PCIM
EUROPE

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

Conference Program

7 Seminars on 6 May 2012
11 Tutorials on 7 May 2012
Conference from 8–10 May 2012

Table of Content

Welcome Address

Dear PCIM participants,

I would like to extend a warm welcome to all industrial, academic and commercial professionals from across the globe, who are engaged in the challenge to achieve highly efficient power conversion systems and sustainable environmental protection through advances in power electronics components and systems. The PCIM Europe conference together with the exhibition has evolved over the years as a major technical platform for discussing new developments within the field of power electronics in the conference seminars and demonstrating new achievements at the exhibition stands.

We have once again this year seen an increase in the number and quality of papers submitted and selected the best and most important for inclusion in the program of oral and poster presentations. Special attention has been given to research carried out by young engineers; the presentation of the Young Engineers and Best Paper Awards at the opening ceremony ranks amongst the conference highlights.

A range of new power devices based on silicon and wide band material designed to meet the future requirements of power converters in terms of ultra high efficiency and high power density design will be discussed during the poster and oral sessions. Many areas of application, such as solar power systems, e-mobility, SMART grids and multilevel converter topologies may open up new business fields as well as excellent job opportunities for both young and experienced engineers. Some major future challenges for the sector e.g. thermal management and reliability issues at both the component and system levels, managing parasitics and EMI resulting from ultrafast switching devices will be discussed in an open forum. High performance motor drives and advanced control circuits will also feature strongly at this year's meeting.

The conference will address many of these topics. The key notes speeches are always a highlight of the event and this year will address SMART energy distributed systems, solar power and power electronics in space applications. Three special sessions will be devoted to the current topical themes in the field of power electronics, such as the application of ultra fast switching devices, e- mobility and high performance motor control.

I am convinced that with its high level technical program and discussion platform this year's PCIM Europe Conference will provide you with an overview of the key technological developments in power electronics and inspire you to pursue new business opportunities.

I wish you an enjoyable and successful conference packed with new ideas for your future business.

Leo Lorenz,
General Conference Director, Germany

Seminars Sunday, 6 May 2012, 14:00–17:30

Venue: Arvena Park Hotel Nuremberg,
Görlitzer Str. 51, 90473 Nürnberg

Seminar 1

Batteries for Beginners

Richard Redl, Redl Consulting, Switzerland

About the instructor
Dr. Redl is a consultant in Switzerland, specializing in power supplies and other power-conversion equipment, electronic ballasts, and integrated circuits for power management. He holds 22 patents, has written more than a hundred technical papers and book chapters, and co-authored a book on the dynamic analysis of power converters. Dr. Redl is a Fellow of the IEEE.

Contents

Batteries are used in a wide variety of commercial, industrial, transportation, utility and military applications. They are seemingly simple devices, but their behavior, care and feeding are quite complex. This seminar presents a comprehensive introduction to batteries, covering technologies, applications, characteristics, charging techniques and charger circuits, battery alternatives, and also battery monitoring and management solutions.
The seminar begins with a discussion of general battery terminology and the electrochemical principles of operation. This is followed by an overview of non-rechargeable and rechargeable battery technologies. Special emphasis is given to the three most-important rechargeable battery types (lead-acid, nickel-based and Li-ion) and their charging and charge-terminating methods. Advanced Li-ion battery technologies and battery alternatives (supercapacitors, fuel cells, thermoelectric generators) are also covered.
Battery charger architectures are presented next, including the standard CC/CV charger, dissipation limiting techniques for linear chargers, dynamic voltage compensation for reduced charge time, and wireless and high-power battery chargers.
The seminar concludes with a discussion of battery and battery pack protection, monitoring and managing solutions. Methods of determining the state of charge and battery health are reviewed, together with techniques for protecting and monitoring single-cell and multi-cell Li-ion battery packs and balancing cells in multi-cell packs.

Who should attend?
This is an entry-level seminar for power-electronics engineers, power-management IC designers, system designers, managers, engineering students and all other professionals interested in the characteristics and application aspects of batteries.

Seminar 2

Basics of Electromagnetic Compatibility (EMC) of Power Systems

Jacques Laeuffer, Dtalents, F

About the instructor
Jacques Laeuffer has a 30 years experience in the field of Power Electronics, including high frequency resonant converters, automotive drive systems for hybrid vehicles, high power drives, from 10 W up to 10 MW. He has written 75 technical papers, and is inventor of 27 patents. »Habilité à Diriger des Recherches« (H.D.R.) by University of Paris 6, he received also the »Grand Prix de l'Innovation 2004« from PSA Peugeot Citroen. Teacher at Supelec, Ensta, Aemc, Eurosae, he is also a Consultant for design of switch mode power supplies and variable speed drives, EMC and control.

Contents

Seminar benefits include:
– Avoid noisy oscillations in power systems
– Calculate and optimize high frequency impedances and wiring
– Calculate and optimize Differential Mode (DM) and Common Mode (CM) filters
– Comply with Standards
– Avoid expensive shielding and improve reliability

Main Seminar topics include:
→ Introduction
  – Issues take source in power transistors and diodes sudden commutations.
  – Differential Mode interferences occurs when perturbation flows through active circuits
  – Common Mode occurs when perturbation flows through parasitic capacitors, cases, grounds, etc.
→ Differential Mode management and filtering
  – Switching supply operating sequence.
  – Input filtering capacitor resistance. Disturbance calculation.
  – Disturbance measurement according standards.
  – Line diodes recovery. Line inductance effect.
  – DM filter components calculation.
→ Common Mode management and filtering
  – Parasitic capacitance trough heat sinks. Disturbance calculation.
  – Disturbance measurement according standards.
  – Parasitic capacitance trough transformers; screens, electric machines windings.
  – CM filter components calculation.
→ Power Semiconductors EMC Control
  – Smoothing di/dt and dv/dt front edges by gate drives. Control for MOS and IGBTs.

Who should attend?
This course is targeted towards engineers and project managers, who design, specify, integrate converters, inverters, and components, for power electronics and/or drive systems, optimized for E.M.C., global cost and reliability.

Seminar 3

PCB Layout for Low EMI

Bruce Carsten, Bruce Carsten Associates, USA

About the Instructor
Bruce Carsten has 41 years of design and development experience in switchmode power converters at frequencies from 20 kHz to 1 MHz. In 1982 he designed a 48 Vdc, 200 A, 50 kHz natural convection cooled switchmode telecom rectifier which met the FCC Class A requirements for conducted and radiated emissions. His seminars target the practicing design engineer, and emphasize an intuitive understanding of phenomena involved.

Contents

Although related to previous comprehensive EMI seminars by the instructor, the focus of this new seminar is on the physical design and layout of a PCB to minimize Electromagnetic Interference (EMI). A great deal of switchmode EMI can be produced or avoided in the layout and construction of a Printed Circuit Board (PCB), and EMI from a poor layout is usually very difficult to fix without a redesign. This half day seminar contains extracts from the full day seminar presented last year, focusing on the magnetic and electric shielding benefits of ground planes, and the use of »switching cell macros« to assist in a low EMI layout. New material for this seminar illustrates the significant magnetic field reduction above and behind a PCB with a ground plane.
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 seminar 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 ›one day‹ seminar notes will be provided, but some subjects will be gone over lightly or even skipped due to the limited time.
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 fields | Why EMI is so hard to prevent; a »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 H-field and E-field probes

Who should attend?
This seminar 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 seminar will also be of some value to layout software users without an engineering background.

