International Exhibition and Conference for Power Electronics, Intelligent Motion, Renewable Energy and Energy Management

Nuremberg, 5 – 7 June 2018
pcim-europe.com

Conference Program

→ 6 Seminars
→ 9 Tutorials
→ Over 300 presentations
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## Conference Program at a Glance

### Sunday, 3 June 2018

14:00 – 17:30  Hotel Arvena Park Görlitzer Str. 51, D-90473 Nuremberg

**Seminars**

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<td>Seminar 4</td>
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### Monday, 4 June 2018

09:00 – 17:00  Hotel Arvena Park Görlitzer Str. 51, D-90473 Nuremberg

**Tutorials**

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<td>Tutorial 3</td>
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### Tuesday, 5 June 2018

09:00  Brüssel 1

Conference Opening and Award Ceremony

09:45  Brüssel 1

Keynote »Electric Vehicles Charging – An Ultrafast Overview«

10:30 Coffee Break

11:00  Brüssel 1

Special Session: Advanced Solutions for Charging of Electric Vehicles

Brüssel 2: Special Session: Materials for Packaging and Thermal Management

München 1: SiC based Power Module

München 2: Traction Inverters

Mailand: Intelligent Motion

12:40 Lunch Break

14:00  Brüssel 1

SiC Devices I

Brüssel 2: Advanced Packaging Technologies I

München 1: Power Electronics Topologies

München 2: Multi-Level Converters

Mailand: Energy Storage

15:15 Foyer Entrance NCC Mitte

Poster/Dialogue Session

17:30 Welcome Party

### Wednesday, 6 June 2018

08:45  Brüssel 1

Keynote »New Passive Devices in Power Conversion - Nice to Have or a Must?«

09:30 Coffee Break

10:00  Brüssel 1

High Power IGBT Devices

Brüssel 2: Converter Design and Integration

München 1: Control in Power Electronics

München 2: Gate Driver

Mailand: Special Session: Passive Components

12:00 Lunch Break and impulse-presentation »Fit for Stage«

14:00  Brüssel 1

SiC Devices II

Brüssel 2: High Power IGBT System Applications

München 1: Advanced Packaging Technologies II

München 2: HVDC Transmission Systems

Mailand: Software Tools and Applications

15:15 Foyer Entrance NCC Mitte

Poster/Dialogue Session

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**Benefit from early-bird rates until 2 May 2018 and save up to 100 Euro! pcim-europe.com/registration**
About the instructor
Jacques Laeuffer has a 35 years’ experience of R&D in Power Electronics, inside international companies, with powers from 10 W to up to 1 MW, including HF resonant converters and high voltage transformers, electric machines and inverters for hybrid cars. He is inventor of 27 granted patents and author or over 80 technical papers. As a consultant, he’s activities extend from one year consulting to several months projects, including choices & design of conversion topologies, power components & electric machines, sizing, EMC, digital control, industrial property, field support. Affiliated Professor at École Polytech, he teaches also at CentraleSupelec, France, and for inter and intra companies training courses in former topics and also on microchips, cars propulsion, or «Design and Innovations».

Content
Fast semiconductors commutations are required for efficiency of high frequency (HF) power converters and drives, and their wide bandwidth control electronics. These sudden front edge generate perturbations in control circuits, and on public utility power networks. The seminar shows step by step how perturbations propagate, as Differential Mode (DM) and Common Mode (CM), how to reduce many oscillations from the beginning, how to design and implement robust control electronics, how to calculate and optimize DM and CM filters for EMC standards compliance, how to avoid expensive shielding and improve reliability. Number of practical designs are theoretically calculated, showing orders of magnitudes for a wide range of powers and frequencies.

Introduction: Issues & Standards
DM in Control
- Resistive, inductive / capacitive coupling reduction
- Reduction by ground planes.
DM in Power & Filters Design
- Switching power supply sequence as EM sourced
- Calculation of Disturbances from transistors & diodes
- Measurement. CM Filter calculation
- DM Filter calculation, Design of L, C & R components
- Some MHz perturbations evaluations. Reduction means.
CM in Control
- Between PCB’s & between Cabinets. Electric & Optics
- CM parasitic coupling and reduction.
- Wiring & Layout evolution form «Star» to «Net».
CM in Power & Filters Design
- Calculation of Disturbances from CM capacitances.
- Heatsinks, transformers, screens, electric machines/motors.
- Measurement, CM Filter calculation
- Leakage current constraint. CM coupled inductance design

EMC Commutation Control of Power Semiconductors
- Tuning as a trade-off between switching losses & EMC.
- Control of digital & Analog front edges by gate drive.
- Gate drive circuit designs for MOS and IGBTs.
Radio Interference
- Examples of emissions of Electric & Magnetic Fields.
- Field measurements and reduction.
- Neighbor Field & Far Field identification. Examples.
- Wiring, grounding, shielding, packaging.

Who should attend?
This course is targeted towards engineers, students or project managers, who design, specify, simulate, tune, or integrate high frequency power supplies, converters, EM filters, electric machines, and intelligent motion, for high-efficiency consumer, low-cost global and high reliability applications.

Jacques Laeuffer, Diraits, France
Modern Magnetic Technologies for High Efficiency and High Power Density

Isreal Don Jitaru, Rompower, USA

About the instructor
Isreal Don Jitaru is the founder of Rompower Inc., later Ascom Rompower Inc. and Delta Energy Systems (Arizona Inc.), an internationally recognized engineering firm in the field of power conversion. Presently he is the president of Rompower Energy Systems Inc., an advanced development company in Power Conversion Field. He has published 35 papers where several of them have received the best paper award, and held 46 professional seminars at different international conferences in the power conversion Mr. Jitaru has presented novel trends in power conversion technologies such as “PMU’s Soft switching”, full integrated multilayer PCB Magnetic, “gyroscopically rectified and recently “True Soft Switching technologies where the primary switches turn on at zero voltage and the secondary switches turn off at zero current. Some of these technologies have been covered by 52 intellectual properties where 25 are granted patents.

Seminar 6 Design of Magnetic Components for High Power Converters
Tomás Pagá, Exerdrive, Switzerland

About the instructor
Tomás Pagá received his B.S. and M.S. degrees from Simon Bolívar University in Caracas, Venezuela in 1984 and 1990 respectively. He was university professor and consultant in the energy and all industry. From 2001, has been Power Electronics Consultant of ENERDRIVE GmbH in Zurich, for manufacturers of multi-megawatt, wind energy and industrial drives power converter. His research interests include high power electronics converters, magnetic components modeling and design, power electronics cooling and grid integration.

Content
Filter chokes and transformers for high power converters, ranging from hundreds to thousands of kV, are commonly one of the most costly and difficult components to design. Desired electrical performance and tight restrictions in weight, volume and cooling represent a challenging compromise for the designer. In this seminar we address topics from how to specify the components for outsourcing to how to get deep inside the detailed design. Reference, test results and failure examples from real cases are presented. The seminar will be based on a design case, where the main design problems for each step will be addressed. Analytic, Finite Element Method and Circuit Simulation tools will be used during the design. Losses calculation and measuring are treated in detail. Losses produced by the switching high frequency components are often calculated mistakenly in poor thermal performance. High frequency losses curves of laminated magnetic steel are commonly not available from the suppliers, so the designer faces with the need of high frequency losses measuring methods. Loss measurement error sources, like low power factor and angle errors, are explained in detail and methods to overcome these issues will be discussed. Additional sources of losses due to winding resistance, skin/proximity effect and fringe flux on the air-gaps will also be addressed. Finite Element modelling of high frequency winding losses will be used for the analysis.
The tutorial will present also the impact of intelligent power processing in optimizing the efficiency and even in converting a traditional hard switching topology into a soft switching topology.

The presentation will be highlighted with design examples and experimental results such as 99%+ efficiency PFC with power densities above 1000W/in3, and 99% efficiency isolated DC-DC Converters.

Who should attend?

This course is designed for power conversion engineers, magnetic engineers and technical managers who are involved in state-of-art power conversion. The participants will get familiar with the latest advancements in topologies, control and magnetics in power converters aimed to increase the performance and reduce the total cost.

Tutorial 2

Design of Multilevel Converter Systems

Marc Hiller, Karlsruhe Institute of Technology, Germany

About the instructor

Prof. Hiller received his diploma in Electrical Engineering from the Technical University Darmstadt in 1996. After one year as a R&D engineer for traction converters at the Siemens AG, Erlangen, he joined the University of Federal Armed Forces in Munich, Germany, in 1998. After receiving his PhD degree he worked for 10 years in the R&D department at the Siemens AG, where he had to various projects on Multilevel Converters for industrial drives. As project manager and group leader he introduced the first Modular Voltage Modulator Multilevel Converters for drives and proved applications in the market. In 2010, he joined the Karlsruhe Institute of Technology where he holds a chair in Power Electronic Systems at the Institute of Electrical Engineering (ITI).

Content

Compared to the most commonly used 2-Level converters, multilevel converters feature several voltage steps at the output. This allows using power semiconductors which do not have to be rated for the full DC link voltage and avoids series connection of switches. Furthermore this enables higher system voltages for AC and DC applications as well as improved efficiency and reduced harmonic distortion at higher resulting switching frequencies.

In recent years, many 3- and 5-Level converter topologies have been introduced for demanding applications like photovoltaic systems, wind converters, uninterruptible power supplies, MV drives and active filters. In addition, split DC link topologies are commonly used in power grids (HVDC, SVC) and MV applications. All of these applications benefit from one or more of the most important advantages of multilevel converters:

- Improved EMI behavior, less harmonics,
- Improved efficiency,
- Use of cost-efficient power semiconductors at lower voltage ratings,
- Reduction of passive filters (improved power density),
- Improved availability using redundant components,
- Higher bandwidth,
- Despite these benefits multilevel converters still suffer from some drawbacks:
  - Higher parts count and higher design complexity,
  - Higher bandwidth.

The goal of the modern soft switching technologies is to have a simple and low-cost hardware and an intelligent control designed to minimize the losses under different operating conditions.

Though the tutorial will be focused on the modern topologies, a section is dedicated to magnetics. In the quest for efficiency above 99%, the magnetic technology plays a very important role. In some applications such as modern soft switching flyback some of the energy for soft switching is extracted from the parasitic elements of the transformer. A detailed power dissipation analysis in several applications will highlight the need for magnetic optimization.

