

29 May 2023 (Monday)

8:45am ~ 9:10am **Opening**

9:10am~10:30am **PL-1: Plenary Talk**

Chairs: Kevin J. Chen, Ichiro Omura

9:10am~9:50am **PL1-1: The Future of XPU Power Delivery for Artificial Intelligence**

Jinghai Zhou

Monolithic Power Systems, Inc.

9:50am~10:30am **PL1-2: Unleashing the Potential of α -Ga₂O₃ Gallium Oxide Power Device**

Kengo Takeuchi

Flosfia Inc.

10:30am~10:50am **Coffee Break**

10:50am~12:30pm **SiC-1: Novel Device Structures in SiC**

Chairs: Siddarth Sundaesan, Ulrike Grossner

SiC1-1: Proposal of Vertical-Channel Fin-SiC MOSFET Toward Future Device Scaling

Haruka Shimizu¹, Takeru Suto¹, Hiroshi Miki¹, Yuki Mori¹, Digh Hisamoto¹, Akio Shima¹, Koyo Kinoshita², Tatsunori Murata², Tetsuo Oda²

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

SiC1-2: First Demonstration of 600V 4H-SiC Lateral Bi-Directional Metal-Oxide-Semiconductor Field-Effect Transistor (LBiDMOS)

Seung Yup Jang, Sundar Isukapati, Dongyoung Kim, Woongje Sung

State University of New York Polytechnic Institute

SiC1-3: Gate Impedance Analysis of SiC Power MOSFET with SiO₂ and high- κ Dielectric

Salvatore Race¹, Piyush Kumar¹, Philipp Natzke¹, Ivana Kovacevic-Badstuebner¹, Marianne Etzelmuel Bathen¹, Gianpaolo Romano², Yulieth Arango², Sami Bolat², Stephan Wirths², Lars Knoll², Andrei Mihaila², Ulrike Grossner¹

¹ETH Zurich; ²Hitachi Energy

SiC1-4: Demonstration of 3.5kV SiC Deep-Implanted Superjunction Diodes

Reza Ghandi¹, Collin Hitchcock¹, Stacey Kennerly¹, Mohamed Torky², Paul Chow²

¹GE Research; ²Rensselaer Polytechnic Institute

12:30pm~2:00pm **Lunch**

29 May 2023 (Monday)

2:00pm~3:40pm **GaN-1: GaN Power Device Reliability**

Chairs: Shu Yang, Sameh Khalil

GaN1-1: Impacts of n-GaN Doping Concentration on Gate Reliability of p-N Junction/AlGaIn/GaN HEMTs

Chengcai Wang, Haohao Chen, Zuoheng Jiang, Junting Chen, Mengyuan Hua

Southern University of Science and Technology

GaN1-2: Gate Lifetime of P-Gate GaN HEMT in Inductive Power Switching

Bixuan Wang¹, Ruizhe Zhan¹, Hengyu Wang², Quanbo He², Qihao Song¹, Qiang Li¹, Florin Udrea², Yuhao Zhang¹

¹Center for Power Electronics Systems (CPES) Virginia Tech; ²University of Cambridge

GaN1-3: Impact of Inadequate Mg Activation on Dynamic Threshold Voltage of Schottky-Type p-GaN Gate HEMTs

Jiahui Sun, Zheyang Zheng, Li Zhang, Yat Hon Ng, Ji Shu, Tao Chen, Kevin J. Chen

The Hong Kong University of Science and Technology

GaN1-4: Surge Current Ruggedness in Vertical GaN-on-GaN Pin Diode: Role of Conductivity Modulation

Jiahong Du¹, Shu Yang^{1,2}, Guangwei Xu¹, Shibing Long¹

¹University of Science and Technology of China; ²Zhejiang University

3:40pm~4:00pm **Coffee Break**

4:00pm~5:15pm **LVT-1: Vertical Low Voltage Devices**

Chairs: Amit Paul, Tatsuya Nishiwaki

LVT1-1: Strain Engineering in Modern Si Trench Power MOSFETs – A Performance Booster for Future Generations

Stefan Karner^{1,2}, Oliver Blank¹, Jozef Keckes², Maximilian Rösch¹, Seung Hwan Lee¹, Sylvain Leomant¹

¹Infineon Technologies Austria; ²Montanuniversität Leoben

LVT1-2: Investigation of BV_{dss} Instability in Trench Power MOSFET Through DLTS, Electrical Characterization and TCAD Simulations

Marina Ruggeri^{1,2}, Patrick Calenzo¹, Frédéric Morancho², Lia Masoero¹, Rosalia Germana¹, Alessandro Nodari¹, Richard Monflier²

¹STMicroelectronics; ²Université de Toulouse

LVT1-3: High Performance Dual Field Plate Trench MOSFETs for Middle-Voltage Applications

Shuhei Tokuyama, Hiroaki Kato, Tsuyoshi Kachi, Katsura Miyashita, Kenya Kobayashi

Toshiba Electronic Devices & Storage Corporation

30 May 2023 (Tuesday)

8:45am~10:05am PL-2: Plenary Talk

Chairs: Tom Tsai, Nando Kaminski

8:45am~9:25am PL2-1: GaN Devices for Power System

Taikang Shing

Ancora Semi, Inc.