Seminar 4

Frequency Response Measurements on Switching Power Supplies and Components

Ray Ridley, Ridley Engineering Europe, France

About the Instructor
Dr. Ridley is the president of Ridley Engineering Inc. in the US, and Ridley Engineering Europe. He provides valuable assistance to companies worldwide in the form of consulting, test equipment, design software, and unique hands-on power supply design courses.
Dr. Ridley has been designing switching power supplies for over 30 years. He is the author of the definitive analysis and modelling for current-mode control. Working at power levels from less than 1 W to over 50 kW, he has helped numerous companies improve their power systems. Coupled with 8 years of university research, this work has placed him in a unique position to understand and effectively communicate the major issues that face today's designer. He has taught thousands of design engineers over the years, and published papers, books, articles and magazines in the field of power supply design

Contents

This seminar will present the use of frequency response analysis for power systems design. Switching power supplies are unique in the wideband noise environment that they both generate and have to operate reliably in. Proper frequency response measurements are essential to characterize both the passive components and the power circuits.
Capacitors used in power supply design should be properly characterized for their value, ESR, and resonant frequency before they are used in a power circuit. The data provided by the manufacturer is often unreliable. These numbers are essential for proper power circuit design. Measurements can be made using available lab equipment if the proper test circuit setup is used.
Since most magnetics are custom designed and manufactured, it is essential to measure as many of the equivalent circuit-model components as possible. This is done with classic open-circuit and short-circuit impedance measurements that have been performed on such components for over 100 years. For modern power magnetics, further attention must be paid to advanced topics such as proximity winding loss which can greatly affect magnetics performance. It is shown how component measurements can improve your designs and manufacturing reliability. As with capacitors, standard lab equipment can be used to make these measurements.
The power circuits must also be properly characterized for frequency response to ensure a rugged control design. Measurements of control transfer functions are crucial for system stability. It is demonstrated how to measure loop gains, power stage gains, and compensation gains on operating power circuits. This is done in a very high-noise environment, and proper lab techniques are essential to obtaining good results.
It is also a requirement in many industries to measure input and output impedance transfer functions, plus noise transmission. Specialized injection techniques are demonstrated to facility the safe perturbation and measurement of high power circuits.

Who should attend?
Anyone designing switching power supplies at power levels from less than 1 W to 100 kW will benefit greatly from the material presented in this seminar. It is recommended for all levels of designers.

Seminars Sunday, 6 May 2012, 14:00–17:30

Venue: Arvena Park Hotel Nuremberg,
Görlitzer Str. 51, 90473 Nürnberg

Seminar 5

The Easy and Straight Way to Successful Presentation of Technical Content

Mike Meinhardt, SMA Solar Technology, Germany

About the instructor
Dr. Mike Meinhardt is head of the Knowledge Management Department at SMA Solar Technology AG, Germany and has 20 years of experience in photovoltaic and off-grid inverters in industrial R&D as well as research institutes and universities. He has about 20 years experience in writing and reviewing papers and giving lectures at various occasions (incl. most prestigious power electronic conferences).

Contents

Most Engineers love researching but hate documentation. Writing papers and giving presentation is very often regarded as a necessary evil. However what is the sense of generation all these marvelous results if nobody else gets to know them or remembers them.
This seminar teaches a structural approach towards an effective presentation of technical content – either paper or lecture. Tips and tricks are given how to present scientific results in a way that people will understand the quintessence and therefore remember your presentation.

- Defining the quintessence by structuring technical content and satisfying all stakeholders
- Structural approach towards an effective technical presentation (Oral or paper)
- General rules for a successful oral presentation (inkl. dealing with questions after the presentation, the chairman your friend and helper)
- Different Conferences – different requirements

Who should attend?
Engineers or researchers writing papers and giving oral presentations at conferences. In particular Ph.D. students and engineers at the beginning of their carrer.

Seminar 6

Wireless Power Technologies

Dan Jitaru, Delta Energy Systems, USA

About the instructor
Ionel Dan Jitaru is the founder of Rompower Inc. an internationally recognized engineering firm in the field of power conversion, later Ascom Rompower Inc. and today Delta Energy Systems (Arizona) Inc. Presently he is the president of Delta Energy Systems (Arizona) Inc. He has published 48 papers and held 38 professional seminars professional at different International Conferences in the power conversion field, wherein several of them have received the best paper award.
Mr. Jitaru has pioneered several trends in power conversion technologies such as »Soft Switching«, »Full integrated multilayer PCB packaging concept«, »Synchronized rectification« and »Intelligent power processing«.
There are 25 granted patents and 18 pending patents that have covered some of these technologies.

Contents

The seminar will present a comprehensive overview of the wireless power technologies in the last several years and its direction in the near future. There will be presented the evolution of wireless power technology in close correlation with the market trend for portability. In the last several years there was a significant interest in wireless power generated by the need of convenience for portable equipment users. The seminar will present some of the technology behind the lower power levels up to 5W in the area of mobile phone and 15W to 120W for tablets and laptops to very high power (120KW) for automotive applications. The trend in automotive such as hybrid and electrical vehicles has generated a lot of interest for high power wireless charges and even for hands free wireless chargers.
The seminar will focus mostly on the technological challenges of wireless power ranging from the magnetic, topology, communication and control. One of the biggest challenges in wireless power is magnetic structure, wherein the coupling is limited and the windings are placed in the vicinity of the gap, with all the negative consequences associated with the fringe magnetic field. New magnetic structures aimed in addressing these problems will be presented. In the topology section there will be presented chronologically the solutions which were used in the past starting from early nineties, when the inductive charges were developed by GM for the EV1 electric car to the present day. The control and communication section of wireless power will be also presented in the light of the most recent developments in intelligent power processing.
The presentation will be highlighted with examples which will cover a very wide range of power from less than one watt to more than 120KW wireless charges.

Seminar 7

Control of MicroGrids

Josep Maria Guerrero Zapata, Aalborg University, DK

About the instructor:
Josep M. Guerrero (S'01-M'04-SM'08) was born in Barcelona, Spain, in 1973. He received the B.S. degree in telecommunications engineering, the M.S. degree in electronics engineering, and the Ph.D. degree in power electronics from the Technical University of Catalonia, Barcelona, Spain, in 1997, 2000 and 2003, respectively. He was an Associate Professor with the Department of Automatic Control Systems and Computer Engineering, Technical University of Catalonia, Barcelona, where he currently teaches courses on digital signal processing, FPGAs, microprocessors, and renewable energy. Since 2004, he has been responsible for the Renewable Energy Laboratory, Escola Industrial de Barcelona. He has been a visiting Professor at Zhejiang University, China, and University of Cergy-Pontoise, France.
From 2011 he is a Full Professor at the Department of Energy Technology, Aalborg Universiy, Denmark, where he is the responsible of the Microgrids research program. His research interests is oriented to different Microgrids aspects, including power electronics, distributed energy storage systems, hierarchical and cooperative control and energy management systems and optimization of microgrids and islanded minigrids.