In spite of the significant progress the semiconductor industry, the technology in magnetic lags behind. The tutorial will describe the impact of the parasitic elements in the magnets in optimizing the performance of the power converters. Presently we are reaching 99% efficiency in PFC and DC-DC converters by using these modern soft switching technologies, optimized magnets and intelligent control. The developments in semiconductor technology such as GaN and SiC did help us to further improve the efficiency exceeding the 99% in some applications.
About the instructors
Christian P. Dick studied Electrical Engineering at RWTH Aachen University, Germany, where he also received his PhD degree. Beginning of 2011 he joined SMA Solar Technology AG as a director for advanced development of solar converters up to 200 kW. He is now professor for power electronics and electrical drives at Cologne University of Applied Sciences. His main research interests are resonant converters with focus on magnetics, and the large-scale utilization of renewable energy.

Prof. Jens Omm Krah studied electrical engineering at the Bochum University of Applied Sciences and received his doctorate in 1991 from Prof. Hof in the field of electronic machines and drive research. Until February 2008 he was Technical Director responsible for the development of Kollmorgen Servo Drives. Since 2004 Prof. Krah has been teaching control technology, motion control, FPGA-based digital signal processing and functional safety at the TH Köln. This research focus is on the development of robust, safety-related and energy-efficient inverters with programmable hardware.

About the instructor
Tobias Reimann received 1994 his PhD from the Technische Universität Ilmenau. Prof. Reimann is a member of scientific board of the German PowerPoint Systems Association. Since 2014 he is a professor for power electronics and electrical drives at Chemnitz University of Technology and responsible for the operational business of this company. In addition, he is one of the founders of the company ISLE GmbH which is engaged in system design with focus on power electronics and electrical drives. He is responsible for the operational business of this company. Additionally, since July 2003 he is a professor for Industrial Electronics at Technische Universität Ilmenau. Prof. Reimann was member of a scientific board of the Thomson Center of Excellence in Mobility (ThCM) at Technische Universität Ilmenau in the field of automotive electronics.

Thomas Basler, Infineon Technologies, Germany

About the instructor
Tobias Reimann received 1994 his PhD from the Technische Universität Ilmenau in the field of power semiconductor applications for hard and soft switching inverters. In 1994 he was one of the founders of the company ISLE GmbH which is engaged in system development for power electronics and electrical drives. He is responsible for the operational business of this company. In addition, since July 2003 he is a professor for Industrial Electronics at Technische Universität Ilmenau. Prof. Reimann is a member of scientific board of the Thomson Center of Excellence in Mobility (ThCM) at Technische Universität Ilmenau in the field of automotive electronics.

Thomas Basler received his Diploma in Electrical Engineering from Chemnitz University of Technology in 2008. His diploma thesis was on the robustness of power devices. Between 2009 and 2012 he was a member of the scientific staff at the Chair of Power Electronics and Electromagnetic Compatibility at Chemnitz University of Technology. At the beginning of 2014 he received his PhD. His dissertation dealt with short-circuit and surge-current ruggedness of IGBTs and was supervised by Prof. Dr.-Ing. Jürgen Lütz. In 2014 he joined Infineon Technologies AG, Nürnberg, Germany, where he works on the development of SiC-MOSFETs, diodes and Si IGBTs.

Content
Utilizing power electronic based converter technology is a key approach to build energy efficient solutions. Due to the innovation cycles of the semiconductor suppliers the size and the cost of more and more complex inverter systems is not increasing. However, especially the new fast switching wide bandgap devices (SiC & GaN) are challenging the control hardware. The advanced control architectures are covered by discussing algorithms and possible implementations using µC, DSP and FPGA technology. Robust controller design with well-defined set up procedures or reliable self-tuning algorithms can help to use these innovations utilizing a reasonable safety.

1. Converter Design Basics
   - IGBT, MOSFET, SiC
   - State-machine based dead time generation
   - 2-Level / 3-Level Inverter - including Energy Efficiency Classes
   - Gate driver basics
2. Inverter Modulation Techniques
   - Single Phase Modulator
   - Pulse Width vs. Pulse Frequency Modulation
   - 2-Level / 3-Level Sine
3. Analog to Digital Conversion
   - Sigma-Delta DAC versus R-2R DAC and PWM
   - Sigma-Delta Modulation
   - Sinc’ decimation filtering
   - Efficient FIR implementations, Demonstration, Examples
4. Current Sensing
   - Transducer versus shunt
   - Synchronous sampling
   - Aliasing, EMI suppression
   - 2 vs. 3 current probes in 3~ Loads
5. Current Control
   - Hysteresis Control
   - Sampling Control
   - Synchronous Control (FOC): Clarke, Park, decoupling
   - Hybrid control
   - (single-phase) PLL
   - Dead-Time Compensation
6. Current Prediction
   - Modeling the Plant
   - Smith Predictor
   - Current Observer
   - Parameter Tuning
   - Theoretical background
   - Parameter estimation

Tutorials Monday, 4 June 2018, 09:00 – 17:00
Venue: Arvena Park Hotel Nuremberg, Gürliert Str. 51, 90473 Nuremberg

Tutorial 4 High Performance Control of Power Converters
Christian Peter Dick, Jens Omm Krah, Cologne University of Applied Sciences, Germany

Tutorial 5 Advanced System Design with Ultra-Fast Si/SiC/GaN Power Semiconductor Devices
Tobias Reimann, ISLE Steuerungstechnik und Leistungselektronik, Germany

Tutorial 6 Switchmode Printed Circuit Board Design and Layout for Low EMI
Bruce Carsten, Bruce Carsten Associates, USA

Tutorial 7 Switchmode Power Losses
- DC / DC-converter
- DC / AC-converter
- Load Cycles
- Calculation of heat sink
- Device Induced Electromagnetic Disturbance
- Parasitics
- Oscillations in Power Modules

Who should attend?
This tutorial will be especially valuable for engineers and PhD’s who address the following control aspects:
- Digital Motor Control
- Mains Control, including PFC
- High-Performance Sensor Circuity including Robust Signal Transmission
- Modulation Techniques
- Controller Implementation using FPGA
- Controls-Related/Non-Converter Issues like Wide-Range Drives

Who should attend?
Engineers designing converters equipped with fast power semiconductors like Si/SiC-MOSFETs, IGBTs and diodes having basic knowledge in power devices and power converters.

Who should attend?
This tutorial is directed largely towards the switchmode design engineer who is either directly involved in PCB layout, or needs to direct and assist layout technicians. However, the tutorial will also be of some value to layout software users without an engineering background.

A good PCB layout for low EMI is a technically demanding design task, ideally performed by one versed in the physics and visualization of electric and magnetic fields. Unfortunately, PCB layout is increasingly performed by someone trained only in the use of layout software, where arbitrary component placement and the use of auto-routing of conductor traces can be deadly to EMI performance.

The tutorial will begin with physical demonstrations of energy coupling by changing magnetic and electric fields to aid in the comprehension of EMI generation. A full set of tutorial notes will be provided, but some subjects maybe gone over lightly or even skipped due to the limited time.

Questions and comments from attendees are strongly encouraged.

Topics include:
- Definition of EMI, and how it is measured
- How EMI is generated by changing voltages and currents
- Magnetic field coupling from a current loop to a pickup loop
- Electric field coupling from one surface to another
- Illustration of energy coupling through changing electric and magnetic phenomena
- Why EMI is as hard to prevent: «parts per trillion» phenomena
- Switching Cells as the principal source of EMI
- Conductive shielding of Magnetic Fields
- Faraday shielding of Electric Fields
- The many benefits of a Ground Plane (expanded from last year)
- Layout of switching cells as a «macro» or «component», which can be moved but not pulled apart
- Locating sources of EMI with Hi-field and E-field probes

Who should attend?
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2. Materials, substrates and interconnection technologies

Power devices, aspects going from Si to SiC are considered.

Content

Tutorial 7

Reliability of Si and SiC Power Devices and Packages
Josef Lutz, Chemnitz University of Technology, Germany

About the instructor
Josef Lutz joined Siemens Electric, Nuremberg, Germany in 1985. First he worked in the development of GTO-Tiristors, then in the field of fast-recovery diodes. He introduced the Controlled Anode Lifetime (CAL) diode. Since August 2001 he is Professor for Power Electronics and Electromagnetic Compatibility at the Chemnitz University of Technology, Germany. His main fields of research are ruggedness and reliability of power devices. He is involved in several national and international research projects regarding reliability of SiIGBTs and wide bandgap devices. He is author of the books »Semiconductor Power Devices – Physics, Characteristics, Reliability«, published by Springer 2011.

Focal points
- Thermal measurement and monitoring
- Condition monitoring and active thermal control for improved reliability
- Six-step system-level reliability prediction approach for power electronic converters
- Reliability prediction for model based power electronics converter design
- Condition monitoring and active thermal control for improved reliability
- Thermal measurement and monitoring
- Control under normal operations of converter
- Abnormal condition testing for power electronic components
- Impact of severe and abnormal events on the reliability performances
- Basic of instabilities and related phenomena
- Instabilities during short circuit of IGBT
- Non-destructive testing technique and setups
- Future Research Opportunities in Interdisciplinary eﬀorts and opportunities ahead

Who should attend?
Engineers in design of converters with IGBTs and SiC devices with interest in reliability, beginners as well as experienced engineers are welcome.

Tutorial 8

Reliability Engineering in Power Electronics Systems
Frede Blaabjerg, Francesco Iannuzzo, Huai Wang, Aalborg University, Denmark

About the instructor
Frede Blaabjerg is currently a Professor with the Department of Energy Technology and the Director of Center of Reliable Power Electronics (CORDIE), Aalborg University, Denmark. He has intensive research work on power electronics and its applications in motor drives, wind turbines, PV systems, smart grids, and the reliability of power electronic systems. He has held more than 350 lectures at national and international conferences. From the late 80s he has led more than 100 national and international projects. Since 1997 he has published more than 300 journal papers. Among other awards he received the IEEE William E. Newell Power Electronics Award in 2004.