9:25am~10:05am PL2-2: Evolution of automotive power modules

Matthias Hammerl

Vitesco Technologies GmbH

10:05am~10:25am Coffee Break

10:25am~12:30pm PK-1: Power Module Design & Development

Chairs: Ichiro Omura, Antonio Pio Catalano

PK1-1: A SiC 3D Power IC Directly Integrating a Power MOSFET With Its CMOS Gate Driver Using Flip Chip Bonding

Atsushi Yao, Mitsuo Okamoto, Shinji Sato, Daiki Yamaguchi, Hiroshi Sato

National Institute of Advanced Industrial Science and Technology

PK1-2: Application-Oriented Characterization of Thermally Optimized, Asymmetrical Single Chip Packages for 100 V GaN HEMTs

Dominik Koch¹, Vladimir Polezhaev², Ankit Bushan Sharma², Kevin Muñoz Barón¹, Till Huesgen², Ingmar Kallfass¹

¹*University of Stuttgart*; ²*University of Applied Science Kempten*

PK1-3: SiC MOSFET bi-Directional Switch IMS Module Design

Yonghwa Lee¹, Sébastien Avilès², Philippe Lasserre², Cyrille Duchesne², Alberto Castellazzi¹

¹*Kyoto University of Advanced Science*; ²*Deep Concept*

PK1-4: Package Design Consideration for Suppressing Radiated EMI Noise in Semi-Bridgeless PFC Converters

Satoshi Yoshida¹, Takenori Yasuzumi¹, Tsuguhiro Tanaka², Yasuyuki Fujiwara²

¹*Toshiba Corporation*; ²*Toshiba Electronic Devices & Storage Corporation*

PK1-5: Power Cycling of Sintered SiC Power MOSFET Baseplate-Less Modules with Aluminum Oxide and Silicon Nitride Substrates

Ivana Kovacevic-Badstuebner¹, Elena Mengotti², Philipp Natzke¹, Salvatore Race¹, Enea Bianda², Joni Jormanainen³, Ulrike Grossner¹

¹*ETH Zurich*; ²*ABB Switzerland Ltd.*; ³*ABB Drives Oy*

12:30pm~2:00pm Lunch

30 May 2023 (Tuesday)

2:00pm~4:05pm **ICD-1: ICs for Drivers & Protection Circuits**

Chairs: Makoto Takamiya, John Pigott

ICD1-1: P-GaN HEMT Hard Switching Fault Type Short-Circuit Detection Based on the Gate Schottky-Barrier Leakage Current Using a Dual-Channel Segmented CMOS Buffer Gate-Driver

Yazan Barazi, Frédéric Richardeau, Sébastien Vinnac, Nicolas Rouger

Université de Toulouse

ICD1-2: CMOS Gate Driver with Integrated Ultra-Accurate and Fast Gate Charge Sensor for Robust and Ultra-Fast Short Circuit Detection of SiC Power Modules

Anas El Boubkari^{1,2}, Nicolas Rouger¹, Frédéric Richardeau¹, Thierry Sicard², Pierre Calmes², Matthew Bacchi², Marc Cousineau¹

¹Université de Toulouse; ²NXP SEMICONDUCTORS

ICD1-3: Novel Multifunctional Transient Voltage Suppressor Technology for Modular EOS/ESD Protection Circuit Designs

Zhao Qi^{1,2}, Ming Qiao^{1,3,4}, Jingqi Wei¹, Yonggang Shi¹, Hongquan Chen¹, Zhaoji Li¹, Bo Zhang¹

¹UESTC, Chengdu; ²UESTC, Chongqing; ³UESTC, Guangdong; ⁴UESTC, Shenzhen

ICD1-4: Gate Driver IC with Fully Integrated Overcurrent Protection Function by Measuring Gate-to-Emitter Voltage During IGBT Conduction

Haifeng Zhang¹, Dibo Zhang¹, Hiromu Yamasaki¹, Katsuhiro Hata¹, Keiji Wada², Kan Akatsu³, Ichiro Omura⁴, Makoto Takamiya¹

¹The University of Tokyo; ²Tokyo Metropolitan University; ³Yokohama National University; ⁴Kyusyu Institute of Technology

ICD1-5: Monolithic FET-Controlled GaN Driver with Pre-Boosting and Robust Dead Time Control for DToF Lidar Application

Chun-Wang Zhuang, Xin Ming, Zi-Kai Ye, Yao Qin, Zhi-Yi Lin, William Li, Hui Yan, Bo Zhang

University of Electronic Science and Technology of China

4:05pm~4:20pm **Coffee Break**

30 May 2023 (Tuesday)

4:20pm~5:50pm Poster Session 1 (GaN, HV, ICD)

Poster-1: GaN

Chair: Oliver Hilt

P1-1: Failure Process of GaN-HEMTs by Repetitive Overvoltage Stress

Wataru Saito, Shin-Ichi Nishizawa
Kyushu University

P1-2: Vertical GaN Schottky Barrier Diode with Record High FOM (1.23GW/cm²) Fully Grown by Hydride Vapor Phase Epitaxy

Ping Zou¹, Haofan Wang¹, Junye Wu¹, Zeliang Liao¹, Shuangwu Huang¹, Ze Zhong¹, Xiaobo Li¹, Feng Qiu², Wenrong Zhuang³, Longkou Chen⁴, Xinke Liu¹

¹Shenzhen University; ²Gensol (Shenzhen) Tech. Innovation Center Co., Ltd; ³Dongguan Sino Nitride Semiconductor Co., Ltd; ⁴Shenzhen Baseus Technology Co., Ltd.

