

Table of Content PCIM Asia Conference 2022

Keynote

- 1 Development and Application of Novel Power Semiconductor Devices and DC Equipment..... 16**
Zhanqing Yu, Tsinghua University, China

Packaging and Reliability

- 2 Pin electrical resistance welding capability and verification of new TO-247 PLUS discrete package 17**
Zhenbo Zhao, Laser Jiang, Infineon Technologies Center of Competence (Shanghai) Co., Ltd., China
Omar Harmon, Infineon Technologies Austria AG, Austria



- 3 Degradation Mechanism of SiC MOSFET Module with Double Side Cooling for Electric Vehicle in Accelerated Aging Test..... 21**
Lubin Han, Lin Liang, Yong Kang, State Key Laboratory of Advanced Electromagnetic Engineering and Technology, School of Electrical and Electronic Engineering, Huazhong University of Science and Technology, China
Xudan Liu, Maojun He, Bosch (China) Investment Ltd., China
- 4 Cable Stray Parameters Impact Exploration on Stability of DC Distributed Power System..... 27**
Mustafa Tahir, Sideng Hu, Zhengbin Zhu, College of Electrical Engineering, Zhejiang University, China
- 5 Reliability Evaluation of New Generation High Temperature Capacitor Films for Inverter Applications 33**
Adel Bastawros, Andrew Pingitore, SABIC, USA
Yuan Zhou, SABIC, China
Fumio Yu, Koichi Nakashima, Hisao Katsuta, SABIC, Japan

Motion Control

- 6 Model Predictive Current Control of Open-winding PMSM Based on Zero Sequence Current Suppression..... 40**

Xiaoguang Zhang, Han Zhang, North China University of Technology, China

- 7 Model Predictive Control for Open Winding PMSM Based on Optimizing Dead-Zone Effect..... 48**

Xiaoguang Zhang, Chenguang Zhang, North China University of Technology, China



pcim Asia
Best Paper Award
WINNER



pcim Asia
Young Engineer Award
FINALIST



pcim Asia
University Scientist Award
FINALIST

- 8 Rotor Eccentricity Vibration Suppression Strategy for Multi-module Synchronous Motors..... 54**

Pengye Wang, Zicheng Liu, Haiyang Fang, Jiang Dong, Ronghai Qu, School of Electrical and Electronic Engineering, Huazhong University of Science and Technology, China



pcim Asia
University Scientist Award
WINNER

- 9 Improving speed and power density of electrical machines through regional changes in properties of electrical steels..... 60**

Jing Ou, Feng Chai, Jingbo Lin, Dianguo Xu, Harbin Institute of Technology, China
Martin Doppelbauer, Karlsruhe Institute of Technology, Germany

Advanced Power Semiconductor Devices

- 10 A new voltage class 2.3 kV IGBT enables new solutions for 1500 VDC system 65**

Xin Hao, Infineon Technology Competency Center (Shanghai) Co., Ltd., China
Jia Zhao, Infineon Integrated Circuit Beijing Co., Ltd., China

- 11 Research on layout of paralleling LV100-type IGBT modules in three-level NPC converters 70**

Bo Hu, Jian Sun, Gaosheng Song, Mitsubishi Electric & Electronics (Shanghai) Co., Ltd., China
Shota Saito, Mitsubishi Electric Power Device Works, Japan