Focal points
- Temperature sensitive electrical parameters in Si, SiC, GaN
- Fatigue processes, fatigue detection, related tests
- Power cycling as main method to determine package related lifetime expectation
- Experimental setup, test strategies
- Test according to the German sensitive standard UV 324
- New methods for state-of-health analysis
- Efficient models for lifetime prediction
- LSF model, COSP 200 model
- Application of available models, limits, work on new models
- Special aspects with SiC devices
- Special aspects with discrete packages
- First results with GaN devices
- Improved technologies and future trends for increased lifetime expectation
- Diffusion sintering, Diffusion soldering
- Improved techniques and methods
- Improved substrates
- Gate oxide reliability in Si and SiC
- Some aspects on cosmic ray reliability
- Cosmic ray sources
- Failure pattern
- Failure mechanism
- Comparison SiC devices and Si devices

Who should attend?
Engineers in design of converters with IGBTs and SiC devices with interest in reliability, beginners as well as experienced engineers are welcome.

Tutorial 9

Magnetic Components - The Key to Future Power Electronic Circuits
William Gerard Harley, Winner Hugo Wulff, National University of Ireland, Ireland

About the instructors
William Gerard Harley received the B.E. degree in Electrical Engineering from the National University of Ireland, Cork in 1974, the M.S. degree from the Massachusetts Institute of Technology, Cambridge, MA, in 1976 and the Ph.D. degree at the National University of Ireland, Galway in 1980. He worked for Hewlett Packard and Galexie Hydas in Canada from 1977 to 1980. He has been at the National University of Ireland, Galway since 1981. He is a Fellow of the IEEE. He received the IEEE Power Electronics Society Mid-Career Technical Achievement Award in 2015 and was appointed Distiguished Lecturer of the IEEE for 2014-2015. He has authored and co-authored a book on magnetic component design for power electronics.

Winner Hugo Wulff graduated from the University of Stuttgart in Germany in 1981 as a Diplom-Ingenieur in Power Electronics. He completed a PhD degree at the National University of Ireland, Galway in 2003. He worked for various companies in the field of Power Electronics as a Development Engineer for power converters in space craft, military and high-grade industrial applications. Since 1992 he is Managing Director and head of the R&D Depart- ment of Trace Power Solutions in Ireland. Trace Power Solutions develops high-reliability power converters and power supplies for industrial applications. Dr. Wulff has co-authored a textbook on magnetic for power electronics.

Focal points
- Introduction to reliability basics
- Reliability basics, Weibull distribution, Failure rates, Bet life, Reliability block diagrams
- Concepts of HMEA, HAIL, CALT, Sin sigma design, etc.
- Mission profiles and case studies
- Reliability prediction of power electronic converters – case studies
- Six step-level reliability prediction approach for power electronic converters
- Reliability prediction for model based power electronics converter design
- CORDIE Design for Reliability and Robust (OR2) tool platform for case studies
- Condition monitoring and active thermal control for improved reliability
- Basic ideas and control freedoms
- Thermal measurement and monitoring
- Control under normal operations of converter
- Abnormal condition testing for power electronic components
- Impact of severe and abnormal events on the reliability performances
- Basic of instabilities and related phenomena
- Instabilities during short circuit of IGBT
- Non-destructive testing technique and setups
- Future Research Opportunities in Interdisciplinary eﬀorts and opportunities ahead

Who should attend?
Engineers or researchers in power electronics design and testing with interest in improving reliability performances. Beginners as well as experienced engineers are both welcome. Focus is more on the reliability engineering including testing and modelling aspects from componente to system level.

Outline of the Tutorial
- Introduction
  The introduction covers the fundamental concepts of magnetic components that serve to underpin the later sections.
- Inductor Design
  In Section 1, the design rules for inductor design are established and examples of different types of inductors are given. The single coil inductor, be it in air or with a ferramagnetic core or substrate, is the energy storage device for magnetic fields. A special example is the inductor in a flyback converter, since it has more than one coil. Examples include: forward, flyback, pushpull and LLC resonant converters; filter chokes. Examples with both distributed and discrete gaps will be presented.
- Transformer Design
  Section II deals with the general design methodology for transformers. Particular emphasis is placed on modern circuits where non-sinusoidal waveforms are encountered and power factor calculations for non-sinusoidal waveforms are covered. Optimized design for core and winding losses will be fully covered taking into account the additional losses at high frequency. Examples include: forward, pushpull and resonant converters.
- High Frequency Design
  There is an inverse relationship between the size of a transformer and its frequency of operation. However, losses increase at high frequency. There is less effect on loss and less effect on loss in the winding due to the uniform distribution of the current in the conductors. The core loss increases due to the d.c. d.c. currents circulating in the magnetic core and due to hysteresis. General rules are established for optimising the design of windings under various excitation and operating conditions. A new robust and simplified approach to high frequency losses will be presented to optimise the winding design. Losses that result from fringing of the magnetic field around an air gap will be covered. The use of d.c. wire for mitigating skin and proximity effects will be treated. The application of interlacing to reduce proximity effects will be explained.
Awards

Best Paper Award

The Best Paper Award honours the best paper of the conference.

The finalists are:

25 kW High Power Resonant Inverter Operating at 2.5 MHz with SiC SMD Phase-Leg Modules
Fabian Denk, Christoph Simon, Santiago Eizaguirre, Michael Heidinger, Rainer Kling, Wolfgang Heering, Karlsruhe Institute of Technology (KIT), D; Karsten Häfner, Porsche Engineering, D

Reducing the dv/dt of Motor Inverters by a Two Leg Resonant Switching Cell
Thomas Fuchsruenger, Hans Ertl, Technical University of Vienna, AT; Markus Vogelsberger, Bombardier Transportation, AT

Plasma-induced Diode Short-Circuit in Neutral-Point-Clamped Converters
David Hammos, Jan Fuhrmann, Robin Schrader, Sidney Gierschner, Hans-Günter Eckel, University of Rostock, D; Dietmar Krug, Siemens Industry, D

High Dynamic Stress on SiC Trench MOSFET Body Diodes and their Behaviour
Andreas März, Mark M. Bäkran, University of Bayreuth, D

Diagnostic Technique for Traction Motor Insulation Condition Monitoring by Transient Signal Assessment
Markus Vogelsberger, Bombardier Transportation Austria, AT; Clemens Zöller, Hans Ertl, Thomas M. Wolbank, Technical University of Vienna, AT; Martin Bazant, Bombardier Transportation, CH

Highly Integrated Two-Phase SiC Boost Converter with 3D Printed Fluid Coolers and 3D Printed Inductor Bobbins
Arne Hendrik Wienhausen, Alexander Sewergin, Rik W. de Doncker, RWTH Aachen, D

This award is sponsored by:

Young Engineer Award

The Young Engineer Award goes to the three best lectures from engineers not older than 35 years.

The finalists are:

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Applying the 2D-Short Circuit Detection Method to SiC MOSFETs Including an Advanced Soft Turn Off
Patrick Hofstetter, Stefan Hain, Mark-M. Bäkran, University of Bayreuth, D

Novel Thyristor-Based Pulsed Current Converter for a Medical Application – a Conceptual Introduction
Stefan Wettengel, Lars Lindemüller, Steffen Bernet, Technical University of Dresden, D; Florian Kroll, Florian-Emmanuel Brack, Helmholtz-Zentrum Dresden - Rossendorf, D; Jörg Pawelke, OncoRay - Nationales Zentrum für Strahlenforschung in der Onkologie, D

These awards are sponsored by:

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Changes for the better

Infineon

**Tuesday, 05 June 2018**  
**Electric Vehicles Charging - An Ultrafast Overview**

Electric vehicles charging infrastructure, its costs, availability and performances represent very important factors that will directly impact smoothness of mobility transition and is wider deployment. There are varieties of the electrical vehicles charging technologies, standards, requirements, different technological approaches and different charging levels (both in power and time). The keynote will cover the broad topic of electric vehicles charging and provide an overview of the past and present developments as well as future trends in this field.

**Wednesday, 06 June 2018**  
**New Passive Devices in Power Conversion - Nice to Have or a MUST?**

Power electronics play significant role in industrial applications, power generation, home appliance, transportation, etc., etc. Until today, significant research effort has been made in the field of power semiconductors and control circuitry. However, somehow minor research effort has been made in the field of passive devices. The Key Note will address the need to invest more in Passive Devices: Magnetic material for medium, high and very high frequencies, capacitors for very high current applications, system integration, passive current sensors and PCB integration.

**Thursday, 07 June 2018**  
**Modular Multilevel Submodules for Converters, from the State of the Art to Future Trends**

Modular Multi Level Converters have become a mature and proven technology. This paper describes the need for a next step which should be standardization for the submodules of an MMC converter. A submodule that will combine recent topology improvements with latest available semiconductors is described. As it is difficult to pick one of the actual global players to set one new standard, an option to solve such political challenges is also identified.
Chairperson: Alfred Rufer, EPFL, CH

Charging of Electric Vehicles
Special Session: Advanced Solutions for
Room Brüssel 1

Morning Oral Sessions

10:45 Keynote »Electric Vehicles Charging – An Ultrafast Overview«
Dråzen Dujic, Power Electronics Laboratory, EPFL, Switzerland

12:40 Lunch Break

10:30 Coffee Break

Room Brüssel 1
Special Session: Advanced Solutions for Charging of Electric Vehicles

Room Brüssel 2
Special Session: Materials for Packaging and Thermal Management

Room München 1
SIC based Power Module

Room München 2
Traction Inverters

Room Mailand
Intelligent Motion

Chairperson: Alfred Rufer, EPFL, CH

11:00 HighV Band Wireless Charging System for EV or Electric Bus
Akiko Makashima, Tohoku, J

11:25 Advanced Vehicle Charging Solutions Using SiC and GaN Power Devices
Bernd Eckardt, Fraunhofer Institute IISB, D

11:50 System Architectures for Multiple Ports, Bidirectional and Buffered Charging Unit for EV’s
Alfred Rufer, EPFL, CH

Chairperson: Peter Kanschat, Infineon Technologies, D

12:00 Development of High Temperature Gels
Makoto Ohara, Shin-Etsu Silicones Europe, D

12:15 Silicone Gels for Continuous Operation up to 200°C in Power Modules
Christian DiMarino, Dushan Boroyevich, Rolando Päsler, Jörn Hinz, Fraunhofer Institute ISIT, D; Vishay Siliconix, USA; Wolfspeed - A Cree Company, USA

12:50 High Temperature Encapsulation for Smart Power Devices
Karl-Friedrich Becker, Fraunhofer-Institute IPM, BE