P1-3: Enhanced gate breakdown and electroluminescence in p-GaN gate HEMTs under pulsed switching conditions

Huan Wang¹, Yulian Yin¹, Fengwei Ji¹, Jiahong Du², Haoran Li¹, Changhui Zhao¹, Baikui Li³, Cungang Hu¹, Wenping Cao¹, Xi Tang¹, Shu Yang²

¹Anhui University; ²University of Science and Technology of China; ³Shenzhen University

P1-4: A Systematic Characterization Method for Time-Resolved Stability and Reliability Issues on Lateral GaN Power Devices

Yifei Huang^{1,2}, Qimeng Jiang¹, Sen Huang^{1,2}, Xinyu Liu^{1,2}

¹Chinese Academy of Sciences; ²University of Chinese Academy of Sciences

P1-5: Demonstration of the Hydrogen Passivated GaN HEMTs IC Platform

Fan Li^{1,3}, Ang Li^{1,3}, Yubo Wang¹, Yuhao Zhu^{1,3}, Chengruiyuan Yu¹, Chengmurong Ding¹, Shiqiang Wu¹, Wen Liu¹, Guohao Yu^{2,4}, Xiaotian Gao⁴, Zheming Wang^{2,4}, Baoshun Zhang^{2,4}

¹Xi'an Jiaotong-Liverpool University; ²University of Science and Technology of China; ³University of Liverpool; ⁴CAS

P1-6: 700 V/2.5 A Normally-Off Ultrathin-Barrier AlGaN(<6nm)/GaN MIS- Het with Improved Gate Overdrive Window and PBTI

Tiantian Luan^{1,2}, Sen Huang^{1,2}, Yixu Yao^{1,2}, Qimeng Jiang^{1,2}, Yuhao Wang^{1,2}, Yifei Huang^{1,2}, Chao Feng^{1,2}, Xinhua Wang^{1,2}, Xinyu Liu^{1,2}, Ronghua Wang³, Yongshuo Ren³, Wanxi Cheng³, Huinan Liang³

¹Chinese Academy of Sciences; ²University of Chinese Academy of Sciences; ³Runxin Microelectronics Corporation

P1-7: Switching Performance of GaN p-FET-Bridge (PFB-) HEMTs Studied with Mixed-Mode TCAD Simulation

Junting Chen^{1,2}, Tao Chen², Zuoheng Jiang¹, Chengcai Wang¹, Zheyang Zheng², Jin Wei³, Kevin Chen², Mengyuan Hua¹

¹Southern University of Science and Technology; ²The Hong Kong University of Science and Technology;

³Peking University

P1-8: Exploitation of Hole Injection and Spreading for Dynamic Enhancement in p-GaN Gate HEMT Under Room/High Temperatures

Junjie Yang, Yanlin Wu, Muqin Nuo, Zhenghao Chen, Xuelin Yang, Bo Shen, Maojun Wang, Jin Wei
Peking University

30 May 2023 (Tuesday)

4:20pm~5:50pm **Poster Session 1 (GaN, HV, ICD)**

Poster-1: GaN

Chair: Oliver Hilt

P1-9: Threshold Voltage Instability of Schottky-Type p-GaN Gate HEMT Down to Cryogenic Temperatures

Xinyu Wang, Zuoheng Jiang, Juntong Chen, Junlei Zhao, Han Wang, Chengcai Wang, Haohao Chen, Jun Ma, Xiaolong Chen, Mengyuan Hua

Southern University of Science and Technology

P1-10: Total-Ionizing-Dose Radiation Induced Gate Damage in High Voltage P-GaN Gate HEMTs

Zhao Wang¹, Xin Zhou^{1,2,3}, Zhonghua Wu¹, Chen Chen¹, Qi Zhou¹, Ming Qiao^{1,3}, Zhaoji Li¹, Bo Zhang¹

¹University of Electronic Science and Technology of China; ²Shenzhen Institute of Information Technology;

³UESTC in Guangdong

P1-11: Comprehensive MVSG Compact Model for Power GaN Devices

Ryan Fang¹, Yijing Feng¹, Jessica Chong¹, Kaiman Chan², Ujwal Radhakrishna^{1,2}, Lan Wei¹

¹University of Waterloo, ²Texas Instruments

P1-12: Method to Study Dynamic Depletion Behaviors in High-Voltage (BV = 1.4 kV) p-GaN Gate HEMT on Sapphire Substrate

Jiawei Cui¹, Yanlin Wu¹, Junjie Yang¹, Jingjing Yu¹, Teng Li^{1,2}, Xuelin Yang¹, Bo Shen¹, Maojun Wang¹, Jin Wei¹

¹Peking University; ²Beijing University of Technology

P1-13: Suppressing the Reverse Recovery of Si Super-Junction MOSFET with a Low-Voltage GaN HEMT in a Cascode Configuration

Ji Shu, Jiahui Sun, Zheyang Zheng, Kevin Jing Chen

Hong Kong University of Science and Technology

P1-14: An Efficient Switching Transient Analytical Model for P-GaN Gate HEMTs Considering Dynamic CG(VDS,VGS) Characteristics

Caien Sun, Zixu Niu, Shu Yang

Zhejiang University

P1-15: Ultra-Fast Positive Gate Bias Stress (<100ns) to Understand the Hole Injection in Power p-GaN HEMTs

Zhen-Hong Huang¹, Wei-Syuan Lin¹, Ting-Chun Lo¹, Shun-Wei Tang¹, Szu-Chia Chen¹, Dirk Wellekens², Matteo Borga², Niels Posthuma², Benoit Bakeroot^{2,3}, Stefaan Decoutere², Tian-Li Wu¹

¹National Yang Ming Chiao Tung University; ²imec; ³Ghent University

P1-16: Rapid Inverse Design of GaN-on-GaN Diode with Guard Rings Termination for BV and (VFQ)-1 Co-Optimization

Nathan Yee¹, Albert Lu¹, Yifan Wang², Matthew Porter², Yuhao Zhang², Hiu Yung Wong¹

¹San Jose State University; ²CPES Virginia Tech.