Contents

A Microgrid can be defined as a part of the grid with elements like distributed energy sources, power electronics converters, energy storage devices and controllable local loads that can operate autonomously islanded but also interacting with the main power network, in a controlled, coordinated way. In this tutorial, the distributed control of these elements will be presented. Cooperative control and hierarchical control schemes will be introduced to coordinate the power electronics converters of the Microgrid in order to control the power flow and to enhance the power quality. The tutorial will be focused on analysis, modelling, and control design of power electronics based Microgrids. Power electronics control and communications will be emphasized. Further, the interconnection of Microgrid clusters will be shown as an approach towards the Smartgrid.

Who should attend?
The expected audience is mainly PhD students, Professors, or Industry engineers from Power Systems, Power Electronics, or Control area.

Tutorials Monday, 7 May 2012, 9:00–17:30

Venue: Arvena Park Hotel Nuremberg,
Görlitzer Str. 51, 90473 Nürnberg

Tutorial 1

Trends in Soft Switching Topologies

Dan Jitaru, Delta Energy Systems, USA

About the instructor
Ionel Dan Jitaru is the founder of Rompower Inc. an internationally recognized engineering firm in the field of power conversion, later Ascom Rompower Inc. and today Delta Energy Systems (Arizona) Inc. Presently he is the president of Delta Energy Systems (Arizona) Inc. He has published 48 papers and held 38 professional seminars professional at different International Conferences in the power conversion field, wherein several of them have received the best paper award.
Mr. Jitaru has pioneered several trends in power conversion technologies such as »Soft Switching«, »Full integrated multilayer PCB packaging concept«, »Synchronized rectification« and »Intelligent power processing«.
There are 25 granted patents and 18 pending patents that have covered some of these technologies.

Contents

The new developments in the semiconductor technology such as SiC and GaN have created the need for a reevaluation of the most suitable topologies in power conversion. Soft switching topologies have become popular in many power conversion applications in the last twenty years. Some of the soft switching topologies have added complexity and their practical use become more questionable with the availability of more ideal components.
The seminar concentrates on the soft switching topologies which are addressing the soft commutation both in the primary and the secondary side without adding complexity.
Well known topologies are presented in the light of the latest improvements, as well as new topologies which were recently derived.
A section is dedicated to magnetic and packaging, which as a contributor of parasitic elements plays an important role in soft switching at higher frequency.
The progress in semiconductors, magnetic and packaging will increase the operation frequency, and soft switching topologies will become a necessity for higher efficiency.
There will be presented also Intelligent Power Processing techniques, wherein the use of digital control allows us to obtain soft switching over the entire operating conditions.
The presentation will be highlighted with design guidance, design example and experimental results.

Tutorial 2

Advanced Design with MOSFET and IGBT Power Modules

Tobias Reimann, ISLE Steuerungstechnik und Leistungselektronik GmbH, Germany
Thomas Basler, Chemnitz University of Technology, Germany

About the instructors
Tobias Reimann received 1994 his PhD from the Ilmenau University of Technology in the field of power semiconductor applications for hard and soft switching converters. In 1994 he was one of the founders of the ISLE company which is engaged in system development for power electronics and electrical drives. Since July 2009 he is Professor for Industrial Electronics at Ilmenau University of Technology.

Thomas Basler received his Diploma in Electrical Engineering from Chemnitz University of Technology. His Diploma thesis was on improvement of reverse recovery behaviour and surge current capability of power diodes. He is member of the scientific staff at the Chair for Power Electronics and Electromagnetic Compatibility at Chemnitz University of Technology. His PhD Thesis is on short circuit ruggedness of IGBTs supervised by Prof. Josef Lutz.

Contents

- → Power Devices/Modules/Reliability
  - – New Developments in MOSFETs, IGBTs, Freewheeling Diodes
  - – Module Layouts
  - – Thermal Mismatch, Thermal Stress
  - – Power Cycling Capability
  - – Design for Reliability
- → Drive and Protection
  - – Principles, Technical Realisations
  - – Failure Modes, Failure Detection
  - – Current, Voltage, Temperature Protection
- → Topology-dependent Power Losses
  - – DC/DC-Converters
  - – DC/AC-Converters
  - – Load Cycles
  - – Calculation of Heat Sink
- → Device Induced Electromagnetic Disturbance
  - – Parasitics
  - – Oscillations in Power Modules
- → Special Aspects of Application
  Consideration of Special Problems of Participants, for example:
  - – Paralleling and Series Connection, Special Effects in ZVS/ZCS Topologies
  - – Special Problems Related to New Device Technologies
  - – Short-Circuit Ruggedness of IGBTs

Who should attend?
Engineers designing converters with IGBT- and MOSFET power modules having basic knowledge in power devices and power converters

Tutorial 3

Advanced Control Techniques for DC-DC Converters

Richard Redl, Redl Consulting, Switzerland

About the instructor
Dr. Redl is a consultant in Switzerland, specializing in power supplies and other power-conversion equipment, electronic ballasts, and integrated circuits for power management. He holds 22 patents, has written more than a hundred technical papers and book chapters, and co-authored a book on the dynamic analysis of power converters. Dr. Redl is a Fellow of the IEEE.

Contents

This tutorial presents advanced control concepts for dc-dc converters. The first topic is a review of PWM control techniques, including both single-loop and two-loop (current-mode) control. Control for fast dynamic regulation (wide-band feedback loop, ripple regulators, feedforward control, voltage positioning), and for high efficiency (PFM, valley-mode control, adaptive bus voltage and adaptive frequency positioning) are discussed next. The seminar concludes with an overview of controlling dc-dc converters for enhanced stability and robustness against parameter tolerances or external influences.

The following topics will be covered:

- → PWM control techniques: Single-loop control | Constant-frequency (trailing-edge, leading-edge, dual-edge, both latched and unlatched; »enhanced« PWM) | Variable-frequency (constant-on-time, constant-off-time) | Two-loop (current-mode) control (constant-frequency and variable-frequency versions; low-gain and high-gain current loops; emulated current-mode control)
- → Control for fast dynamic regulation: Considerations for using wide-band loop gain | Ripple-based control (hysteretic regulator, constant-frequency and constant off-time peak-voltage control, constant-frequency and constant on-time valley-voltage control; enhancements for improved dc regulation and reduced control delay) | Feedforward control (small-signal input voltage and load-current feedforward, feedforward of large perturbations, feedforward pulse-width modulators) | Voltage positioning (concept, types, »optimal« voltage positioning and its various implementations)
- → Control for high efficiency: High efficiency at light load | Losses in the dc-dc converter | Pulse frequency modulation (PFM), pulse skipping, burst-mode control | Adaptive multi-mode PWM/PFM control | Phase-shedding in multiphase converters | Quasi-resonant (valley-mode switching) control of converters operating in DCM | Adaptive bus voltage and frequency positioning in two-stage converter systems
- → Control for enhanced stability and robustness: Techniques for reducing the effect of the additional output capacitor or the value of the filter inductor on the stability of the control loop | Techniques for reducing the effect of large variations in the input voltage or load current on the converter behavior

Who should attend
The target audience of this tutorial is power-supply design engineers, power-management IC designers, system designers, project managers, engineering students, and all other professionals interested in advanced control of dc-dc converters.