Chairperson: Manfred Schlenk, Infineon Technologies, D

11:00 New SiC 1200V Power MOSFET & Compact 3.25 mm², 41mm Power Module for Industrial Applications
Jeffrey Cassady, Ty McIlhott, Brett Hail, John Palmer, Wolfram - A Cree Company, USA

11:25 A Wire-bandless 10 kV SiC MOSFET Power Module with Reduced Common-mode Noise and Electric Field
Christina DiMarino, Dushan Boroyevich, Rolando Päsler, Center for Power Electronics Systems, Virginia Tech, USA; Baozuo Mu, Shanghai Tongji University, China; Chao Zhang, University of California, Berkeley, USA; Vitaliy Kurylyk, International Rectifier, USA

11:50 Enhanced Breakdown Voltage and High Current of All-SiC Modules with 1st Generation Trench Gate SIC MOSFETs
Mutsuki Hori, Masayoshi Nakano, Fujih Electric, J; Thomas Heinzel, Fuji Electric Europe, D

Chairperson: Manfred Schrödl, Vienna University of Technology, AT

11:00 Effects of a SiC TMOSFET Tractions Inverters on the Electric Vehicle Drivetrain
Alexander Nied, Daniel, D

11:25 Highly Integrated Traction Inverter for a Modular Drive Concept
Ulf Schimmert, Jasper Schrank, Ronald Eiselt, Dominik Hilger, University of Applied Sciences Karlsruhe, D; Christian Mertens, Patrick Heumann, Volkswagen, D; Hans-Jürgen Schlichenmaier, Malte Pailek, Jens Herz, Fraunhofer Institute ISE, D; Mathias Kempe, Andrea Zattera, Infineon Technologies, D; Hiroshi Bar, Frank Steinhardt, Darieos Silicon Power, D; Thomas Elbel, Sven Bräucher, EVCAP, D; Hayan Rincón, Sergio Schikowski, Renes and Trillen, D

11:50 Automotive Traction Inverter Utilizing SiC Power Module
Masanori Nakamura, Aby Mundahl, Gunter Richter, ROHM Semiconductor, D

Chairperson: Daniel Chatroux, CEA-LITEN, F

11:00 Decentralized Control of a Twelve-Phase PMSM
Silvio Dittamo, Thomas Goosn, University of Applied Sciences Pforzheim, D

11:25 Computationally Efficient Predictive Direct Torque Control Strategy for PMSMs Without Weighting Factors
Mikael Abadir, Helmut Elsässer, Christoph Hauß, Ralph Kiener, Technical University of Munich, D; Jose Rodriguez, University Andres Bello, CL

11:50 Switching Frequency Control for a DS-PWM
Afu Khan, Malte Thiede, Walter Schwander, Technical University of Braunschweig, D

12:15 Improvements on a Sensorless Controlled Synchronous Reluctance Machine Down to Standstill
Maria Nikola, Manfred Schmidt, Technical University of Vienna, AT

12:40 Lunch Break

Chairperson: Peter Kanschat, Infineon Technologies, D

11:00 Lithium Ion Battery Chargers in LLC-Topology
Highly Integrated SiC-power Modules for Ultra-Fast Lithium Ion Battery Chargers in LLC-Topology
Thomas Bloek, Bas Ngo An, Dennis Bauer, Matthias Loh, Marc Winkel, Karlsruhe Institute of Technology, D; Dai Jinhua, Hinaot, China; Ochs, J

11:25 Highly Integrated SiC-power Modules for Ultra-Fast Lithium Ion Battery Chargers in LLC-Topology
Thomas Bloek, Bas Ngo An, Dennis Bauer, Matthias Loh, Marc Winkel, Karlsruhe Institute of Technology, D; Dai Jinhua, Hinaot, China; Ochs, J

11:50 Novel Approach of Integrated Motor-Inverter Power Module for 48V Mild Hybrid Starter and Generator (MHSS)
Jinsun Song, Sang-Wan Yoon, Min Ki Kim, Jongmook Lim, Nohnam Yeo, Hanyang University, RO; Seon Park, Hyundai OMS, Y; Yeon Seop Park, Pilkington GDI, Sang Min Kim, Taeuk Kim, Hyundai Motors, RO;
Conference Tuesday, 5 June 2018
Afternoon Oral Sessions

Room Brüssel 1
SiC Devices I

Chairperson: Andreas Lindemann, Otto-von-Guericke-University Magdeburg, D

14:00 A 3.3 kV/1800 A Ultra-High Power Density SiC Power Module
Takashi Higaki, Satoshi Hasegawa, Takeshi Morita, Kenta Kimishita, Tetsuo Ota, Fujio Takanoshita, Hitachi Power Semiconductor Device, J; Tenshi Matsuda, Hisashi Miki, Ryosuke Fujita, Aki Shimra, Hitachi, J

14:25 Mission Profile Analysis of a 1200V Silicon-Carbide Trench-MOSFET Module for Automotive Traction Inverter Applications
Ajay Poonjal Pai, Tomas Reiter, Infineon Technologies, D; Martin März, Fraunhofer Institute IISB, D

14:50 Applying the 2D-Short Circuit Detection Method to SiC MOSFETs Including an Advanced Soft Turn Off
Patrick Hofstetter, Stefan Hain, Mark-M. Bakran, University of Bayreuth, D

Room Brüssel 2
Advanced Packaging Technologies I

Chairperson: Masahide Otaki, Fujio Electric, J

14:00 Investigation of Tensile Dependency of Al-Clad Cu Bond Wires Under Power Cycling Tests
Nor Aung, Joel Luke, Technical University of Chemnitz, D; Benjamin Fakun, Markus Keplinger, Revessa, D

16:25 System Cost Reduction with Integration of Shunts in Power Modules in the Power Range Above 75 kW
Klaus Vogel, Infineon Technologies, D

Room München 1
Power Electronics Topologies

Chairperson: Francisco Javier Accurso, University of Cantabria, E

14:00 Protection Schemes in Low-Voltage DC Shipboard Systems
Seongil Kim, Drazen Dujic, EPFL, F; đa của của, Hyundai Electric & Energy Systems, ROK

14:25 Power Stage and Control Design of a 60-kV 60-kW Switching-mode Power Supply for Industrial Electrostatic Precipitators
Shengwen Fan, Yiqin Yuan, Zhenyu Shan, Pengyu Jia, Zhengxi Li, Yinghong Li, North China University of Technology, CN

14:50 Design and Characterization of a Full-SiC 80 kW Current Source Inverter for Photovoltaic Applications
Luis Gabriel Alves Rodrigues, Jérémy Martin, Anthony Bier, Stéphane Catellani, Commissariat à l’Énergie Atomique et aux Énergies Alternatives, F; Jean-Paul Ferrieux, University Grenoble Alpes, F

Room München 2
Multi-Level Converters

Chairperson: Drazen Dujic, Power Electronics Laboratory, EPFL, CH

14:00 Modular Multilevel Converters as Active Filters to Mitigate Low Frequency Current Harmonics in Converter Fed Grid Applications
Dennis Böckle, Stefan Mersche, Mathias Schmerr, Karlsruhe Institute of Technology (KIT), D

14:25 MMC-Based High Power DC-DC Converter Employing Scott Transformer
Stefan Milovanovic, Drazen Dujic, Power Electronics Laboratory, EPFL, CH

14:50 Experimental Validation of Three-Level Advanced-Active-Neutral-Point-Clamped Converter for Grid Operation
Sidney Gierschner, Felix Kayser, David Hammes, Yves Hein, Hans-Günter Eckel, University of Rostock, D; Diemtar Krug, Siemens Industry, D

Room Mailand
Energy Storage

Chairperson: Silvio Colombi, General Electric, CH

14:00 Megawatt Scale Li-Ion Batteries Mounted in Opposition to Save Power During Test
Younès Jaoui, Philippe Laflaquiere, SAFT, F

14:25 A Battery Cell Emulator for Hardware-in-the Loop Tests of Reconfigurable Lithium-Ion and Post-Lithium Batteries
Gian-Bastian Cern-Kärtner, Thomas Blank, Marc Weber, Karlsruhe Institute of Technology (KIT), D

14:50 Combined Sensor Minimal Cell-Monitoring and Active Inductive or Capacitive Cell-Balancing
Constandin Sotirakis, Philip-Duest, Ruhr-University Bochum, D

15:15 Coffee break

15:15 Foyer Entrance NCC Mitte Poster / Dialogue Session

Conference Tuesday, 5 June 2018
Afternoon Oral Sessions
Chairperson: Gourab Majumdar, Mitsubishi Electric, J

A New MOSFET Intelligent Power Module for Low Power Motor Drive Applications
Jürgen Löser, Tanja Lien, Doronov Zhong, Infineon Technologies AG, Germany

High Voltage Semiconductor Switch on the Basis of RFSPD for Bipolar Power Current Pulse Conduction
Alexey Shashkin, Alexander Zaykov, Volodya A. Martyanov, Vuschilche Mykolaivych, Vysotskiy Vyacheslav, Eltranspolitex, JSC, UK; Sergey Kanyev, Info Physics-Institute, TU; Igor Gubanov, Vladimir Ozin, Inst of Plasma-Physical Research, RUS

IGBT Switching Behaviors Under Low Current Conditions (Stefano Spera, Dusan Dujak, EPC - Epo-System Technologies, France; Eltranspolitekh, Ukraine; F. Djeum Pante, University of Lorraine, France)

Driver Integrated Fault-Test Reconfiguration after Short-On Failures of a MOSFET ANPC Inverter Phase (Richard Ottavio, Teresa Bertelshofer, Mark-M. Bakran, University of Bayreuth, D)

SIC Effect on Source Voltage Distribution in Large Electrical Machines
Robert Mueh, Mark M. Bakran, University of Bayreuth, D

In-Depth Study of Short-Circuit Robustness and Protection of SIC-IGBTs
Xue Xiang, Shen, Gao Lei, Cai Xiu, Benxian Cui, Nanjing University of Aeronautics and Astronautics, CN

Aircraft Electro-Mechanical Actuators up to 20 kW
Alain Calmels, Julien Richer, Microsemi Power Module Products, USA

New Traction Converter with Low Inductive High-Voltage Rail Supply in Bipolar DC-Grids
Bernd Laska, Jan Weigel, Siemens, D; Sven S. Buchholz, Waleri Funk, Markus Vogelsberger, Bombardier Transportation, CH

Combination Structure in xEV Active Short Circuit Survival
Igor Galakhov, Vladimir Osin, Institute of Laser-Physical Gases Power Semitech, ROK

 blistering damage of various metallic materials.