30 May 2023 (Tuesday)

4:20pm~5:50pm **Poster Session 1 (GaN, HV, ICD)**

Poster-1: HV

Chair: Shigeto Honda

P1-17: A 15V Operated Shallow Trench IGBT(ST-IGBT) Fabricated by Low Temperature Process and Optimized for 12inch Wafers

Masahiro Tanaka¹, Naoki Abe¹, Akio Nakagaw²

¹Nihon Synopsys G.K; ²Nakagawa Consulting Office, LLC.

P1-18: Design of 1200-V RC-IGBT for TOYOTA's 5th generation HEV/PHEV systems

Jun Okawara¹, Masaru Senoo¹, Tsuyoshi Nishiwaki¹, Yusuke Yamashita², Satoru Machida², Yuma Kagata¹, Masaki Konishi¹

¹Toyota; ²Toyota Central R&D Labs Inc.

P1-19: Separate-Bottom P Layer CSTBTM for Approaching Turn-Off Switching Loss Reduction Limit

Konishi Kazuya, Nitta Tetsuya, Tomohiro Tamaki, Shinya Soneda

Mitsubishi Electric Corporation

P1-20: Si IGBT and SiC MOSFET – Potentials and Limitations of Plasma Shaping Versus Unipolar Switching in Medium Power Applications

Roman Baburske¹, Jana Hänsel², Frank Pfirsch¹, Katja Waschneck²

¹Infineon Technologies AG; ²Infineon Technologies Dresden GmbH & Co. KG

P1-21: On the Electron Extraction Mechanism in Punch-Through NPN Fast Recovery Diodes

Xin Peng, Yong Liu, Hao Feng, Linhua Huang, Johnny Sin

The Hong Kong University of Science and Technology

P1-22: A SEB Hardened Trench Gate DMOS with HfO₂ Gate Dielectric and Decelerating Electric Field Layer in Parasitic NPN Base

Jian Fang, Yibo Lei, Zhou Fang, Lijuan Shi, Lingli Tang, Xihe Yang, Ling Yan, Bo Zhang

University of Electronic Science and Technology of China

P1-23: Optimization of Reverse Recovery Characteristics Based on Termination Structure for 700V Super-Junction VDMOS

Yibing Wang¹, Ming Qiao^{1,2}, Jue Li¹, Ruidi Wang¹, Bo Zhang¹

¹University of Electronic Science and Technology of China; ²UESTC in Guangdong

P1-24: A Novel IGBT with Variable Conductance Path Realizing Both Low Von and Turn-Off Loss

Yuxiao Yang¹, Wanjun Chen¹, Xinqi Sun¹, Xiaorui Xu¹, Yun Xia¹, Chao Liu¹, Zhaoji Li¹, Bo Zhang¹, Meng Wei², Ping Zhang², Zhong Ren³

¹University of Electronic Science and Technology of China;

²Sichuan Aerospace Liaoyuan Science and Technology Co., LTD; ³China Academy of Aerospace Science and Innovation

P1-25: Experimental Demonstration of Point-Injection Trench IGBT Concept

Nick Schneider¹, Elizabeth Buitrago¹, Marina Antoniou², Enea Bianda³, Luca De-Michiellis¹, Chiara Corvasce¹, Florin Udrea⁴

¹Hitachi Energy, Switzerland Ltd.; ²University of Warwick; ³ABB Group; ⁴Cambridge University

30 May 2023 (Tuesday)

4:20pm~5:50pm Poster Session 1 (GaN, HV, ICD)

Poster-1: ICD

Chair: Xin Ming

P1-26: A Novel Junction Termination Technique with Excellent Cost-Performance and Extraordinary Anti-Charge-Deviation Ability

Junji Cheng^{1,2,4}, Weisen Meng¹, Bo Yi^{1,2}, Haimeng Huang^{1,2}, Keqiang Ma³, Xinkai Guo², Hongqiang Yang¹, Zhiming Wang¹, Guoyi Zhang⁴

¹University of Electronic Science and Technology of China; ²UESTC in Guangdong;

³Chengdu Semi-Future Technology Co., Ltd.; ⁴Peking University

P1-27: Application of a Smart Gate Driver to Detect Aging in SiC Power MOSFETs

Mengqi Wang¹, Jiupeng Zhang¹, Haruhiko Nishio², Motomitsu Iwamoto², Hitoshi Sumida², Wai Tung Ng¹

¹University of Toronto; ²Fuji Electric Co. Ltd.

P1-28: Compact GaN Power ICs with Power HEMT, Gate Driver, Temperature Sensor, Current Sense-FET and Amplifier

Michael Basler¹, Jörg Haarer², Richard Reiner¹, Stefan Moench¹, Patrick Waltereit¹, Rüdiger Quay¹

¹Fraunhofer Institute for Applied Solid State Physics IAF; ²University of Stuttgart

P1-29: A 600V GaN Active Gate Driver with Level Shifter Common-Mode Noise Sensing for Built-in dV/dt Self-Adaptive Control

Tianqi Liu, Yan Lu, Rui P. Martins

University of Macau

P1-30: Protection of SiC MOSFET Gate from Negative Voltage Spikes with a Low-Voltage GaN HEMT

Ji Shu, Jiahui Sun, Zheyang Zheng, Kevin Jing Chen

Hong Kong University of Science and Technology

P1-31: A High-Speed Level Shifter with dV/dt Noise Immunity Enhancement Structure for 200V Monolithic GaN Power IC