12	Hardware Optimization of Current Distribution for Parallel-Connected, High-Power, Press-Pack IGBTs	78
	Ahmed Majed Saif, Karsten Fink, Power Integrations GmbH, Germany Hao Wang, Power Integrations, China	
13	20A/600V RC-IGBT Based Transfer Molded IPM for Home Appliance Application	84
	Hongguang Huang, Xiaoling Wang, Mitsubishi Electric & Electronics (Shanghai) Co., Ltd., China Motonobu Joko, Mitsubishi Electric Corporation, Japan	
14	Infineon' s IGBT package evolution with regard to the development of 1500 V solar string inverters	87
	Dunhu Sun, Xin Hao, Infineon Technology Competency Center (Shanghai) Co., Ltd., China Sichao Ma, Infineon, Germany	
15	The 7th Generation "X Series" Intelligent Power Module and Its Feature	91
	Kei Minagawa, Takahiro Mori, Kaname Mitsuzuka, Yuki Kumazawa, Kiyoshi Sekigawa, Yasuyuki Kobayashi, Fuji Electric Co., Ltd., Japan Song Chen, Fuji Electric (China) Co., Ltd., China	
16	A New Generation of 600V CIPOS™ Tiny IM323 Intelligent Power Module for Home Appliance Motor Drive Application	99
	Kihyun Lee, Bokkeun Song, Jaewook Lee, Taesung Kwon, Infineon Technologies Korea, South Korea	
17	Introduction of Large DIIPM+™ application on air-conditioner inverters	104
	Jiasheng Bao, Jian Chen, Mitsubishi Electric GEM Power Device (Hefei) Co., Ltd., China Hongguang Huang, Mitsubishi Electric & Electronics (Shanghai) Co., Ltd., China Hongbo Zhang, Power Device Works, Mitsubishi Electric Corporation, Japan	

Packaging Technologies and Reliability

18	Si₃N₄ Substrate Metallization	107
	Xiaosi Wang, TEDA Tian&Di IT Co. Ltd., China	
19	Thermal Evaluation of SiC MOSFET Power Modules with HPD Package and Double-sided Cooling Package	111
	Huakang Li, Yuhui Kang, Puqi Ning, Institute of Electrical Engineering Chinese Academy of Sciences, China Huakang Li, Puqi Ning, University of Chinese Academy of Sciences, China	

20	Effect of Fatigue Crack Network in Die-attach Joints on Thermal Resistance	116
	Koki Ochi, Ryuichiro Hanada, Power Device Works, Mitsubishi Electric Corporation, Japan Yoshinori Yokoyama, Shinichi Izuo, Kazuyasu Nishikawa, Advanced Technology R&D Center, Mitsubishi Electric Corporation, Japan Hiroki Kanai, Yoshiki Abe, Graduate School of Shibaura Institute of Technology, Japan Yoshiharu Kariya, Department of Materials Science and Engineering, Shibaura Institute of Technology, Japan	
21	The effect of quasi-DC power cycling on insulated gate bipolar transistor dual-in-line package intelligent power module	121
	Jaewook Oh, Inhyeok Hwang, Namsu Kim, Konkuk University, Republic of Korea	
22	New Transfer Molded Power Integrated Module (TMPIM) for Industrial Drive	125
	Jinchang Zhou, onsemi, USA Chee Hiong Chew, onsemi, Malaysia Silnore Sabando, Joji Corbillon, onsemi, Vietnam	
23	Transient optimal control algorithm for DC-DC converter based on time-series neural network	131
	Junzi Zhang, Ye Liu, Yuanyuan Yan, Xiaoqi Zhang, Fuhua Huang, School of Electrical Engineering, Xi'an Jiaotong University, China	
24	High-Performance Double Side Cooled Power Module for Automotive Traction Inverter Applications	138
	Maryam Kahali Moghaddam, Ajay Poonjal Pai, Infineon Technologies AG, Germany	

Power Conversion Technology for Renewable Energies



25	High Ratio DC/DC Converter for Offshore Wind Farms with MVDC Collection System	143
	Lei Li, Hao Tian, Binbin Li, Ming Yang, Dianguo Xu, School of Electrical Engineering, Harbin Institute of Technology, China Tianliu Wei, Weiwei Li, State Key Laboratory of HVDC, Electric Power Research Institute, CSG, China	
26	An ANPC converter design using ST20 for high-power offshore wind application	151
	Fengjie Zhu, SEMIKRON Electronics (Zhuhai) Co., Ltd., Beijing, China Wei Jing, SEMIKRON Electronics (Zhuhai) Co., Ltd., Shenzhen, China	