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 blistering damage of various metallic materials.
Synchronization of Multi-Axis Motion Control Over Drive System using an Output LC Filter

Modeling of Inverter Nonlinear Effects
Anton Tomus, Simeon Wischnewski, MACDON, D; Ralph Kienel, Technical University of Munich, D

Self-Commissioning of the Current Control Loop in AC Drives
Simeon Wischnewski, MACDON, D; Rajiv Kienel, Technical University of Munich, D

Sensorless Position Estimation for an Externally Excited Synchronous Machine over the Whole Speed Range
Johannes Schuster, Vukasin Kostadinov, Jörg Roth-Stieelhofer, University of Siegen, D

Synchrodrives with Slewable Voltages for an Enhanced Sensorless Control of the Induction Machine
Harth Al-Badrani, Simon Feuersänger, Mario Pacas, University of Siegen, D

Simplified Wide Speed-Range Sensorless Control Scheme for a PMSM
Van Trang Phung, Mario Pacas, University of Siegen, D

A Stacked 3-Level Common Mode Voltage Eliminated Inverter Scheme with Single-DC-link for Open-End Induction Motor Drive
Alper Kursun Yıldız, Sezai Karaman, University of Stuttgart, D

Energy Optimal Motion and Motion Flows Trajectories for an Induction Motor Drive
Günther Steinborn, Wildrow Rehmann, Technical University of Dresden, D

Controller Synthesis and Testing in a 48V System based on Physical Models
Salim Cayaç, MathWorks, GB

Modeling and Analyzing the Stability of an Induction Motor Drive System using an Output LC Filter
Pascal Cramb, Al Fares Jibril, Schneider Electric, F

Synchronization of Multi-Axis Motion Control Over Real-Time Networks
Jens Samann, Analog Devices, USA; Christian Auer, Dara O’Sullivan, Analog Devices, JR

Lean and Fast Fieldbus based Safety Functionality for Drives in Automation
Jens Oesen Krab, Adin Basic, Technical University of Cologne, D

Wind Turbine Nacelle Test Bench Using an Optimized Torque Control and an Aerodynamic Real Time Model
Sören Behrens, Johannes Adler, Bernd Döhl, University of Braunschweig, D; Holger Rothfels, Brennan Center of Mechatronics, D; Holger Schröll, DIT, D

Wind Turbine for Underground Subway Stations
László Galé-Del, Janos László Caraffi, EFFECIENCY, F; Alexandre De Bernardin, IFSTTAR, F

Assisting Passive AI Proposal for VC-350s
Christian Cholán-Antó, Marc Lluch-Minsachs, Daniel Hernandez-Pérez, Marc-Pau Grané, Daniel Montserrat-Miracle, Universitat Politècnica de Catalunya CITCEA-UPC, ES

Evaluation of DC-to-AC Converter Impedance Passivity Using Pseudo-Random Test Signals
Laquild Ohi, Fraunhofer Institute ISE, D

Saving Isolation- and Power Supply Problems for Current Monitoring in High Voltage Power Line Applications
Bernhard Strzalkowski, Analog Devices, D

Zero Vector Placement Strategies in Space Vector Modulation of inverters for UPS Applications
Lavern-Guérin, DE Consumer & Industrial, CH

Advanced Solutions in Over-Current Protection of Hvdc Circuit of Battery-Powered Electric Vehicle
Milja Koprivnik, ZTV, SI

Induction Power Transfer Systems for Rotating Applications
Nikolaos Mavridakis, Ryoichi Harakiri, Volody Petrov, Levad Petrov, Technical University of Gabrovo, BG

Combined-Inductors Losses Modelling for Size and Weight Optimization Process Avoiding Time-Consuming Co-Simulations
Leyla Arioua, Moncef Ammarou, VEDECIM, F

Enlarging the Standard Permeability Set of Powder E-Cores by Combination of Different Pulse Core-Ribbons
Phil Waker, Wolf Stöcker, Aizu Technology, Germany, D

Guidelines for Hysteresis Curve Measurements with Arbitrary Excitation: Pitfalls to Avoid and Practices to Follow
Erika Stengel, Daniel Kobus, Manfred Albers, Thomas Bub, Friedrich-Alexander-University of Erlangen, D

Comparing Inductive Components for Different Boost Converter Topologies in a PV System
Michael Scharfholzer, Christian Rechthart, SUNIMADA, D; Marco Jung, Fabian Schrapel, Fraunhofer Institute IWES, D

Linear Machine with a Magnetic-Coupled Structure Based on the Transverse Flux Technology
Jonik Uib vertical, Alexander Rehbach, Bernd Döhl, University of Bremen, D

Wide Bandwidth Current Sensor Combining a Coreless Current Transformer and TMR Sensors
Nathan Tröster, Johannes Rothfels, Maximilian Mitzner, Jörg Roth-Stieelhofer, University of Stuttgart, D

Practical Voltage Measurement for Power Electronics with High Switching Frequencies
Maximilian Mitzner, Matthias Zehnder, Nathan Tröster, Jörg Roth-Stieelhofer, University of Stuttgart, D

Fault Diagnosis in Frequency Inverter with Space Vector Recognition of Output Voltage
Rubén Monleón, Max University of Applied Sciences, D

Characterization Platform for Modular Power Converters
André Andreta, Yves Lembeye, Jean-Christophe Crébier, Université Libre of Brussels, Belgium, B

Rare Earth Fine EV and HEV Motor Drives: State of the Art
David Colmenares, Esteban Ibba, Jose Arrebola, Hipolito Berzosa, Jose Ignacio Garate, University of the Basque Country UPV/ EHU, ES

Conference Tuesday, 5 June 2018, Poster / Dialogue Session Foyer
15:15 – 17:30, Foyer Ground Floor Entrance NCC Mitte

Kopta, Umamaheswara Reddy Vemulapati, Friedhelm Bauer, Daniel Buitrago, Samuel Hartmann, Sven Matthias, Chiara Corvasce, Arnost Charalampos Papadopoulos, Boni Boksteen, Maxi Andenna, Elizabeth Katsuaki Saito, Hitachi Power Semiconductor Device, J.

Chairperson: Hauke Saile, Hitachi Power Semiconductor Device, J.

High Power IGBT Devices

10:25 Ultra Compact 2kV 12V-48V Converter Using a 4-Phase Coupled Inductor

Chairperson: Steffen Loosch, SATIE, F

10:50 Thermal Analysis of a Directly Liquid Cooled Silicon Carbide Resonant Inverter for High Voltage Generation

Ulf Möller, Klaus Hoffmann, Holger Schmidt University of the Federal Armed Forces Hamburg, D; Oliver Wieczorek, Jan Radon, Philips Medical Systems, D

10:55 Design and Development of an Integrated Power Mod- ule Used in Low Voltage DC/AC Hybrid Circuit Breaker

Korean Arakak, Michael Bartonek, Eaton Industries, AT; Klaus Sobe, Infineon Technologies, AT

11:40 New 1200 V IGBT and Diode Technology with Improved Controllability for Superior Performance in Drives Application

Christin Müller, Alexander Philippou, Christian Jäger, Max Seifert, Infineon Technologies, D; Antonio Saile, Michael Fugger, Infineon Technologies, AT

10:00 Fully Optimized Discrete Coupled Inductor DC/DC Converter as the TriMagic Converter

Anja Schlüer, New IGBTs, AT;恶性大学 scholarship holder Toshihisa Hirotsuru, Denka, R.

10:25 Adaptive Frequency Control of DC-DC Converters for Maximum Efficiency Using Artificial Neural Network

Lukas Küstel, University of Paderborn, D

10:50 Estimation of the Excitation Current of an Externally Excited Synchronous Machine Supplied by a Two-Switch Flyback Converter

Stefan Kühler, Bernhard Wagner, Technical University of Applied Sciences Rosenheim Sayegh Zouba, D

11:15 Highly Integrated Two-Phase SiC Boost Converter with 3D Printed Fluid Coolers and 3D Printed Inductor Bobbins

Arne John, Arne Krug, Siemens Industry, D; Dietmar Krug, Siemens Industry, D

11:40 High Step-Up High-Frequency Zero Voltage Switched GaN-Based Single-Stage Isolated DC-DC Converter for PV Integration and Future DC Grids

Christian Müller, Christian Philippou, Max Seifert, Infineon Technologies, AT

11:50 Asymmetric Current Control of Grid Connected 3-Phase Cascaded H-Bridge Multilevel Inverter

Takashi Ohmae, Technical University of Munich, D

10:00 Control Scheme for Wide-Bandgap Power Converters with an Observer-Based Active Damped Sine Wave Filter

Maksym Kryza, David Neises, Infineon Technologies, D; Vincenzo Pipitone, University of Noto, D

10:25 Adaptive Control Scheme for Wide-Bandgap Motor Inverters with an Observer-Based Active Damped Sine Wave Filter

Maksym Kryza, David Neises, Infineon Technologies, D; Vincenzo Pipitone, University of Noto, D

10:50 High-Side Driver Supply With Reduced Coupling Capacitance

Jens Friese, Oliver Preh, SMA Solar Technology, D; Martin Knud, SMA-Magdeburg, PT

11:15 An Isolated Voltage-Source Integrated SiC Gate Driver IC with a Slow Rate Adjusting for Gate-Resistance-Free

Yasuhiro Kawai, Takashi Hagi, Hitachi, J

11:40 Asymmetric Current Control of Grid Connected 3-Phase Cascaded H-Bridge Multilevel Inverter

Takashi Ohmae, Technical University of Munich, D

10:00 IGBT Power Stage Delay Calibration is Minimizing Current Imbalance in Large Power Modules with Isolated Multiphase Segmented Parallel Half Bridges

Seun Kim, H. Lee, KSI, Korea; Seung Jin Lee, EPCOS, D; Sven Matthias, Fraunhofer IESE, D

10:25 Performance Comparison Between Voltage Source and Current Source Gate Drive Systems

Wolfgang Frenk, Infineon Technologies, D; Jiyoung Zheng, Infineon Technologies, CH

10:50 High-Side Driver Supply With Reduced Coupling Capacitance

Jens Friese, Oliver Preh, SMA Solar Technology, D; Martin Knud, SMA-Magdeburg, PT