Yifei Zheng¹, Qing Yuan¹, Deyuan Song¹, Yutao Ying¹, Jing Zhu³, Weifeng Sun¹, Long Zhang¹, Sheng Li¹, Denggui Wang², Jianjun Zhou², Sen Zhang⁴, Nailong He⁴

¹Southeast University; ²Science and Technology on Monolithic Integrated Circuits and Modules Laboratory;

³Wuxi Chipown Micro-electronics limited; ⁴CSMC Technologies Corporation

31 May 2023 (Wednesday)

8:45am~10:25am HV-1: High Voltage Power Devices

Chairs: Noriyuki Iwamuro, Yi Tang

HV1-1: Single-Back and Double-Front Gate-Controlled IGBT for Achieving Low Turn-Off Loss

Yusuke Kobayashi¹, Munetoshi Fukui², Tomoko Matsudai³, Takuya Saraya², Kazuo Itou², Toshihiko Takakura², Shinichi Suzuki², Ryohei Gejo³, Tatsunori Sakano¹, Takahiro Kato¹, Tomoaki Inokuchi¹, Kazuto Takao¹, Toshiro Hiramoto²
¹Toshiba Corporation; ²The University of Tokyo; ³Toshiba Electronic Devices & Storage Corporation

HV1-2: Novel Diode Structure for Ultra-Low-Loss RC-IGBTs

Yusuke Yamashita¹, Satoru Machida¹, Jun Saito², Masaru Senoo³
¹Toyota Central R&D Labs Inc.; ²MIRISE Technologies Corporation; ³DENSO CORPORATION

HV1-3: Reduction of Junction Temperature with Local Lifetime Control and High Density Arranged Diode for 3rd Generation 650V RC-IGBT

Kosuke Sakaguchi, Kazuya Konishi, Eguchi Keisuke, Soneda Shinya
Mitsubishi Electric Corporation

HV1-4: A New Generation 700 V BCD Technology That Integrates Quadruple-RESURF LDMOS with Best-in-Class Specific On-Resistance

Ming Qiao^{1,2}, Dican Hou¹, Yue Gao¹, Dingxiang Ma¹, Jiawei Wang¹, Bo Zhang¹
¹University of Electronic Science and Technology of China; ²UESTC in Guangdong

10:25am~10:45am Coffee Break

10:45am~12:25pm GaN-2: Novel GaN Power Devices & Technologies 1

Chairs: Roy K.-Y. Wong, Oliver Hilt

GaN2-1: Demonstration of Fundamental Characteristics for Power Switching Applications in Planer Type E-Mode MOS-HEMT Using Normally Depleted AlGaIn/GaN Epitaxial Layer on Si Substrate

Takuma Nanjo¹, Shotaro Yamamoto¹, Takashi Imazawa¹, Akira Kiyoi¹, Tomohiro Shinagawa¹, Tatsuro Watahiki¹, Naruhisa Miura¹, Masayuki Furuhashi¹, Kazuyasu Nishikawa¹, Takashi Egawa²
¹Mitsubishi Electric Corporation; ²Nitride Semiconductors

GaN2-2: GaN-HEMT with a Back-Gated Segment for High Voltage Cascades

Richard Reiner, Stefan Moench, Patrick Waltereit, Michael Basler, Stefan Müller, Michael Mikulla, Rüdiger Quay
Fraunhofer IAF

GaN2-3: Conductivity Enhancement Induced by Confined Vicinal Hole Storage in Enhancement-mode p-GaN Gate Double-Channel HEMTs

Hang Liao¹, Zheyang Zheng¹, Tao Chen¹, Li Zhang¹, Yan Cheng¹, Long Chen¹, Li Yuan², Kevin J. Chen¹
¹The Hong Kong University of Science and Technology; ²Genettice (Qingdao) Semiconductor Material Co., LTD.

GaN2-4: Switching of a Bus Voltage of 1400 V at 10 MHz Using Vertical GaN Fin-JFETs

Andrew Edwards, Andrew Walker, Vianey Padilla, Cliff Drowley, Subhash Pidaparathi, James Michael, Prashant Saxena, Joseph Tandingan, Wolfgang Meier
NexGen Power Systems Inc.

12:25pm~2:00pm Lunch

31 May 2023 (Wednesday)

2:00pm~3:40pm **SiC-2: Ruggedness & Reliability of SiC MOSFETs**

Chairs: Dethard Peters, Shinsuke Harada

SiC2-1: Improving Surge Current Capability of SBD-Embedded SiC-MOSFETs in Parallel Connection by Applying Bipolar Mode Activation Cells

Akifumi Iijima, Koutarou Kawahara, Katsutoshi Sugawara, Shiro Hino, Katsuhiro Fujiyoshi, Yasunori Oritsuki, Takeshi Murakami, Tetsuo Takahashi, Yasuhiro Kagawa, Yoichi Hironaka, Kazuyasu Nishikawa
Mitsubishi Electric Corporation

SiC2-2: Improvement of Surge Current Capability in SBD-Embedded SiC MOSFETs by Introducing Trigger p-n Diodes

Teruyuki Ohashi¹, Hiroshi Kono², Takahiro Ogata¹, Shunsuke Asaba², Hideki Hayakawa², Ryosuke Iijima¹
¹Toshiba Corporation; ²Toshiba Electronic Devices & Storage Corporation

SiC2-3: Gate Current Peaks Due to CGD Overcharge in SiC MOSFETs Under Short-Circuit Test