27	A Hybrid Isolated DC-DC Converter With Wide Input Voltage Regulation Range	156
	Ning Wang, Xiaodong Zhao, Binbin Li, Dianguo Xu, School of Electrical Engineering, Harbin Institute of Technology, China	
28	A benchmark study on the AC voltage in the 3L converter for high power offshore wind turbines	162
	Heng Wang, Xin Ma, Yong Yang, Infineon Integrated Circuit (Beijing) Co., Ltd., China	
29	Efficiency Improvement of a Nearly Zero Energy Building through the Optimal Control of the Domestic Wind Turbine	170
	Christos Mademlis, School of Electrical and Computer Engineering, Aristotle University of Thessaloniki, Greece	

Special Session: WBG Devices

30	A SiC Based high efficiency high power Three-Phase Interleaved LLC Resonant Converter.....	178
	Chen Wei, Zongzeng Hu, Fulin Zhang, Wolfspeed, China Jianwen Shao, Anuj Narain, Wolfspeed, United States	
31	How Silicon Carbide is Changing the Future of Electric Vehicles	184
	Tong Wu, Onsemi, China	
32	An indispensable role of SiC on the EV field.....	185
	Jun Li, ROHM Semiconductor (shanghai) Co., Ltd., China	
33	Technology Developments, Limits and Challenges of SiC Power Devices	186
	Haihui Luo, Zhuzhou CRRC Times Semiconductor Co., Ltd., China	
34	SiC Power Devices and Application to Power Electronics.....	187
	Jun Li, Fuji Electric (China) Co. Ltd, China Seiki Igarashi, Naoto Fujishima, Fuji Electric Co., Ltd., Japan	

Keynote

35	DC Grid.....	195
	Yanzhong Zhang, Huawei Digital Energy, China	

Power Devices

- 36 Trench IGBT with FS2 Technology Platform for Low Loss and High Robustness Applications 196**
Ken Zhang, Charlie Zhu, Ke Jiang, Bo Xu, Jinshan Shi, Randy Yin, Huiling Zuo, Jimmy Fang, Junli Xiang, Boger Cai, Katherine Huang, Jason Duan, Nexperia (China) Ltd., China
- 37 Novel 2000 V IGBT with LV100 package for Renewable Energy Application..... 200**
Satoshi Miyahara, Nobuya Nishida, Ikumi Fukuda, Mitsubishi Electric Corporation, Japan
Yuanchen Zhang, Mitsubishi Electric & Electronics (Shanghai) Co., Ltd., China
- 38 Application Benefits of 3.3 kV/185 A, 375 A Full SiC Power Modules..... 206**
Mamoru Matsuo, Shota Saito, Kenta Nakahara, Ryo Tsuda, Kenji Hatori, Keiichi Nakamura, Mitsubishi Electric Corporation, Japan
Jian Sun, Gaosheng Song, Mitsubishi Electric & Electronics (Shanghai) Co., Ltd., China
- 39 3.3 kV All SiC Module for Traction Inverters with 2nd Generation Trench gate SiC MOSFETs211**
Yusuke Sekino, Sayaka Yamamoto, Takafumi Uchida, Keiji Okumura, Yoshiyuki Kusunoki, Yuichi Onozawa, Hiroshi Kimura, Yasuyuki Kobayashi, Takashi Shiigi, Fuji Electric Co., Ltd., Japan
Song Chen, Fuji Electric (China) Co., Ltd., China

Special Session: AI for Power Electronics

- 40 Preliminary study on multi-objective design of converters/power modules based on machine learning algorithm 218**
Jianing Wang, Hefei University of Technology, China
- 41 Emerging Applications of AI in Magnetics for Power Electronics 219**
Li Wang, Nanjing University of Aeronautics and Astronautics, China
- 42 Artificial Intelligence Applications for Power Electronics Reliability 220**
Chunlin Lv, Xi'an Jiaotong University, China
- 43 AI Applications for Power Electronics – Challenges and Opportunities 221**
Huai Wang, Aalborg University, Denmark