Tutorial 4

Electromagnetic Design of High Frequency Converters and Drives

Jacques Laeuffer, Dtalents, France

About the instructor
Jacques Laeuffer has a 30 years experience in the field of Power Electronics, including high frequency resonant converters, automotive drive systems for hybrid vehicles, high power drives, from 10 W up to 10 MW. He has written 75 technical papers, and is inventor of 27 patents. »Habilité à Diriger des Recherches« (H.D.R.) by University of Paris 6, he received also the »Grand Prix de l'Innovation 2004« from PSA Peugeot Citroen. Teacher at Supelec, Ensta, Aemc, Eurosae, he is also a Consultant for design of switch mode power supplies and variable speed drives, EMC and control.

Contents

Tutorial benefits include:

- – Design HF windings, lines, layouts to avoid noisy resonances, over voltages, extra losses
- – Discover some examples of correct and non correct designs with practical calculation
- – Choose and design E.M.C. optimized power converters (from 100 W up to 10 MW)
- – Design E.M.C. drive systems made of inverters, cables and electric machines together
- – Avoid expensive shielding and improve reliability

Main Tutorial topics include:

- → Introduction: Examples of issues | Electromagnetic fields actions: expected and non expected | Differential mode (DM) and common mode (CM) from transistors and rectifiers | Tests according standards and filters design | HF oscillations inside converters; snubbers for EMC
- → Lines Design: Propagation on lines. Poynting theorem | Electric and magnetic energy storage | Electromagnetic power flow | Waves impedance and speed | Design of bifilar, coaxial, and strip lines | Practical examples
- → Winded Components Design: Energy flow trough H.F. transformers, inductances | Equivalent schematics and simulation | Planar and multi-layer transformers | Design for low EMI and low HF losses
- → Converters Design: Global propagation in converters | Semiconductors connection, SiC devices | Topology choice according to requirements, electromagnetic and other constraints | Design of flyback, forward, bridge, ZVS and ZCS converters | Matching components and layout impedances
- → Drives Design: Energy flow trough electric machines windings | HF system made of inverter, cable and electric machine, as DM and CM | Boundary conditions for EMC between inverters and motors windings
- → Radiations Reduction: Neighbor field and far field identification | Magnetic field measurement and reduction | RF emissions from windings | Electric field interference reduction

Who should attend?
This course is targeted towards engineers and project managers, who design, specify, integrate converters, inverters, and components, for power electronics and/or drive systems, optimized for E.M.C., global cost and reliability.

Tutorials Monday, 7 May 2012, 9:00–17:30

Venue: Arvena Park Hotel Nuremberg,
Görlitzer Str. 51, 90473 Nürnberg

Tutorial 5

FPGA based Control of 2-level and 3-level Inverters

Jens Onno Krah, Cologne University of Applied Sciences, Germany

About the Instructor
Prof. Dr.-Ing. Jens Onno Krah studied electrical engineering at the University Wuppertal and obtained his PhD 1993 by Prof. Holtz within electrical drives research. Until February 2004 he worked as technical director for Kollmorgen, formerly Seidel Servo Drives in Düsseldorf. He was responsible for the development of the Kollmorgen Servo Drives. Since March 2004 Prof. Krah teaches control engineering at the Cologne University of Applied Sciences.

Contents
Advanced FPGA based control architectures are covered by discussing algorithms and new electronic components. The digital logic to implement an FPGA based full featured PWM generator for a 3-level inverter that determines all required switching sequences and the necessary blocking times can be fitted together with the fault detection and reaction and a supervising soft core CPU into one low cost device. Due to the straight forward VHDL respectively state machine programming such a solution is extremely fast and allows a cost efficient single chip implementation even for very high switching frequencies. Including memory stick with VHDL Files.

1. Introduction into Digital Logic
2. Digital to Analog Conversion:
   R-2R resistor ladder | PWM (VHDL example) | Sigma Delta (VHDL example) | Bandwidth versus resolution
3. Analog to Digital Conversion:
   Successive approximation ADC | Sigma Delta modulator | Sinc-filter (VHDL example) | Sampling versus Sigma Delta
4. Inverter Design – Basic Topologies:
   2-level VHDL example: blanking time | 3-level VHDL example: state machine (NPC & NPC2)
5. Gate Driver Topologies:
   Gate signal generation | Short circuit and under-voltage protection
6. Current Measurement:
   Shunts versus hall effect transducers | EMI suppression | Over-current detection
7. Regeneration – Over-Voltage Protection:
   Voltage measurement | Resistive regeneration | Line regeneration | I^2T estimation (VHDL example)
8. Space Vector Modulation:
   2-level (VHDL example) | suppressing the 3rd harmonic | 3-level – neutral potential control
9. Current Control:
   Field Oriented Control (FOC) | Processor based digital control | FPGA based digital control (VHDL versus model based)
10. System Integration:
    Real Time Ethernet | Digital Encoder Interface | Motion Control

Who should attend?
R&D engineers and professionals working in the area of IGBT and MOSFET-based inverter design who wish to learn about power electronic specific usage of programmable logic. Basic knowledge in the area of power electronics is helpful.

Tutorial 6

Switching Power Supply Analysis

Ray Ridley, Ridley Engineering Europe, France

About the Instructor
Dr. Ridley is the president of Ridley Engineering Inc. in the US, and Ridley Engineering Europe. He provides valuable assistance to companies worldwide in the form of consulting, test equipment, design software, and unique hands-on power supply design courses.
Dr. Ridley has been designing switching power supplies for over 30 years. He is the author of the definitive analysis and modelling for current-mode control. Working at power levels from less than 1 W to over 50 kW, he has helped numerous companies improve their power systems. Coupled with 8 years of university research, this work has placed him in a unique position to understand and effectively communicate the major issues that face today's designer. He has taught thousands of design engineers over the years, and published papers, books, articles and magazines in the field of power supply design

Contents
This tutorial will present the analysis and control-loop design of switching power supplies. Starting with the PWM switch model, the converter characteristics will be derived for all of the popular topologies. Power stage characteristics will be discussed in detail for voltage-mode control. The derivation of RHP zeros in many converters will be explained in a comprehensive way.
Following this, Dr. Ridley will present an in-depth look at current-mode control, the most popular control scheme used for power supplies today. His powerful yet straightforward analytical techniques yield an accurate yet simple model for current mode, helping you properly implement this important control technique.
Loop compensation design will also be presented, together with feedback networks, and proper choice of compensation components.
Finally, the design of proper input and output filters will complete the presentation, and their impact on converter stability will be shown.
All attendees at this seminar will receive a personalized license for the full version of POWER 4-5-6 Release 8 (retails at 1000 Euros) and a free copy of a power supply book. Offered exclusively at this conference, this software will greatly enhance your understanding of converter operation, and speed up the design process.

Who should attend?
Anyone designing switching power supplies at power levels from less than 1 W to 100 kW will benefit greatly from the material presented in this seminar. It is recommended for all levels of designers. Advanced designers will find insight to problems that they have seen in past designs, and new designers will receive clear guidance on how to proceed with their first power supply. The included POWER 4-5-6 software is a powerful simulation, design, and modelling tool that will speed up the design process for all users.