Sara Kochoska, Jaume Roig Guitart, Lukas Richert, Basil Vlachakis
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SiC2-4: Investigations of Residual Damage in SiC Trench MOSFETs After Single and Multiple Short-Circuit Stress

Mitsuki Takahashi¹, Shinsuke Harada², Hiroshi Yano¹, Noriyuki Iwamuro¹
¹University of Tsukuba; ²Advanced Industrial Science and Technology (AIST)

3:40pm~4:00pm Coffee Break

4:00pm~5:30pm **Poster Session 2 (LVT, PK, SiC)**

Poster-2: LVT

Chair: Kuo-Ming Wu

P2-1: Isolated JFET Design and Performance Analyze by Experiment Based on Standard 0.18 μm BCD Platform

Dingxiang Ma¹, Yue Gao¹, Dican Hou¹, Zhangyi'an Yuan¹, Ming Qiao^{1,2}, Shaowei Zhen¹, Bo Zhang¹
¹University of Electronic Science and Technology of China; ²UESTC in Guangdong

P2-2: Mechanism Analysis and Improved Model for HCI in 200V STI-Based Triple RESURF LDMOS With n-p-n Layer

Zuquan Zheng¹, Ming Qiao^{1,2}, Wenliang Liu¹, Xingrui Long¹, Penglong Xu³, Chunxia Ma³, Feng Lin³, Bo Zhang¹
¹University of Electronic Science and Technology of China; ²UESTC in Guangdong; ³CSMC Technologies Co. Ltd.

P2-3: Low Loss Lateral Insulated Gate Bipolar Transistor with an Anode PNP Structure and Integrated Freewheeling Diode

Yuxi Wei¹, Jie Wei¹, Pengchen Zhu¹, Kemeng Yang², Kaiwei Dai¹, Jie Li¹, Junnan Wang¹, Bo Zhang¹, Xiaorong Luo¹
¹University of Electronic Science and Technology of China; ²Nanjing University of Posts and Telecommunications

P2-4: 0.18 μm 200V SOI-BCD Technology with Ultra-Low Specific On-Resistance LDMOS for Automotive Application

Li Lu¹, Shulang Ma², Jinyu Xiao², Feng Lin², Shuxian Chen², Hong Shao², Yixin Dai¹, Zhihan Zhu¹, Jia Ma¹, Siyang Liu¹, Long Zhang¹, Weifeng Sun¹
¹Southeast University; ²CSMC Technologies Corporation

P2-5: Improvement of HCI and HTRB Reliability on 100V pLDMOS for 48V Battery Applications

Donghoon Park, Minwoo Kim, Junki Min, Kwangyoung Ko, Sanggi Lee
DB HiTek

31 May 2023 (Wednesday)

4:00pm~5:30pm Poster Session 2 (LVT, PK, SiC)

Poster-2: LVT

Chair: Kuo-Ming Wu

P2-6: Novel Complementary Lateral IGBTs on Bulk Silicon with Multiple Buried Layers for Perfect Isolation and High Performance

Zijian Zhang, Xuehao Tang, Kai Chen, Suyang Liu, Masahide Inuishi
Waseda University

P2-7: 3D simulation study of 375V partial SOI SJ LDNMOS BDS limitation

Elizabeth Kho Ching Tee¹, Alexander Hölke⁴, Marina Antoniou², Florin Udrea⁵, David Green³
¹X-FAB Sarawak Sdn. Bhd.; ²University of Warwick; ³Silvaco Europe Ltd.; ⁴X-FAB Semiconductor Foundries;
⁵University of Cambridge

P2-8: A Novel Lateral Power MOSFET with Ultra-Low Energy Consumption and Extraordinary Robustness

Junji Cheng^{1,2,4}, Tao Zhong¹, Bo Yi¹, Haimeng Huang^{1,2}, Keqiang Ma³, Xinkai Guo², Hongqiang Yang¹, Zhiming Wang¹, Guoyi Zhang⁴
¹University of Electronic Science and Technology of China; ²UESTC in Guangdong;
³Chengdu Semi-Future Technology Co., Ltd.; ⁴Peking University

Poster-2: PK

Chair: Alberto Castellazzi

P2-9: TCAD Simulation Modeling of Mold Epoxy Resin Applied for Encapsulation of Power Devices

Tomohiro Tamaki¹, Kohei Ebihara¹, Kazuya Konishi¹, Koki Kishimoto¹, Shinya Soneda¹, Tetsuo Takahashi¹, Tetsuya Nitta¹, Tatsuro Watahiki¹, Keunsam Lee²
¹Mitsubishi Electric Corporation; ²Nihon Synopsys G.K.

P2-10: Withdrawn

P2-11: Simplified Open-Loop Transfer Functions to Analyze Influential Parasitic Parameters for Oscillation Caused by Parallel Connected Transistors

Hiroto Sakai, Yuta Okawauchi, Shinji Yato, Hideo Araki, Takayuki Atago, Ken Nakahara
ROHM Co., Ltd

P2-12: Lifetime Modeling of SiC MOSFET Power Modules During Power Cycling Tests at Low Temperature Swings

Felix Hoffmann¹, Stefan Schmitt², Nando Kaminski¹
¹University of Bremen; ²Semikron Danfoss

P2-13: A Symmetric Low-Inductance High-Power Density SiC Power Module for EV Applications

Haiyong Wan¹, Marina Antoniou¹, Nikolaos Iosifidis¹, Rui Rong², Philip Mawby¹
¹University of Warwick Coventry; ²MacMic Science & Technology Co., Ltd