Future Power Converter System Solution

44 Automatic optimization of motor controller with component arrangement, disassembly and thermal management 222
 Jian Cui, Puqi Ning, Yunhao Huang, Tao Fan, University of Chinese Academy of Sciences, China
 Jian Cui, Puqi Ning, Yunhao Huang, Tao Fan, Institute of Electrical Engineering, Chinese Academy of Sciences, China
 Jian Cui, Puqi Ning, Yunhao Huang, Tao Fan, Key Laboratory of Power Electronics and Electric Drive, Institute of Electrical Engineering, Chinese Academy of Sciences, China
 Jian Cui, Puqi Ning, Yunhao Huang, Tao Fan, Collaborative Innovation Center of Electric Vehicles in Beijing, China

45 DIIPM Suitable for Middle Power Servo Drive 228
 Siqing Lu, Rui Zhao, Mitsubishi Electric & Electronics (Shanghai) Co., Ltd., China
 Rongning Tao, THINKVO Automation Eqpt. Co., Ltd., China

46 Four-stage Deadbeat Control with Dead-time Compensation Based on PMSM..... 236
 Xiaoguang Zhang, Guofu Zhang, North China University of Technology, China

47 Robust Model Predictive Current Control Based on Inductance Sliding Mode Observer..... 241
 Xiaoguang Zhang, Zhen Wu, Hailong Bai, North China University of Technology, China



48 Suppression of vibration and common-mode voltage of dual three-phase motor under improved PWM methods..... 249
 Dailin Ou, Zicheng Liu, Xiangwen Sun, Dong Jiang, Ronghai Qu, Huazhong University of Science and Technology, China



49 Enhanced Master-Slave Windings Motor System with Extended Range of Applications 255
 Sideng Hu, Zhao Li, Mustafa Tahir, College of Electrical Engineering, Zhejiang University, China

- 50 Microgrid Reliability Assessment Based on Historical Weather Conditions..... 262**
 Xiaoguang Chai, Wuxi Power Supply Company of State Grid, China
 Fancheng Guo, Nantong Power Supply Company of State Grid, China
 Ming Chen, Wuxi Power Supply Company of State Grid, China
 Shaolei Zong, Wuxi Power Supply Company of State Grid, China
 Zhong Liu, Wuxi Power Supply Company of State Grid, China
 Guangzhong Yang, Wuxi Power Supply Company of State Grid, China
- 51 Resonance analysis and detection of the clustered grid-connected PV system 267**
 Jing Gao, Yi Lu, Yuan Zhao, State Grid Jibei Electric Power Co. Ltd. Research Institute
 (North China Electric Power Research Institute Co., Ltd.), China
- 52 Design of Portable Power Quality Detection Device Based on DSP+ARM 272**
 Pengsheng Bu, Gaohui Feng, Yuan Tian, Shanxi Tiandi Coal Mining Machinery Co., Ltd., China
 Pengsheng Bu, Gaohui Feng, Yuan Tian, China Coal Technology & Engineering Group
 Taiyuan Research Institute Co., Ltd., China
 Pengsheng Bu, Gaohui Feng, Yuan Tian, China National Engineering Laboratory for Coal
 Mining Machinery, China

Power Converter Control and Protection



- 53 Short-circuit and overcurrent protection scheme of SiC MOSFET based on combined protection method 279**
 Tao Li, Xiangfei Zhang, Xueqing Qi, Beijing Smartchip Microelectronics Technology Company Limited, China
 Zhijing Ye, Chi Li, Zedong Zheng, Tsinghua University, China
- 54 Comparison of CCM and CRM Totem-Pole PFC based on Silicon Carbide Device 287**
 Hua Wang, Jianhua Wang, Yang Xu, Yang Lei, Xing Huang, PN Junction Semiconductor (Hangzhou) Co., Ltd., China
- 55 Suppressing Switching Noise Three-phase Inverter Enabling Output Voltage Control in Extended Output Range 292**
 Atsushi Hirota, National Institute of Technology, Akashi College, Japan
- 56 The new CIPOS™ Micro intelligent power module with reverse conducting IGBT technology for home appliances 299**
 Syed Shamsul Arefin, Infineon Technologies AG, Germany
 Claudio Villani, Stefano Ruzza, Infineon Technologies Italia S.r.l., Italy