11:15 An Isolated Voltage-Source Integrated SiC Gate Driver IC with a Slow Rate Adjusting for Gate-Resistance-Free

Yasuhiro Kawai, Takashi Hagi, Hitachi, J

11:40 Asymmetric Current Control of Grid Connected 3-Phase Cascaded H-Bridge Multilevel Inverter

Takashi Ohmae, Technical University of Munich, D

10:00 Gate Driver

Chairperson: Mark M. Bakran, University of Bayreuth, D

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Jens Friese, Oliver Preh, SMA Solar Technology, D; Martin Knud, SMA-Magdeburg, PT

10:50 Future Wind Turbine Power Electronic Generation

Dennis Kopp, EFCO Transformations GmbH, D

11:15 Rippel Current Determination for Inductors in a DC/DC Converter Both With and Without Magnetic Bias

Takuma Akiyama, Denken, D; Takeshi Isozaki, D; Takeshi Isozaki, D

11:40 Development of Accelerated Testing of Thermal Degradation in Metalized Ceramic Substrates for SiC Power Modules

Hiroshi Nakamura, Hitachi, J; Hiroshi Nakamura, Japan Advanced Institute of Science and Technology (AIST), J; Hitachi, J

10:00 High-Side Driver Supply With Reduced Coupling Capacitance

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Hiroshi Nakamura, Hitachi, J; Hiroshi Nakamura, Japan Advanced Institute of Science and Technology (AIST), J; Hitachi, J

*An attractive supporting program

Take advantage of the available time in the lunch break to visit the exhibition or attend the impulse presentation entitled "Fit for Stage." Here, Kyloxy Pozzi, EXPLAIN Presentation Coach, will introduce the principles of presenting successfully in a new and entertaining light.
Room Brüssel 1
SiC Devices II
Chairperson: Kando Kaminski, University of Bremen, D

14:00
Beyond the Datasheet: Commercialization of 700 V - 1.7 kV SiC Devices with Exceptional Ruggedness for Automotive & Industrial Applications
Achrafi Kaddour, Anany Goenka-Hansen, Duvente Sathe, Bruce Stelken, Dennis Meyer, William Brewer, Changsun Hong, Microsemi, USA

14:25
6.5 kV Full SiC Power Module with HV100 Package
Junichi Nakashima, Akinori Nishizawa, Tetsu Negishi, Shinichi Iura
Mitsubishi Electric, J

14:50
Is an Antiparallel SiC-Schottky Diode Necessary? Calorimetric Analysis of SiC-MOSFETs Switching Behavior
Otto Kreutzer, Markus Billmann, Fraunhofer Institute IISB, D; Martin März, FAU Erlangen-Nuremberg, D

Room Brüssel 2
High Power IGBT System Applications
Chairperson: Klaus Mundhenke, SEM-Europe, D

14:00
A Test Bench for Thermal Characterization of IGBT Power Modules Over Mission Profiles
Christoph van der Broeck, Rik W. de Doncker, RWTH Aachen, D

14:25
Floating Gate Method to Protect IGBT Module from Explosion in Traction Converters
Erna Banda, Yvesh Kumar Sundararamanthy, Gerald Krapp, Alexander Noltemeyer, ABB Switzerland, CH

14:50
A Condition Monitoring System for Power Semiconductors in Wind Energy Plants
Winfried Hatke, Helger Gobre, Alexander Brenke, Nando Kaminski, Bernd Uhla, University of Bremen, D

Room München 1
Advanced Packaging Technologies II
Chairperson: Stefan Linder, Aiqiq, CH

14:00
Sintering Cu Bonding Paste: Cycle Reliability and Applications
Hidetaka Nokaka, Yoshiiro Ejiri, Chie Sugama, Yuki Kawana, Masakazu Negishi, Hitachi Chemical, J

14:25
Selective Silver Sintering of Semiconductor Dies on PCB
Fabian Dresel, Sigrid Zischler, Sebastian Lets, Andreas Schlotterer, Fraunhofer Institute IISB, D; Michael Novak, Continental, D

14:50
Feasibility of Copper-Based Ribbon Bonding as an Assembly Method for Advanced Power Modules
Stefan Behrendt, Ronald Eisele, University of Applied Sciences Kiel, D; Martin Becker, Andre Bastos Abibe, Danfoss Silicon Power, D

Room München 2
HVDC Transmission Systems
Chairperson: Philippe Luders, University of Toulouse, F

14:00
Design of a Surge Arrester Based on Lead Commutation Switch for Hybrid HVDC Breakers and MVDC Breakers
David Weiss, Mathias Duerr, Noemi Drack, Felix Kirchheil, Philippe Maucler, ABB Switzerland, CH; Arman Hassanpour, ABB, CH

14:25
Fault Discrimination in Bipolar HVDC MTS Equipped with Bus Bar Breakers
Max Görtz, Rene Sander, Simon Wiesing, Wolf Schelte, Michael Sophie, Thomas Lohbrink, Karlruhe Institute of Technology (KIT), D

14:50
An HVDC Current Flow Controller for Multi-Terminal Grids
Ulfert Hoffmann, Mark-M. Balzer, University of Bayreuth, D

Room Mailand
Software Tools and Applications
Chairperson: Bernd Strzalkowski, Analog Devices, D

14:00
5-parameter Based Simulation Modeling a Power Module Independent of Measurement Data
Jens U. Kudzewicz, Hisakazu Sakuri, Nastasha Karama, Hiroki Okada, Ken Nakamura, ROSME, J

14:25
Electro-Thermal Simulation for Predicting the Temperature of SiC Dies in the Power Module of a High Frequency Operating Power Converter
Yuki Nakamora, Hiroki Okada, Hiroki Kusakura, Hitachi Automotive, CH; Natsuko Kura, Ken Nakamura, ROSME, J

14:50
Comparison of Dynamic Performance of a Lab-Scale Modular Multilevel Converter and its Equivalent Model for Real-Time Simulations
Nikola Danelovic, Oiap-RT Europe, F; Jerome Monet, Tarek Chal Bachi, Jose Belanger, Oiap-RT, CA
Conference Wednesday, 6 June 2018, Poster / Dialogue Session Foyer

Thermal Management

Chairperson: Pavel Babuska, Delft University of Technology, NL
Application of Mic-Air Thermoeffectifiers in Power Module Peltier Coolers and Throttlers
Alanea Ghobrial, Valerio A. Marzorati, Vladimir Eklom, Michael Maliga, Anne Szmigiel, Alexander Palla, Electrowatt, CH

Packaging Technologies

Chairperson: Peter J. Grünberg, Huawei Technologies, D
Effect of Load Frame Structure and Electrical Characteristic Comparison of IPM Modules
Samuel Bertin, Xiangquan Gao, Kenjiro Chou, Thomas Yin, SiC Semiconductors, NL
Development of 146X330 Footprint HV IGBT Module Daohui Li, Xiaoping Dai, Yangang Wang, Fang Qi, Matthew Pack - Dynex Semiconductor, GB
From Feasibility to SiP in a 5 Steps Process Described on a SPC-Di Dc-Bruck Controller Powermos
Yoann Pascal, Denis Labrousse, Mickaël Petit, Stéphane Lefebvre, ENS Cachan - SATIE, F
Control and Drive Strategies

Chairperson: Hans Erti, Vienna University of Technology, A
Synchronization and Control of Modular AC- and DC-Sided Parallel Connected Three-Level NPC Inverters
Josu Iroz, Gabriel Vitores, Gabriel de la Fuente, University of Cantabria, ES
Real-Time Development Interface Embedded in a Compact Motion Controller
Joaquín Martínez, Ayda Crespo, Jaume Anguera, Universitat Politècnica de València, ES
Asymmetric Flicker Filter in High Density SMPS
Alfredo Medina-García, Matthias Jacobshagen, Marcel Sickert, Infineon Technologies, D, Gerald-Dubey, Infineon Technologies, AT
Reliability Aspects

Chairperson: A.J. Fereira, Delft University of Technology, NL
Reliability Testing of SiC JBS Diodes for Harsh Environment Operation
Thomas Balzarini, Aiden Ballis, Edgar Arelline, Wolfspeed, A Cree Company, USA; Julian Magy, Vircotech, NL; Matthias Tauer, Vircotech, D
Mechanical Properties and Reliability of Passivated Silicon Carbide Power Devices
Masahiro Takahashi, Tamotsu Watanabe, Koitsuru Tomita, Masaaki Nakagawa, Kenji Shinya;wara, Bandi Chemical Industries, J

Conference 15.15 - 17.30, Foyer Ground Floor Entrance NCt Mitte
Power Electronics in Automotive

Chairperson: Thomas Mayer, D; Siemenschaltwerke, D

Robust Automotive 400V Power Modules for Serial Vehicles
Filippo Sartiuzzi, Giuseppe Longo, Giacy Gamboni; STMicroelectronics, I

Huge Capacity Power Module Packaging Technology for Automotive Inverter Applications
Yuki Hata, Shigeki Matsumoto, Hideki Hata, Mitsubishi Electric, J

Analysis of a Multi-phase Multi-Grid-PMIM Drive System with 3G-Based Inverter for an Automotive Application
Stefan Papehofer, Fabian Stuhl, Matthias Kagelmann, Fraunhofer Institute ISE, D; Julian Berlinski, Robert Pilat, Volkswagen, D; Nicola Beunen, Federal Bittin, Siemens Dresden, D; Santa Maria, ACCESS, I

Supercapacitors-Based Engine Start-Battery Support Device with Active Control
Kasper Kristo, HigTech Technical University, LV

A Modular DC/DC Converter to Couple a Double Layer Capacitor to the Automotive High Voltage Grid for Short Time Energy Storage
Burkard Schreiner, Andreas Lindemann, Otto-von-Guericke-Universität, D

Design Optimization of a Three-Phase Bidirectional Dual Active Bridge DC/DC Converter for E-Vehicles Applications
Edmundo Facenda da Oliveira, Peter Zacharias, University of Karlsruhe, D; Felipe Brandão da Silva, Tobias Rafael Fernandes Neto, Federal University of Ceara, BR

On-Chip Current Sensor: A New Approach for On-Current and Short Circuit Detection for Automotive Main Inverter Remy Korea, Infineon Technologies, D