P2-14: Kirkendall Voids in Soft Soldered Power Packages

Tim Boettcher¹, Max Haenze¹, Guerkan Ilicali¹, Alex Sabelfeldt¹, Tom Birkoben¹, Soenke Kahl¹, Haibo Fan²
¹Nexperia Germany GmbH; ²Nexperia Hong Kong

P2-15: Coupled Structural and Functional Characterization and Modelling of Integrated GaN half-Bridge Power Switches

Ciro Scognamillo¹, Hamzeh J. Jaber², Antonio Pio Catalano¹, Vincenzo Dalessandro¹, Alberto Castellazzi²
¹University of Naples "Federico II"; ²Kyoto University of Advanced Science

31 May 2023 (Wednesday)

4:00pm~5:30pm Poster Session 2 (LVT, PK, SiC)

Poster-2: PK

Chair: Alberto Castellazzi

P2-16: In-Situ Extraction of the Thermal Impedance of GaN Power HEMTs Embedded in PCB-Based Power Circuits

Antonio Pio Catalano¹, Ciro Scognamiglio¹, Vincenzo D'Alessandro¹, Lorenzo Codecasa²

¹University Federico II; ²Politecnico di Milano

Poster-2: SiC

Chair: Sei-Hyung Ryu

P2-17: Impact of Layout Arrangement on Surge Current and Avalanche Robustness of Silicon Carbide JBS Diodes

Fu-Jen Hsu^{1,2}, Hsiang-Ting Hung², Cheng-Tyng Yen²

¹National Tsing Hua University; ²FastSiC Semiconductor Incorporated

P2-18: Mechanism of Threshold Voltage Instability in SiC MOSFETs and Impacts on Dynamic Switching

Junsong Jiang¹, Mohan Tian¹, Wen Ji^{1,2}, Zhihao Hu¹, Haoran Li¹, Yuzheng Guo², Zhaofu Zhang², Xi Tang¹, Cungang Hu¹, Wenping Cao¹

¹Anhui University, ²Wuhan University

P2-19: The Impact of the Dead-Time on the Reverse Recovery Behavior of SiC-MOSFET Body Diodes

Xing Liu, Xupeng Li, Clemens Herrmann, Thomas Basler

Chemnitz University of Technology

P2-20: 5 A/1.17 kV NiO/ β -Ga₂O₃ heterojunction Power Rectifier with high-Temperature Operation Capability Up to 548 K

Zhengpeng Wang, Hehe Gong, Xinxin Yu, Rangfang Ren, Shulin Gu, Youdou Zheng, Rong Zhang, Jiandong Ye
Nanjing University

P2-21: An Electro-Thermal Co-Designed Ga₂O₃ [100] Trench Power Diode Featuring Ferroelectric Dielectric

Yuan Li, Yitong Yang, Xiaoli Lu, Yunlong He, Xiaohua Ma, Yue Hao

Xidian University

P2-22: 1.2 kV SiC MOSFET Body Diode Turn-Off in Fast Switching: Channel Conduction, Carrier Plasma and Parasitic Turn-on

Thanh-Toan Pham¹, Jimmy Franchi¹, Kwangwon Lee², Martin Domeij¹

¹onsemi, Sweden; ²onsemi, Korea

P2-23: Stability Analysis of Parallel SiC Power MOSFETs Based on a Virtual Prototype

Michel Nagel¹, Ivana Kovacevic-Badstuebner¹, Salvatore Race¹, Dan Popescu², Bogdan Popescu², Daniele Romano³, Giulio Antonini³, Ulrike Grossner¹

¹ETH Zurich; ²Infineon Technologies AG; ³University of L'Aquila

P2-24: Fabrication of Ampere-Class p-Cu₂O/n- β -Ga₂O₃ Trench Heterojunction Barrier Schottky Diodes and Double-Pulse Evaluation

Akio Takatsuka, Hironobu Miyamoto, Kohei Sasaki, Akito Kuramata

Novel Crystal Technology, Inc.

31 May 2023 (Wednesday)

4:00pm~5:30pm **Poster Session 2 (LVT, PK, SiC)**

Poster-2: SiC

Chair: Chih-Fang HUANG

P2-25: Self-Clamped P-Shield SiC Trench IGBT for Low On-State Voltage and Switching Loss

Xuan Li, Qian Lou, Hanqing Zhao, Xiaochuan Deng, Bo Zhang

University of Electronic Science and Technology of China

P2-26: Improved Blocking, Short-Circuit and Switching Characteristics of Split-Gate 1.2kV 4H-SiC MOSFET with a Deep P-Well

Dongyoung Kim, Skylar Deboer, Seung Yup Jang, Adam Morgan, Woongje Sung

State University of New York Polytechnic Institute

P2-27: Short-Circuit Rugged 1.2 kV SiC MOSFET with a Non-Linear Dielectric Gate Stack

Marco Boccarossa¹, Luca Maresca¹, Alessandro Borghese¹, Michele Riccio¹, Giovanni Breglio¹, Andrea Irace¹, Giovanni Antonio Salvatore²

¹University of Naples Federico II; ²Ca' Foscari University of Venice

P2-28: Enhanced Design Architecture to Suppress Leakage Current of High-Voltage (HV) Lateral nMOSFETs in 4H-SiC

Sundar Babu Isukapati, Seung Yup Jang, Woongje Sung

State University of New York Polytechnic Institute

P2-29: Experimental Demonstration of dV/dt Effect on Silicon Carbon SGTO for Pulse Power Applications

Chao Liu¹, Ziwen Chen¹, Qingyu Liu¹, Wanjun Chen¹, Yijun Shi³, Ruize Sun¹, Zhaoji Li¹, Bo Zhang¹, Heng Deng²