57 Analysis and Simulation Validation of Boost Inverter Switching Losses 305
Hang Li, Xiaosa Sui, Deliang Wu, Shanghai University, China

58 Research on Source Network Load Storage Collaborative control Based on multi port power electronic transformer in Coal Mine..... 312
Gaohui Feng, Yuan Tian, China Coal Technology & Engineering Group Taiyuan Research Institute Co., Ltd., China
Gaohui Feng, Pengsheng Bu, Yuan Tian, China National Engineering Laboratory for Coal Mining Machinery, China
Pengsheng Bu, Shanxi Tiandi Coal Mining Machinery Co., Ltd., China
Kainan Chen, Department of Electrical Engineering, Tsinghua University, China

Power Conversion and Gate Driver Solution

59 Programmable Gate Driver Solution with Optimized Two-Level Turn- Off for Paralleled IGBTs in Renewable Energy Application..... 318
Hao Wang, Yuejuan Bian, Power Integrations, China
Karsten Fink, Power Integrations, Germany

60 A novel low-cost, high efficiency, low-ripple high PF LED driver with ripple cancellation..... 323
Jie Fu, Zhiqun Chen, Gang Wang, Signify (China) investment Co. Ltd. Research Center, China

61 Equalizing the voltage of ANPC topology switches..... 327
Jianwen Qiu, Chaoqun Zhang, SEMIKRON Electronics (Zhuhai) Co., Ltd., China



62 Short Circuit Protection of SiC MOSFET Module with Extended Short Circuit Withstanding Time..... 333
Chengmin Li, Jing Sheng, Drazen Dujic, Power Electronics Laboratory, EPFL, Switzerland

63 Optimized design of unified platform for light industrial applications using SiC MOSFETs and mixed DC-link capacitors..... 342
Simon Kim, Infineon Technologies, Korea
Dinesh Palaniappan, Kwok Wai Ma, Infineon Technologies Asia Pacific, Singapore

Chinese Session: Passive Components and Filter Design

- 64 Second Harmonic Current Reduction Techniques for Two-Stage Single-Phase Converters..... 348**
Xinbo Ruan, Nanjing University of Aeronautics and Astronautics, China
- 65 The analysis, modeling and test of Common-mode EMI Inductors..... 349**
Wei Chen, Fuzhou University, China
- 66 Design for "E+E" Type Magnetic Integrated Transformers in 2-Phase Parallel LLC Resonant Converter 350**
Yugang Yang, Shixian Wang, Haichao Li, Runbo Chen, College of Electrical and Power Engineering, Taiyuan University of Technology, China
Yanqiu Wu, State Grid Liaoning Electric Power Company Anshan Power Supply Company, China
- 67 Researches on Passive Integration of High Frequency High density Power Converters..... 358**
Laili Wang, Xi'an Jiaotong University, China
- 68 Research on High Distance Diameter Ratio IPT System based on Series Multi-segment Compensation..... 359**
Yijie Wang, Harbin Institute of Technology, China

Keynote

- 69 Power Solution for Server Applications 360**
Lisong Hu, Infineon Semiconductors (Shenzhen) Company Limited, China

Chinese Session: Challenges in High Power Density Converter Design

- 70 Integrated Motor Drives with Novel Topologies 361**
Dong Jiang, Huazhong University of Science and Technology, China
- 71 Technology & Industrialization Development of eDrive System for New Energy Vehicles 362**
Zhouyun Zhang, Shanghai Edrive Co., Ltd., China
- 72 Research and prospect of high density power electronics technology for rail transit applications..... 363**
Zechun Dou, CRRC Zhuzhou Institute Co., Ltd., China

73 Untitled paper 364
Zhaomin He, COMAC Beijing Aircraft Technology Research Institute, China

Tutorial: SiC & GaN

74 SiC Power Device Industry Outlook 365
Weiwei He, Shenzhen BASiC Semiconductor Ltd., China

75 Untitled paper 366
Yi Sun, Innoscience, China