Tutorial 7

Battery charging – Battery restriction, Needs for charging power, Power electronic solutions

Dirk Uwe Sauer, RWTH Aachen, D

About the instructor
Dirk Uwe Sauer received a diploma degree in physics from University of Darmstadt and a PhD in electrochemistry from University of Ulm. From 1992 until 2003 he worked at the Fraunhofer Institute for Solar Energy Systems (ISE) in Freiburg, as scientist, project coordinator and finally head of the groups »Storage Systems« and »Off-grid Power Supply Systems«. In 2003 he was appointed as a Juniorprofessor for »Electrochemical Energy Conversion and Storage Systems« at RWTH Aachen University (2003) in the Faculty for Electrical Engineering and Information Technology and in 2009 he became Full Professor on the same subject also at RWTH Aachen University.
The research focus is on storage systems in hybrid and full electric vehicles, energy storage in grids with a high penetration of renewable energies including economic analysis, ageing and lifetime prediction of batteries, modelling and diagnostics for batteries, as well as on hardware and methodology for impedance spectroscopy on batteries and fuel cells. The main technologies in focus are lithium-ion batteries, lead-acid batteries, supercaps, redox-flow batteries; concepts and consequences of a CO_2-free energy supply.

Contents
Full electric driving becomes a most important solution for future clean and sustainable mobility. One of the key success factors is a sufficient charging infrastructure and charging ability of the vehicle batteries. Therefore this tutorial will focus on both, the battery and its recharging ability and the chargers and their requirements towards the grid and their market options.
Vehicle users generally would like to get their battery recharged in very short times. But it is necessary to mention that real fast charging would require a full charging in less than 30 minutes. With regard to the battery this requires a higher power ability of the battery during charging than during discharging. Therefore, batteries which can accept fast charging must be designed accordingly with regard to the battery cell and the battery pack design. The tutorial will discuss appropriate cell designs and battery pack design rules to cope with the fast charging. Most important are thermal issues, because high charging power may overheat the battery and may therefore bear safety risks and lifetime reductions.
After a general introduction to lithium-ion battery technology with a focus on all aspects relevant with regard to charging strategies (electrode design, safety issues related to materials and cell design, thermal conductivities and capacity, suitability of different cell designs for fast charging, safety features on cell pack level). Finally the impact of fast charging ability on battery costs will be discussed.
But beside the general wish of users for fast charging it is necessary to be aware of the resulting costs for fast charging stations. Beside the power electronics the costs for the grid infrastructure must be taken into account. It is necessary to analyze under which circumstance in normal use profiles fast charging is really required. This is the basis for the analysis of business models for the operation of fast charging stations, because at the end of the day the total costs for fast charging infrastructure must be refinanced by the users.
Finally the most relevant topologies for charging stations at different power levels will be discussed. This includes a comparison of advantages and disadvantages of the different topologies with regard to costs, robustness and efficiency. Besides fast charging also the alternative of standard charging with a standard 3.7 kW AC single phase charger will be discussed for comparison throughout all aspects under discussion in the tutorial.
The aim of the tutorial is to make the attendees aware of the complex overall system aspects of vehicle battery charging including the interaction among battery design and charging power, the user needs and the power grid restrictions to some solutions.

Who should attend?
The target audience of this tutorial is battery pack design engineers, engineers and project managers working on electro mobility concepts or power supply grid structures, engineers working on charging hardware, and engineering students, and all other professionals interested in advanced of electro mobility.

Tutorials Monday, 7 May 2012, 9:00–17:30

Venue: Arvena Park Hotel Nuremberg,
Görlitzer Str. 51, 90473 Nürnberg

Tutorial 8

Power Electronics for Renewable Energy Systems

Mike Meinhardt, SMA Solar Technology, Germany
Siegfried Heier, Peter Zacharias, University of Kassel, Germany

About the instructors
Dr. Mike Meinhardt is head of the Knowledge Management Department at SMA Solar Technology AG, Germany and has 20 years of experience in photovoltaic and off-grid inverters in industrial R&D as well as research institutes and universities. He is tutor and organiser of various professional tutorials on power electronics for renewable energies.

Prof. Siegfried Heier is head of the Wind Power Engineering Department at the University of Kassel, Germany and has been working in the field of wind energy for 30 years. He's author of the standard work »Grid Integration of Wind Energy Conversion Systems« (John Wiley) and of about further 100 articles on generator systems, control and grid integration of wind energy converters etc.

Prof. Peter Zacharias is head of the »Centre of Competence for Distributed Electric Power Technology« at the University of Kassel, Germany. He has more than 25 years of experience in power electronics in industry, research and education. His work experience covers a wide range of power electronic applications like lasers, renewable energy systems as well as power semiconductors and magnetic components.

Contents

Low-carbon generation has an important part to play in sustainable energy supply in the 21st century. A key component of this is the integration of renewable energy resources into the power supply network – particularly at the low-voltage distribution level.
Power electronics is the key of future developments of the electrical power supply. All distributed generators (like photovoltaic, wind turbines, micro turbines and fuel cells) as well as storage devices are connected to the grid through power electronics. Power electronic offers also a lot of opportunities of controlling grid parameters like power balancing, frequency control and voltage regulation.
This tutorial will give an overview of state-of-the-art of photovoltaic inverters including topologies and control in research and industry. Power electronics and control for wind energy systems will also be taught. Aspects of grid connection of PV-plants and Wind parks will also be discussed.

Who should attend?
This tutorial is interesting to beginners and advanced participants from university and industry as it includes a perfect mixture of different aspects of power electronics for renewable energy systems. The tutorial comprises theoretical parts on power electronic topologies and control structures as well as practical aspects on design consideration and manufacturing methods of inverters for photovoltaic applications.

Tutorial 9

IGBT Gate Drive Technologies

Reinhard Herzer, Arendt Wintrich, Semikron Elektronik, Germany

About the instructors
Reinhard Herzer studied Electrical Engineering and received 1984 his PhD in the field of Microelectronics and 1992 his Habilitation in the field of Power Devices and Smart Power ICs from the Ilmenau Technical University. He joined Semikron Electronics Nuremberg, Germany in 1995 as head of the MOSFET, IGBT and IC research department. Here he is responsible for the introduction of new power device generations as well as driver- and sensor-IC in new power modules and systems. Further he is Associated Professor at the Technical University of Ilmenau were he teaches and coaches students and PhD students.

Dr. Arendt Wintrich studied electrical engineering with focus on power electronics at the Technical University Chemnitz. He received his doctorate in electrical engineering with the subject »Modelling of power semiconductors«. He joined SEMIKRON in 1999 as Applications Manager focusing on customer consulting and system design. Further key activities are circuit simulation, loss and temperature calculation.

Contents

- → Fundamentals: Power control system | Inverter principle, frequency inverter | Methods of potential separation | Different applications
- → Power devices: Physical basics, parameter and characteristics | Parasitics | Switching behaviour, switching times and losses
- → Driver fundamentals: Gate driver topologies | Influence of different gate driver components on the switching behaviour | Transmission principles of control signal and driving energy | Galvanic isolation and level shift | Variants of power supply: DC/DC converter, bootstrap power supply, charge pump | Gate driving technologies and different gate drive circuits
- → Protection techniques: Under voltage protection | Short pulse suppression and interlock | Different kinds of short circuit protection | Hard and soft turn-off
- → Calculation and selection of drivers: Information and parameters, e.g. gate charge, frequency output voltage and current | Dimensioning of output stages
- → Using IGBT drivers: Input and output signals, VCE-diode | Dimensioning and design of gate resistors | Gate Clamping | Connection between gate driver and IGBT module, paralleling of modules | Some questions of system design: dc-link design (low inductivity), choice of right snubber, design of AC-terminal connection | Application circuits
- → New innovative gate driver concept- digital gate driver: Concept, solution, interfaces | Properties, advantages
- → Overview about available gate drivers: Hybrid driver | Integrated driver IC

Who should attend?
Engineers using and designing drivers, converters and power electronic systems with IGBTs and MOSFETs.