Evaluation of Infineon HybridPACKTM Drive with Optimized Integrated CapacitorBox DC Link for High Performance Inverter Applications
Michael A. Brubaker, Terry Hebling, SBE, USA; Michael MacKer, Energy Production and Infrastructure Center, USA; Tony Reiter, Infineon Technologies, D

Multiple Fault Pattern Based Living Object Detection with Enhanced Resolution Design for Wireless Electric Vehicle Chargers
Yan Tian, Jiaoyang Pang, Chuangyuan Liu, Guanghua Institute of Science and Technology, ROK; Siyong Juang, Korea Advanced Institute of Science and Technology, ROK

Power Modules for Electric Vehicles/SRM Converter
David Calabrese, Jon Andreu, Hugo Krosenberg, Edmídio Libia, Vinícius Marinho de Almeida, University of the Baixo Cunha Country (UPV), ES

Power Quality, Power Transmission

Chairperson: Hélène Donatien, Dassault - Partner Inge- nieurs, D

Active Damping for Power Quality Improvement in Grid-Con- nected Current-Controlled Voltage Source Converters
Lorenzo Giardini, Andrea Mainarain GE Consumer & Industrial, CH

Harmonic Current Control in DG-Connected Network Using Proportional Pulse Adaptation VSI
Ranli Dandeni, Eures Engineering, D

Dynamic Performance Evaluation of a Dual UPQC Operating Under Power Quality Disturbances
Sergio Augusto Oliveira da Silva, Leonardo Bruno Garcia Campanelli and Vinicius de Souza, Federal University of Technology Paraná, BR

Active Filtering of DC Ripple Currents Between Converter and Low-Resistive DC Load
Sebastian Frank, Arger Active, University of Applied Sciences Würzburg-Schweinfurt, D

Dynamic Control and Design of a Modular Power Flow Con- troller for HVDC Networks with Fault Clearing Capabilities
Daniel Groß, Christian Hillemer, Rene Monquardt, University of the Federal Armed Forces Munich, BR

Multi-Terminal HVDC Grid Control Using a Fictitious, Model Based Machine Set
Steffen Marx, Alexander Ernst, Johann Schwider, Bernd Dörr, University of Bremen, D

Research on Solid State Circuit Breaker Based on SiC MOSFET with Soft Switch off Method
Haihong Qin, Ying Zhang, Shishan Wang, Nanjing University of Aeronautics and Astronautics, CN

Software Tools and Applications

Chairperson: Gerald Nepias, Eaton Corporation, USA

Virtual Prototyping of Applications for Wide Bandgap Power Devices Using Physically Scalable SPICE Models in Keysign Advanced Design System
Method Bühne Yuki, D; Siemenschaltwerke, Germany, D

Predicting ZVS Behavior of Resonant Converters Using a Fast and Effective Calculation Method
Christian Köhler, Martin Böning, Thomas Darbka, Friedrich-Alexander-University of Erlangen, D

A Novel Combination of Algorithms for Accelerated Conver- gerce in Steady-State
Bernd-André Hennig, Jens Görtle, Eva Schmidt, Thomas Darbka, Friedrich-Alexander-University of Erlangen-Nuremberg, D

A Novel Detailed Analysis of the Boost Converter Utilizing Nonlinear Inductance and Capacitance Phaenix Montomoli, Erwin Reymann, Thomas Darbka, Friedrich-Alexander-University of Erlangen, D

Performance Analysis of IGBT Clamp Circuit and Thermal Loss Modelling of IGBT Based Converters for High Power Applications
Mahmud Mobin, Asra Kasthrambeer, ABB Group, UK; Kew-Mon Chew, Monash University, ABB Switzerland, CH

SIMPS Protection Against Lightning Effects
Claudio Mazzurco, STMicroelectronics, I

Power Loss Breakdown in ELCI Drives Applications Using MATLAB
Hrach Amirkhanian, Infineon Technologies, USA

Statistical Modelling Method for Active Power Components Based on Datasheet Information
André Andreta, Yves Lembeye, Jean-Christophe Crébier, Université Grenoble Alpes - G2Elab, F; Luc Loncata Ville, LAAS, F

Fast Solver to Get Steady-State Waveforms for Power Con- verter Design
Guillaume Fortus, Regis Richaud, Ahmet Mermut, Guillaume Delamare, Nicolas Vidal, Adel Ziani, Power Design Technologies, F; Thierry Meynard, University of Toulouse, F

System Complexity Reduction Approach in the Modelling of a Discrete Power Device
Gianluca Cusumano, Alessandro Casini, Giuseppe Greco, STMicroelectronics, I

Automated Medium Voltage Virtual Test Bench Using HARDware-in-the-Loop
Emmanuel Frappe, Alain Dutrey, François Mukobi, Schneider Electric, F

Chairperson: Thomas Mayer, D; Siemenschaltwerke, D
Conference Thursday, 7 June 2018
Morning Oral Sessions

08:45 Room Brüssel 1 Keynote »Modular Multilevel Submodules for Converters, from the State of the Art to Future Trends«
Markus Billmann, Fraunhofer Institute IISB, D

Chairperson: Josef Lutz, Chemnitz University of Technology, D

12:00 Lunch Break

09:30 Coffee Break

Chairperson: Uwe Scheuermann, Semikron Elektronik, D

10:00 Practical Aspects and Body Diode Robustness of a 2200V SiC Trench MOSFET
Thomas Eulier, Daniel Her, Dethard Peters, Rointhl Scherer, Infineon Technologies, D; Thomas Aichinger, Infineon Technologies, AT

10:25 High Dynamic Stress on SiC Trench MOSFET Body Diodes and their Behaviour
Andreas Mair, Mark-M. Bakran, University of Bayreuth, D

10:50 Reliability and Ruggedness of SiC Trench MOSFETs for Long-Term Applications in Humid Environment
Irene Viza, Thomas Graber, Peter Frischknecht, Roland Rapp, Infineon Technologies, D; Thomas Aichinger, Infineon Technologies, AT

11:15 Investigation on Reliability of SiC MOSFET Under Long-Term Extreme Operating Conditions
Tien Anh Nguyen, Nabil Beusschaert, David Labrousse, Gérard Chaplier, Stéphane Lefebvre, SATIE Laboratory, F; Stéphane Azzopardi, Safran, F

11:40 High Humidity, High Temperature and High Voltage Reverse Bias - A Relevant Test for Industrial Applications
Joni Jormanainen, Aleksi Vulli, Janne Inberg, ABB OY, FI; Elena Mengotti, Thiago Batista Soeiro, Jonny Ingman, ABB Switzerland, CH

Chairperson: Enrique J. Dede, University of Valencia, E

Room München 1 Power Modules & Smart Driver

10:00 Power Module Design - a Detailed Analysis Based on 7th Generation of IGBT and Diode Technology
Stefan Schmöcker, Arvanasiou Efstati, Andrea Lozza, Alexander Philippou, Christian Jäger, Johannes Lowen, Benjamin Salerno, Christian Mühl, Infineon Technologies, D

10:25 A Novel Insulation Technology for Gate Drivers
Karsten Fink, Andreas Völlner, Power Integrations, D; Matthias Kurth, Power Integrations, CH

10:50 Directly Cooled HybridPACK Power Modules with Ribbon Bonded Cooling Structures
Andre Stöcker, Infineon Technologies, D

11:15 Enhanced Module Design with DPD Technology
Roberto Bello, SEMIKRON Elektronik, D

11:40 Direct 2-Way Coupled Electro-Thermal Simulation of Temperature and Current Distribution in Power Devices
Marina Montaine, Marina Ravyts, Maurizio Dalla Vecchia, Jeroen Zwysen, Giel van den Broeck, Johan Driesen, SEMIKRON Elektronik, D; Martin Rødgaard, Jakob Mønster, Nordic Power Converters, DK

12:00 Lunch Break

Room München 2 Reverse Conducting IGBT’s

Chairperson: Meinulf Rohrme, ABB Switzerland, CH

10:00 Short-Circuit Behavior of 6.5 kV RC-IGBT
Miguel Vargas, Daniel Leoner, Hans-Gunter Schöbel, University of Rostock, D

10:25 New Transfer Mold SMD Type RPM with Integrated RC-IGBT, Bootstrapped Diode and Capacitor
Yuhai Wang, Min Huanpeng, Mitsubishi Electric Corporation, J

10:50 The Series of 7th-Generation »X Series« RC-IGBT Modules for Industrial Applications
Atsuo Yamane, Fuj Electric, J

11:15 4.5kV Rupture Resistant Press Pack IEGT
Raita Kotani, Toshiba, J; Georges Tchouangue, Toshiba, D

11:40 New Low Loss Phase Control Thyristors for Medium Current UHVDC Transmission
Sachita Puspakumara, Chinbin Liu, Marco Bottin, Kevin Tangus, Urban Mønster, Jørgen Vollaire, Laboratoire Ampère, F

12:00 A Novel AC Direct Linear LED Driver with Unity Power Factor, Low Input Current THD, Low Light Flicker and Low Profile
Jie Fu, Gang Wang, Shan Wang, Zhiquan Chen, Liang Shi, Philips Lighting, CN

Chairperson: Munaf Rahimo, ABB Switzerland, CH

Room Mailand High Frequency Converters

10:00 Optimisation of an Integrated Bidirectional Interleaved Single-Phase Factor Corrector
Julian Le Losle, Rémy Caillaud, Nicolas Degremont, Roberto Micali, Mitsubishi Electric, R&D Centre, F; Florian Moors, Cyril Biskup, Christian Yatil, Laboratoires Ampère, F

10:25 Multi MHz LED Drivers: Design for Lifetime and Reliability
Reccardo Pittini, Thomas Andersen, Tobias M. Andersen, Miroslav Mladen, Robert Mrad, Stefan Mollov, Mitsubishi Electric Deutschland, D; Johannes Zwenner, Gerd van den Broeck, Johan De Smet, KU Leuven, BE

10:50 High-Frequency and High-Density Design of all GaN Power Supply Unit
Ruiyang Yu, University of Texas at Austin, USA

11:15 Comparison Between an Interleaved Boost Converter Using Si MOSFETs Versus eGaN FETs
Simone Ranots, Maurizio Dalla Vecchia, Vincenzo Zanezzi, Jörgen Vollaire, Laboratoire Ampère, F; Sandro Fornei, Fabio Cipressi, Igor Kovacic, Siemens, IT