¹University of Electronic Science and Technology of China; ²Xi'an Modern Control Technology Research Institute; ³MIIT

P2-30: Electrical Characterization and Analysis of 4H-SiC Lateral MOSFET (LMOS) for High-Voltage Power Integrated Circuits

Li Liu¹, Jue Wang², Zishi Wang¹, Miaoguang Bai¹, Junze Li¹, Zhengyun Zhu¹, Hongyi Xu³, Na Ren¹, Qing Guo¹, Kuang Sheng¹

¹Zhejiang University; ²Hangzhou City University; ³ZJU-Hangzhou Global Scientific and Technology Innovation Center

1 June 2023 (Thursday)

8:45am~10:25am GaN-3: Novel GaN Power Devices & Technologies 2

Chairs: Hong Zhou, Hideyuki Okita

GaN3-1: 3.0-V-Threshold-Voltage p-GaN HEMTs with Low-Loss Reverse Conduction Capability

Feng Zhou¹, Weizong Xu¹, Yulei Jin¹, Tianyang Zhou¹, Fangfang Ren¹, Dong Zhou¹, Yuanyang Xia², Leke Wu², Yiheng Li², Tinggang Zhu², Dunjun Chen¹, Rong Zhang¹, Hai Lu¹

¹Nanjing University; ²CorEnergy Semiconductor Co. Ltd.

GaN3-2: 10 A/950 V Switching of GaN-Channel HFETs with non-Doped AlN Buffer

Oliver Hilt, Frank Brunner, Mihaela Wolf, Eldad Bahat Treidel, Joachim Würfl, Andreas Thies, Anna Mogilatenko
Ferdinand-Braun-Institut gGmbH (FBH)

GaN3-3: High Dynamic Stability in Enhancement-Mode Active-Passivation p-GaN Gate HEMT

Yanlin Wu¹, Muqin Nuo¹, Junjie Yang¹, Zheyang Zheng², Li Zhang², Kevin J. Chen², Mengyuan Hua³, Yilong Hao¹, Xuelin Yang¹, Bo Shen¹, Maojun Wang¹, Jin Wei¹

¹Peking University; ²The Hong Kong University of Science and Technology;

³Southern University of Science and Technology

GaN3-4: Impact of Gate Morphology on Electrical Performances of Recessed GaN-on Si MOS channel-HEMT for Different Channel Orientations

Clémentine Piotrowicz^{1,3}, Blend Mohamad³, Pedro Fernandes Paespinto Rocha^{2,3}, Simon Ruel³, Patricia Pimenta-Barros³, Marie-Anne Jaud³, Laura Vauche³, Nathalie Malbert¹, Cyrille Le Royer³

¹University of Bordeaux; ²Univ. Grenoble Alpes CNRS; ³Univ. Grenoble Alpes

10:25am~10:45am Coffee Break

10:45am~12:00noon SiC-3: Recent Advances in Ga2O3 Devices

Chairs: Cheng-Tyng Yen, Alexander Bolotnikov

SiC3-1: NiO Junction Termination Extension for Ga2O3 Devices: High Blocking Field, Low Capacitance, and Fast Switching Speed

Ming Xiao¹, Boyan Wang¹, Ruizhe Zhang¹, Qihao Song¹, Joseph Spencer¹, Zhonghao Du³, Yuan Qin¹, Kohei Sasaki⁴, Han Wang³, Marko Tadjer², Yuhao Zhang¹

¹Virginia Tech; ²U.S. Naval Research Laboratory; ³University of Southern California; ⁴Novel Crystal Technology

SiC3-2: A E-Mode β -Ga2O3 metal-heterojunction Composite Field Effect Transistor with Record High P-FOM of 0.73 GW/cm²

Xichen Wang, Xiaoli Lu, Yunlong He, Peng Liu, Yv Shao, Jianing Li, Yitong Yang, Yuan Li, Xiaohua Ma, Yue Hao
Xidian University

SiC3-3: 1 kV Vertical β -Ga2O3 Heterojunction Barrier Schottky Diode with Hybrid Unipolar and Bipolar Operation

Weibing Hao, Guangwei Xu, Xiaolong Zhao, Shu Yang, Shibing Long
University of Science and Technology of China

12:00pm~1:45pm Lunch

1 June 2023 (Thursday)

1:45pm~3:00pm LVT-2: Lateral Low Voltage Devices

Chairs: Xin Lin, Riccardo Depetro

LVT2-1: Compact 200V Diode Constructed on Thick SOI Wafer

Jaroslav Pjencak, Ladislav Seliga

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LVT2-2: A 600V HVIC with Integrated Bootstrap Diode Function by a New Emulating HVMOS

Yuji Kawasaki¹, Toshihiro Imasaka¹, Yuto Shibuta², Shohei Sano², Yo Habu¹, Nobuo Hashimoto², Mitsutaka Hano¹,
Manabu Yoshino¹

¹Mitsubishi Electric Corporation; ²Melco Semiconductor Engineering Corporation

LVT2-3: Experimental Study on SOI LIGBT with Field Plate Resistances at Anode Side

Jie Wei¹, Pengchen Zhu¹, Yuxi Wei¹, Kemeng Yang³, Jie Li¹, Junnan Wang¹, Kaiwei Dai¹, Hua Song², Sen Zhang²,
Wentong Zhang¹, Bo Zhang, Xiaorong Luo¹

¹University of Electronic Science and Technology of China; ²CSMC Technologies Corporation; ³Nanjing University of
Posts and Telecommunications

3:00-3:25pm Closing

Program updated: 9 April 2023