Tutorial 10

High Frequency Conductor Losses in Switchmode Magnetics

Bruce Carsten, Bruce Carsten Associates, USA

About the Instructor
Bruce Carsten has 41 years of design and development experience in switchmode power converters at frequencies from 20 kHz to 1 MHz. In 1982 he designed a 48 Vdc, 200 A, 50 kHz natural convection cooled switchmode telecom rectifier which met the FCC Class A requirements for conducted and radiated emissions. His seminars target the practicing design engineer, and emphasize an intuitive understanding of phenomena involved.

Contents

This course provides an intuitive understanding of ac Skin and Proximity Effect losses in transformer and inductor windings. Formulas and approaches are provided for the calculation of ac winding losses with arbitrary current waveforms. Methods for ac resistance measurements are discussed, with cautions on invalid measurements. Myths and misunderstandings are also discussed, including:

- – »Skin effect« as the current distribution in an isolated conductor;
- – That foil and litz wire conductors reduce ac loss because they have more ›skin‹ area;
- – That losses are always reduced by replacing a solid wire with litz wire of the same ›size‹.

Loss mechanisms unique to planar windings will be presented. A copy of PROXY software and manual will be included on the CD of the seminar notes.

- – Several Approaches to the Understanding of Eddy Currents
- – Common Misconceptions about Skin Effect
- – ›Single Conductor‹ Proximity Effects
- – Proximity Effects with two Parallel Conductors
- – Single layer Proximity Effects in a Solenoidal winding
- – Proximity Effects in Multi-Layer Windings
- – Calculating ac Winding Losses with Sinusoidal and Non-sinusoidal currents
- – Conductor Options for Minimizing ac Losses, including Foil and Litz Wire
- – Winding Options For Minimizing AC losses (Interleaving Windings, ac + dc windings, maximizing winding width on cores)
- – The unappreciated Inductor-Transformer Similarity (Equivalence of a Transformer Secondary and an Inductor Core Air gap in determining winding field geometry)
- – Reducing Winding Losses due to Inductor Core Air Gaps
- – Eddy Current Losses in Transformer Faraday Shields
- – Measuring Winding Resistances; Cautions and Techniques
- – Excess Losses in Conventional »Non-ideal« Planar Windings
- – Losses in Flyback Transformer Windings

Who should attend?
Magnetics Design Engineers, as well as Switchmode Converter and Motor Drive engineers who specify high frequency transformers or inductors in their designs.

Tutorial 11

Reliability of IGBT Power Modules

Josef Lutz, Chemnitz University of Technology, Germany

About the instructor
Josef Lutz joined Semikron Electronics, Nuremberg, Germany in 1983. First he worked in the development of GTO Thyristors, then in the field of fast recovery diodes. He introduced the Controlled Axial 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 power cycling lifetime of IGBT modules. He is one of the authors of the book »Power Devices – Physics, Characteristics, Reliability«, published 2011.

Contents

1. Basic architecture of IGBT power modules
2. Substrates in power electronics
3. Interconnection technologies in power modules
4. Losses, thermal resistance, thermal impedance, cooling methods
5. Temperature determination
   - – Thermocouples, IR-Cameras etc.
   - – Virtual junction temperature: Definition, measurement
   - – Thermal simulation
6. Fatigue processes in power modules, fatigue detection, related standardized tests
7. Power cycling as main method to determine the lifetime expectation
   - – Experimental setup, test strategies
   - – Standard measurements and failure criteria
   - – New methods for online state-of-health analysis
8. Empirical models for lifetime prediction
   - – LESIT model
   - – CIPS 2008 model
   - – Limits of available models
9. Mission profiles, superimposition of cycles, and open questions
10. Improved technologies and future trends in power module lifetime expectation
    - – Diffusion sintering,
    - – Diffusion soldering,
    - – Cu bond wires,
    - – Coated bond wires
    - – Improved substrates

Who should attend?
Engineers in design of converters with IGBT modules with interest in reliability, Beginners as well as experienced engineers are welcome.

Conference Program at at Glance

Tuesday 8 May 2012

→ 9:00	Room Paris Conference Opening and Award Ceremony				
→ 9:45	Room Paris KEYNOTE »Electrical Power Sub-Systems on Satellites«				
→ 10:30	Coffee Break				
→ 11:00	Room Paris Competition in Wide Bandgap Devices	Room London Control of Converters and Drivers	Room Amsterdam Advanced Silicon Power Devices	Room München SPECIAL SESSION FPGAs in Intelligent Motion I	Room Mailand High Performance Motors and Electric Drives
→ 13:00	Lunch Break				
→ 14:00	Room Paris Progress in Wide Bandgap Technology	Room London Converters for Wind/Hydraulic Energies	Room Amsterdam Advanced Power Modules	Room München Current Sensing	Room Mailand Power Quality Solutions
→ 15:30	Foyer Ground Floor Poster/Dialogue Session				
→ 17:15	Get Together				

Wednesday 9 May 2012

→ 8:45	Room Paris KEYNOTE »Solar Power«				
→ 9:30	Coffee Break				
→ 10:00	Room Paris SPECIAL SESSION High Frequency Switching Technologies & Devices for Green Applications	Room London AC/DC Converters	Room Amsterdam DC/DC Converters	Room München New Photovoltaic Energy Systems	Room Mailand Gate Drives
→ 12:30	Lunch Break				
→ 14:00	Room Paris Reliability	Room London Cooling	Room Amsterdam Power Electronics in Automotive, Traction and Aerospace	Room München Energy Storage	Room Mailand Sensorless Drives
→ 15:30	Foyer Ground Floor Poster/Dialogue Session				

Thursday 10 May 2012

→ 8:45	Room Paris KEYNOTE »Grid Integration of Renewables«			
→ 9:30	Coffee Break			
→ 10:00	Room Paris SPECIAL SESSION E-Mobility and Battery Chargers	Room London High Power Converters	Room Amsterdam New Materials for Power Electronics	Room Mailand Control Techniques in Intelligent Motion Systems
→ 12:30	Lunch Break			
→ 14:00	Room Paris New Wide Bandgap Devices	Room London Wire Bonds in Power Modules	Room Amsterdam High Power Devices	Room Mailand SPECIAL SESSION FPGAs in Intelligent Motion II

As by February 2012/subject to change without notice

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Alfredo Vagati, Politecnico di Torino, Italy
Peter Wallmeier, AEG Power Solutions, Germany
Dehong Xu, Zhejiang University, China
Peter Zacharias, University of Kassel, Germany

Awards

Best Paper Award

The conference directors will present this award to the best paper overall. As well as being able to present the paper at the PCIM Europe Conference and see it published in the conference proceedings, the winner will receive 1,000 Euros and a paid trip to PCIM Asia 2013 in Shanghai. The award ceremony and speech will be part of the PCIM Europe Conference opening ceremony.