11:40 A Novel AC Direct Linear LED Driver with Unity Power Factor, Low Input Current THD, Low Light Flicker and Low Profile
Jin Yu, Song Wang, Shun Wang, Zhipan Chen, Liang Shi, Philips Lighting, CN

Chairperson: Enrique J. Dede, University of Valencia, E
### Room Brüssel 1

**GaN Devices**

**Chairperson:** Elison Matioli, POWERlab, EPFL, CH

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<th>Speaker</th>
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<th>Location</th>
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<tbody>
<tr>
<td>14:00</td>
<td>High Power Nanosecond Pulse Laser Driver Using an eGaN®FET</td>
<td>John Glaser, Efficient Power Conversion (EPC) Corporation</td>
<td>USA</td>
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<tr>
<td>14:50</td>
<td>6.78 MHz Multi Amplifier and Transmit Coil eGaN® FET based Class-E Wireless Power System Evaluation</td>
<td>Michael de Rooij, Yuanzhe Zhang, Efficient Power Conversion (EPC) Corporation</td>
<td>USA</td>
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### Room München 1

**System Reliability**

**Chairperson:** Robert Schreiling, Siemens, D

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<tr>
<td>14:00</td>
<td>Partial Discharge Measurement in a Motor Winding Fed by a SiC Inverter – How Critical is High dV/dt Really?</td>
<td>Marco Denk, Mark M. Bakran, University of Bayreuth</td>
<td>D</td>
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<td>14:25</td>
<td>Evaluation of Sinter-Based Joining Technologies on Lead Frame</td>
<td>Alexander Ditt, Tim Schneider, Florian Redder, Maria Braun, Ralf Strieg, Jörn Roppke, Wen-Chun Wang, Fraunhofer-Institut für Angewandte Materialforschung (IFAM), D; Kai Monopulos, Kiyohi Oi, Shinko Electric Industries, J</td>
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<td>14:50</td>
<td>On-line Health Monitoring of Wire-Bonded IGBT Power Modules using On-State Voltage at Zero-Temperature-Coefficient</td>
<td>Nikolaos Degeronis, Stefan Mudry, Münchendorf Electronic R&amp;D Centre, F</td>
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<td>15:15</td>
<td>First Results of Development of a Lifetime Model for Transfer Molded Discrete Power Devices</td>
<td>Guang Zeng, Oliver Wenzel, Josef Lohs, Technical University of Chemnitz, D; Lüger Benacht, Oliver Schilling, Infineon Technologies, D</td>
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### Room München 2

**Power Converters**

**Chairperson:** Ulrich Kirchenberger, STMicroelectronics, D

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<tr>
<td>14:00</td>
<td>25 kW High Power Resonant Inverter Operating at 2.5 MHz with SiC SMD Phase-Leg Modules</td>
<td>Fabian Denk, Christoph Simon, Santiago García, Michael Heflinger, Rainer Kling, Wolfgang Hoering, Karlsruhe Institute of Technology (KIT), D; Karsten Haefner, Parosch Engineering, D</td>
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<tr>
<td>14:25</td>
<td>A Trans-Linked 5-kW Inverter Using SiC MOSFETs to Achieve Fan-less Operation</td>
<td>Fatima Miyazaki, Hiroku Okada, Ken Nakashita, ROHM, J; Marenz Tanaya, Power Assist Technology, J</td>
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<tr>
<td>14:50</td>
<td>High power Constant Current Class E12 GaN Power Amplifier for AirFuel Magnetic Resonance Wire-Less Power Transfer Systems</td>
<td>Tiefeng Shi, Paul Wiener, GaN systems, USA</td>
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<td>15:15</td>
<td>System Efficiency and Power Density Comparison of Voltage-Source Based DC-Link and Matrix Converters for Highly Integrated Electric Motor Drives</td>
<td>Jonathan Winkler, Jan Renk, Robert Bosch, D; Ingmar Kallfass, University of Stuttgart, D</td>
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### Room Mailand

**Advanced Sensors**

**Chairperson:** Eric Favre, IMI Precision Engineering, CH

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<tr>
<td>14:00</td>
<td>Closed-Loop Hall Sensors with Near Fluxgate Performance for Residual Current Measurement in Photovoltaic Systems</td>
<td>Stephan Trabattini, CSEM International, CH</td>
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<td>14:25</td>
<td>Evaluation of Overall Accuracy of New Sensing Concepts in Comparison to State-of-the-Art Methods</td>
<td>Frank Lautner, Mark M. Bakran, University of Bayreuth</td>
<td>D</td>
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<td>14:50</td>
<td>Design and Implementation of an Integrated Current Sensor for a Gallium Nitride Half-Bridge</td>
<td>James Walter, Javier Aroz, Ingmar Kallfass, University of Stuttgart, D</td>
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<tr>
<td>15:15</td>
<td>Utilization of Parasitic Luminescence from Power Semiconductor Devices for Current Sensing</td>
<td>Jonathan Winkler, Jan Renk, Robert Bosch, D; Ingmar Kallfass, University of Stuttgart, D</td>
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Tuesday, 5 June 2018

11:00  From Niche to Mainstream – SiC Power Devices as Enabler for Revolutionary Designs, Infineon Technologies
12.00  Challenges and Opportunities facing Power Supply Manufacturers over the next 5 years, Power Systems Design
13.00  SiC and GaN, which Challenges Remain in the Road to Success?, Yole Développement
14.00  Measurements beyond Standard Tasks – 100kA Peak Current, 100MW Peak Power, etc., TU Leoben
14.30  Thermal Management of High Heat Flux Electronics with Mechanically Pumped Two-Phase Cooling, ENEA, Energy Technologies Department
15.00  Langzeitlagerung elektronischer Komponenten als Bestandteil einer vorausschauenden Obsoleszenzstrategie, HV Halbleiter-Test & Vertriebs-GmbH

Wednesday, 6 June 2018

10.00  Automotive Power Modules - Design Changes and Technology Innovations to Come?, Yole Développement
11.30  15 Years ECPE Research Network, ECPE European Center for Power Electronics
12.30  A Semi-Modular-Based and SiC-Based Smart Transformer, Christian-Albrechts-University Kiel
13.30  SIC – Devices for the Future Design, A Media, Bodo’s Power Systems
14.30  GaN – Devices for the Future Design, A Media, Bodo’s Power Systems
15.30  Electric Vehicles Charging – An Ultrafast Overview, Power Electronics Laboratory, EPFL

Thursday, 7 June 2018

10.00  New Passive Devices in Power Electronics - Nice to Have or a MUST?, Huawei Technologies
10.30  Strategies for Increasing Efficiency, Controlling EMI and Reducing Cost in Practical Power Electronics Designs, Brie Research
11.30  Einführung Students Day, ECPE European Center for Power Electronics
12.30  How will Battery Packs Requirements impact Power Electronics Market?, Yole Développement
13.00  Realizing the New Growth Wave for Semiconductors Startups and Innovation in High Voltage and Power Density, Silicon Catalyst
13.45  SiC Solutions for Industrial and Automotive Applications, ROHM Semiconductor
15.30  Verlosung Students Day, ECPE European Center for Power Electronics
At PCIM Europe 2018, more than 470 exhibitors from 28 nations showcase products and services as well as the most recent innovations in the fields of power electronics, intelligent motion, renewable energy and energy management.
Registration Information

Registration Fees

<table>
<thead>
<tr>
<th>Event Type</th>
<th>Until 2 May 2018</th>
<th>From 3 May 2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>One Conference Day</td>
<td>670 EUR</td>
<td>770 EUR</td>
</tr>
<tr>
<td>Two Conference Days</td>
<td>1,120 EUR</td>
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<tr>
<td>Three Conference Days</td>
<td>1,330 EUR</td>
<td>1,430 EUR</td>
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<tr>
<td>Tutorial Full Day</td>
<td>690 EUR</td>
<td>790 EUR</td>
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<tr>
<td>Seminar Half Day</td>
<td>345 EUR</td>
<td>395 EUR</td>
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<tr>
<td>University Staff*</td>
<td>940 EUR</td>
<td>940 EUR</td>
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<tr>
<td>Students</td>
<td>40% Discount</td>
<td>40% Discount</td>
</tr>
<tr>
<td>Exhibitor special rate**</td>
<td>250 EUR</td>
<td>250 EUR</td>
</tr>
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</table>

* University staff and students may only register for the full conference at a reduced rate and must enclose a copy of their university ID card. A student discount of 40% is available upon request. This discount cannot be combined with the University Staff Fee. Please contact Ms. Donata Pfender at Donata.Pfender@mesago.com for registration.

** A transferable ticket valid for the three keynote presentations including the conference proceedings is only available to PCIM Europe 2018 exhibitors. A special registration is required. On-site registration: additional 30 EUR per participant. Please note that cash payments are not possible. Payment by credit card only. All fees plus 19% VAT.

Travel

There are several non-stop flights to Nuremberg daily. In addition, Nuremberg’s closeness to international airports such as Frankfurt, Munich, Zurich, Amsterdam or Paris ensures optimum connections to the intercontinental flight network. Getting from the airport to the exhibition centre is fast and easy. The airport is close to the city with direct underground and taxi connections to the exhibition centre. The underground takes you in 20 minutes from the airport to the exhibition centre. At Nuremberg Airport, taxis to the exhibition centre are available around the clock. Take the taxi directly to the exhibition centre. Journey time from the airport to the exhibition centre is approximately 15 minutes and costs about 25 EUR.

You can reach Nuremberg’s main train station ‘Nürnberg Hauptbahnhof’ conveniently from every German city with the following trains: ICE, IC or EC. There are also frequent train connections from major European cities such as Paris, Brussels, Zurich, Vienna, Amsterdam or Prague. From ‘Nürnberg Hauptbahnhof’ the underground U1 or U11 (direction: ‘Langwasser Süd’) will take you directly to the exhibition centre in only 8 minutes. At the main train station in Nuremberg there are several taxis waiting for you. By taxi you reach the exhibition centre within 10 minutes.

Nuremberg is centrally located in the South of Germany. Its excellent connections to the European motorway and direct feeder roads make it easy and convenient to reach the exhibition centre by car. Destination address for your navigation system: NürnbergMesse, Karl-Schönleben-Str., Messeplatz 1, 90471 Nuremberg

For more travel and hotel information please visit pcim-europe.com