Fast Neutron Irradiation Effect on High-di/dt Switching Characteristics of Insulated Gate Triggered Thyristor for Pulse Power

Chao Liu, Chao Yang, Wanjun Chen, Ruize Sun, Xiaorui Xu, Yun Xia, Yajie Xin, Zhaoji Li, Bo Zhang
University of Electronic Science and Technology of China, China

Development of Reliable Multi-Chip Power Modules with Parallel Planar- and Trench-Gate SiC MOSFETs

Shuhe Fukunaga¹, Alberto Castellazzi², Tsuyoshi Funaki¹

¹Osaka University, Japan; ²Kyoto University of Advanced Science, Japan

Substrate and Trench Design for GaN-on-EBUS Power IC Platform Considering Output Capacitance and Isolation Between High-Side and Low-Side Transistors

Gang Lyu¹, Jin Wei², Yat Hon Ng¹, Yan Cheng¹, Sirui Feng¹, Kevin J. Chen¹

¹Hong Kong University of Science and Technology, Hong Kong; ²Peking University, China

Speed-Up Gate Pulse Method to Suppress Switching Loss and Surge Voltage for MOS Gate Power Devices

Hiroya Egashira, Hirotaka Oomori, Ichiro Omura
Kyushu Institute of Technology, Japan

Dynamic Vgs-Id Monitoring System for Junction Temperature Estimation for MOS Gate Power Semiconductors

Yandagkhuu Bayarsaikhan, Ichiro Omura
Kyushu Institute of Technology, Japan

Source Engineering on Oxygen-Inserted Si Channel for Gate Length Scaling of Low-Voltage Switch Devices

Yi-Ann Chen¹, Changsoo Hong¹, Shuyi Li¹, Abhishek Raol¹, Richard Burton¹, Michael Duane², Lou N. Hutter³, Hideki Takeuchi¹, Robert J. Mears¹

¹Atomera Inc., United States; ²TSI Semiconductors Inc., United States; ³Lou Hutter Consulting, United States

Tuesday May 24th, 2022

Online Poster Session II

10:40 – 12:00

Measurement of the PtH Defect Depth Profiles in Fully Processed Silicon High-Voltage Diodes by Improved Current Transient Spectroscopy

Lena Bergmann^{1,2}, Gregor Pobegen¹, Daniel Schlögl³, Holger Schulze³, Heiko B. Weber², Michael Krieger²

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Novel Si-SiC Hybrid Switch and its Design Optimization Path

Felix Kayser¹, Frank Pfirsch², Franz-Josef Niedernostheide², Roman Baburske², Hans-Günter Eckel¹

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Impact of Degradation Mechanisms in Gate Stress Tests on the Hard-Switching Behavior of 1.2 kV SiC Power MOSFETs

Roman Boldyrjew-Mast, Christian Bäuml, Felix Bruno Wenisch-Kober, Xing Liu, Thomas Basler
Technische Universität Chemnitz, Germany

Optimisation of the Carrier Lifetime Profile in 1.2kV Planar and Trench SiC MOSFETs

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750V Narrow Mesa IGBT Vs SJ-IGBT: Performance and SC-SOA Assessment

L. Ngwendson¹, C. Kong¹, S. Gupta¹, A. Su¹, Y. Wang¹, M. Qin², Q. Xiao², H. Luo², X. Ning², Y. Yao², T. Trajkovic³, F. Udrea³, V. Pathirana³, C. Chan³, N. Udugampola³

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A Generalized Sub-Circuit Model to Enable Accurate CHC Aging Simulation and Spatial Defect Profiling in LDMOS

Sagnik Dey, Arif Sonnet, Dhanoop Varghese, Cathy Chancellor, Vijaya Vemuri, Srikanth Krishnan
Texas Instruments Inc., United States

Gate Stress Study on SiN-Based SiC Power MOSFETs

Stephan Wirths, Giovanni Alfieri, Gianpaolo Romano, Edoardo Ceccarelli, Yulieth Arango, Andrei Mihaila, Lars Knoll

Hitachi Energy Ltd., Switzerland

Comparative Study of 6.5 kV 4H-SiC Discrete Packaged MOSFET, JBSFET, and Co-Pack (MOSFET and JBS Diode)

Nick Yun¹, Justin Lynch¹, Adam J. Morgan¹, Diang Xing², Michael Jin², Jiashu Qian², Minseok Kang², Voshadhi Amarasinghe³, John Ransom³, Victor Veliadis⁴, Anant Agarwal², Woongje Sung¹

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Closing Session

Wednesday May 25th, 2022

13:45 – 14:30

Chair: Wai Tung Ng (University of Toronto)

David Sheridan (Alpha Omega Semiconductor)