This award is sponsored by:

POWER ELECTRONICS EUROPE

SEMIKRON innovation+service

The nominees are:

DC Link Chopper for AC-DC adapters
Bogdan Bucheru, Delta Energy Systems, USA

Power Cycling Capability of New Technologies in Power Modules for Hybrid Electric Vehicles
Christian Herold, Chemnitz University of Technology, D

A novel single-phase transformerless PV inverter with innovative semiconductor technologies
Mehmet Kazanbas, University of Kassel, D

Operating performance of Modular Multilevel Converters in drive applications
Johannes Kolb, Karlsruhe Institute of Technology (KIT), D

A Small Flywheel Energy Storage for Hybrid Cars
Jacques Laeuffer, Dtalents, F

Novel Voltage Balancing and Monitoring for a Stack of Electric Double Layer Capacitors
Nejat Mahdavi, Liebherr-Elektronik, D

The Hybrid Multilevel Converter: A new Voltage Source Converter Topology for improved Efficiency
Ralph Niederer, Vivatec GmbH, CH

Ultra low Ron SiC Trench devices
Keiji Okumura, ROHM Co., Ltd., J

Short-circuit behavior of diodes in voltage source inverters
Steffen Pierstorf, University of Rostock, D

Fast Current Measurement based on Enhanced Sigma Delta Technology
Andreas Rath, UAS Cologne, D

Al-Cladded Cu Wire Bonds Multiply Power Cycling Lifetime of Advances Power Modules
Uwe Scheuermann, SEMIKRON Elektronik GmbH & Co. KG, D

Young Engineer Award

Three »Young Engineer Awards« will be presented for outstanding contributions from authors not older than 35 years old. The submissions will be judged on the basis of their originality and topicality and the age of the author, and the winners will be selected by the conference directors. As well as being able to present their papers at the PCIM Europe Conference and seeing them published in the conference proceedings, the winners will receive prize money of 1,000 Euros each. The award ceremony and speech will be part of the PCIM Europe Conference opening ceremony.

This award is sponsored by:

ECPE

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MITSUBISHI ELECTRIC *Changes for the Better*

The nominees are:

The renaissance of the BJT as a highly efficient power device based on SiC material
Samuel Araujo, University Kassel, D

Design Optimization of a 250W Microinverter for Distributed Photovoltaic Applications
Rosario Attanasio, STMicroelectronics, I

Short-Circuit Behaviour of High-Voltage IGBTs in Circuits with di/dt Snubbers
Thomas Basler, Chemnitz University of Technology, D

A new circuit topology of Modular Multilevel Converter (MMC) with an open end transformer
Anandarup Das, Norwegian University of Science and Technology, N

Soft Switching Characterization of a 6.5kV IGBT for High Power LLC Resonant DC-DC Converter
Drazen Dujic, ABB Corporate Research, CH

Characterization of SiC MOSFET dual modules for future use in railway traction chains
Joseph Fabre, ALSTOM Transport, F

A hybrid HVDC transmission scheme for grid connection of offshore wind farms
Florian Fein, University of Bremen, D

Power Line Communication for a high insulated power
Lilia Galai, SATIE, F

Power Cycling Capability of New Technologies in Power Modules for Hybrid Electric Vehicles
Christian Herold, Chemnitz University of Technology, D

Optimization of the passive components of the Modular Multilevel Matrix Converter for Drive Applications
Felix Kammerer, KIT Karlsruhe Institute of Technology, D

Implementation of a Real-Time Thermal Model for a Multichip IGBT-Module
Jussi Karttunen, Lappeenranta University of Technology, FIN

Operating performance of Modular Multilevel Converters in drive applications
Johannes Kolb, KIT Karlsruhe Institute of Technology, D

A ZVS Half Bridge DC-DC Converter in MHz Frequency Region using Novel Hybrid Power Transformer
Hari Babu Kotte, Mid Sweden University, S

FPGA Current Controller for Virtual Synchronous Machine
Christopher Pelczar, Clausthal University of Technology, D

Direct comparison among different technologies in Silicon Carbide
Bettina Rubino, STMicroelectronics, I

Cost-effective implementations of sensorless control strategies
Giacomo Scelba, University of Catania, I

3.3kV High Speed IGBT Module For Bi-directional and Medium Frequency Application
Masashi Shinagawa, Hitachi Europe, UK

Construction of a High Force Density Linear Motor with a Passive Stator using Transverse Flux Technology
Marek Siatkowski, University of Bremen, D

Keynotes

Speaker: Albert Crausaz, European Space Agency, F
Chairman: Eric Favre, Norgren-FAS, CH

Tuesday 8 May 2012

Electrical Power Subsystem on Satellites

While space is using solar energy and batteries storage since decades, a short introduction on the constraints induces by the space environment is necessary to understand the specificities of the flown solution. The first part of the presentation will give a general overview of main space power converters topologies and the regulation principles. Alphabus, the newly-developed 22KW payload telecommunication platform, will serve as the basis of the more concrete part of the presentation. The Alphabus batteries, solar arrays will be presented, but more emphasis will be given on the main regulator and the achieved performances. Future developments in batteries and solar cells, and breadboard testing results of a GaN buck regulator will close our presentation, but open the door to future research and development activities.

Speaker: Peter Zacharias, University of Kassel/ ISET e.V., D
Chairman: Leo Lorenz, ECPE, D

Wednesday 9 May 2012

Solar Power

The keynote adresses the recent and expected developments in the solar power market. It takes into account the changes within the market players but also the installed capacity and sizes of solar power plants and according consequences.
The technical and economical market drivers are taken into account. The efficiency is not the most important selling argument anymore. Investment costs, balance of system and reliability of PV inverters influence the total cost of ownership and thus the profitability of an investment.
Integration into the existing electric grid becomes more and more important. For example the limiting factor in the low voltage grid is usually not the current capability of the cables but the voltage constraints of the power supply region. Control of voltage and power flow is becoming more and more of interest and may result in a huge new market for power electronic applications.

Speaker: Frede Blaabjerg, Aalborg University, DK
Chairman: Friedrich W. Fuchs, Christian-Albrechts-University of Kiel, D

Thursday 10 May 2012

Grid Integration of Renewables

The global electrical energy consumption is still rising and there is a steady demand to increase the power capacity. It is expected that it has to be doubled again within 20 years. The production, distribution and use of the energy should be as technological efficient as possible and incentives to save energy at the end-user should also be set up. Two major technologies will play important roles to solve the future problems. One is to change the electrical power production sources from the conventional, fossil (and short term) based energy sources to renewable energy resources. Another is to use high efficient power electronics in power generation, power transmission/distribution and end-user application. This presentation will discuss some of the most emerging renewable energy sources, wind energy and photovoltaics, which by means of power electronics are changing character from being a minor energy source to be acting as important power sources in the energy system. Issues like technology development, implementation, power converter technologies, control of the systems, synchronization, anti-islanding, grid codes, system integration and future trends will be addressed in the presentation.

Conference Tuesday, 8 May 2012

Room Paris
→ 09:00
Conference Opening/ Young Engineer Award/ Best Paper Award

More information on page 18

Room Paris
→ 09:45
KEYNOTE: Electrical Power Subsystem on Satellites

Speaker: Albert Crausaz, European Space Agency, F
Chairman: Eric Favre, Norgren-FAS, CH

More information on page 19

→ 10:30 Coffee Break

Room Paris
Competition in Wide Bandgap Devices

Chairman:
Ulrich Kirchenberger,
STMicroelectronics, D

→ 11:00
Comparison of Reverse Recovery Behavior in Full-SiC Switches
Tim Hilden, Peter Jänker, EADS Deutschland; Lothar Frey, University of Erlangen, D

→ 11:30
Direct Comparison Among Different Technologies in Silicon Carbide
Bettina Rubino, Michele Macauda, Massimo Nania, Simone Buonomo, STMicroelectronics, I

→ 12:00
Comparison of Six Different SiC Power Switching Devices in the 1200 V Range
W.-Toke Franke, Bjørn Jongschaap, Danfoss Solar Inverters, DK

→ 12:30
The Renaissance of the BJT as a Highly Efficient Power Device Based on SiC Material
Samuel Araujo, Peter Zacharias, University of Kassel, D; Anders Lindgren, Fairchild Semiconductor, S

Room London
Control of Converters and Drivers

Chairman:
Klaus Marahrens,
SEW-EURODRIVE, D

→ 11:00
High-Frequency GaN Diode-free Motor Drive Inverter with Pure Sine-wave Output
Yifeng Wu, D. Kebort, J. Guerrero, S. Yea, J. Honea, Transphorm; Kohei Shirabe, Jun Kang, Yaskawa America, USA

→ 11:30
Multiphase Buck Controller Based on Voltage Controlled Constant on Time Architecture
Osvaldo Enrico Zambetti, Alessandro Zafarana, STMicroelectronics, I

→ 12:00
A SVPWM for Three-Phase Current Reconstruction on Single DC-Link Shunt
Ling Qin, Bilal Akin, Texas Instruments, USA

→ 12:30
New Control Method of Adaptive Dead Time for High Efficient Forward DC/DC Converter
Bernhard Strzalkowski, Analog Devices, D

→ 13:00
Discrete Modeling of Resonant Converters – Practical Validation
Jürgen Stahl, Thomas Dürbaum, University of Erlangen, D

Room Amsterdam
Advanced Silicon Power Devices

Chairman:
Josef Lutz,
Chemnitz University of Technology, D

→ 11:00
600 V 6th-Gen CSTBTTM: An Improvement of the Switching Characteristic in Large Current Density
Tatsuo Harada, Kazunari Hatade, Noritsugu Nomura, Tesuo Takahashi, Mitsubishi Electric, J

→ 11:30
TRENCHSTOP 50 µ: a New Application Specific IGBT Series
Thomas Kimmer, Infineon Technologies Austria, A; Erich Griebl, Infineon Technologies, D

→ 12:00
DTMOS-IV – RDS(ON) Innovation by Deep-Trench Filling Superjunction Technology
Syotaro Ono, Hiroshi Ohta, Hiroaki Yamashita, Masaru Izumisawa, Wataru Saito, Shingo Sato, Noboru Matsuda, Yoshihisa Ohishi, Masataka Tsuji, Jun Onodera, Georges Tchouangue,Toshiba Corporation, J

→ 12:30
Super Junction MOSFET: Analysis and Market Outlook of Next Generation Silicon Power Devices
Alexandre Avron, Yole Développement, F

Room München
SPECIAL SESSION »FPGAs in Intelligent Motion I«

Chairman:
Jens Onno Krah,
Fachhochschule Köln, D

→ 11:00
FPGA Current Controller for Virtual Synchronous Machine
Christopher Pelczar, Markus Stubbe, Hans-Peter Beck, Oliver Zirn, Clausthal University of Technology, D

→ 11:30
Use of FPGA Model Based Design Flow for Motor Control on Servo Drives
Kevin Smith, Altera Europe, UK

→ 12:00
A Switching Control Strategy for the Reduction of Torque Ripple for PMSM
Karel Jezernik, Robert Horvat, University of Maribor, SLO

→ 12:30
FPGA High Efficiency Low Noise Pulse Frequency Space Vector Modulation
Giulio Corradi, D. Quagreda, R. Raffaettà, Xilinx, D

Room Mailand
High Performance Motors and Electric Drives

Chairman:
Eric Favre,
FAS-Norgren, CH

→ 11:00
Very high Performance Drives– up to 1 Mio rpm
Christoph Zwyssig, Celerotron, CH

→ 11:30
Analysis and Design of a High Force Density Linear Electromagnetic Actuator
James Barns, Jiabin Wang, Kais Atallah, University of Sheffield, UK

→ 12:00
Construction of a High Force Density Linear Motor with a Passive Stator using Transverse Flux Technology
Marek Siatkowski, Bernd Orlik, University of Bremen, D

→ 12:30
Magnetic Bearing for Grind Ball
Alexander Norbach, University of Bremen, D

→ 13:00 Lunchbreak

Room Paris
Progress in Wide Bandgap Technology

Chairman:
Andreas Lindemann,
Otto-von-Guericke-University Madgeburg, D

→ 14:00
Gate Oxide Reliability Assessment of the Cree 1200 V Z-FET
Mrinal Das, Jim Richmond, Sarah Haney, Zoltan Ring, Anant Agarwal, John Palmour, Cree, USA

→ 14:30
Ultra Low Ron SiC Trench Devices
Keiji Okumura, Nobuhiro Hase, Kazuhide Ino, Takashi Nakamura, Masanori Tanimura, ROHM, J

→ 15:00
New SiC Thin Wafer Technology Paving the Way of Schottky Diodes with Improved Performance and Reliability
Vladimir Scarpa, U. Kirchner, A. Kern, Infineon Technologies Austria, A; R. Gerlach, Infineon Technologies, D

Room London
Converters for Wind/Hydraulic Energies

Chairman:
Alfio Consoli,
University of Catania, I

→ 14:00
Island Grid Control with Independent Wind Power Stations Based on Fully-fed Synchronous Generators
Florian Fein, Markus Schmidt, Bernd Orlik, University of Bremen, D

→ 14:30
Behavior of a Steam Power Plant in a Wind Power Station to Avoid Grid Oscillations and Add Primary Control
Markus Schmidt, Florian Fein, Bernd Orlik, University of Bremen, D

→ 15:00
Modified Control Structure for Single Phase Z-Source-Inverter and Efficiency Analysis
Manuel Steinbring, Jose Mario Pacas, University of Siegen, D

Room Amsterdam
Advanced Power Modules

Chairman:
Yasukazu Seki,
Fuji Electric Europe, D

→ 14:00
IGBT Inverter with Increased Power Density by Use of a Low-Inductance and High-Temperature-capable Design
Klaus Vogel, Daniel Domes, Infineon Technologies, D

→ 14:30
New Module Concept for Overall Low Inductance
Daniel Domes, Infineon Technologies, D

→ 15:00
Numerical Modelling of a High Temperature Power Module Technology with SiC Devices for High Density Power Electronics
Paul-Etienne Vidal, Francisco Carrillo, University of Toulouse; Alioune Cisse, Gregor Massiot, Catherine Munier, EADS, F

Room München
Current Sensing

Chairman:
Jacques Laeuffer,
Dtalents, F

→ 14:00
Fast Current Measurement Based on Enhanced Sigma Delta Technology
Andreas Rath, Jens Onno Krah, UAS Cologne; Christoph Klarenbach, Beckhoff Automation, D

→ 14:30
High Temperature Current Transducer with Enhanced Rejection of External Magnetic Fields
Wolfram Teppan, Dominik Schlaefli, LEM, CH

→ 15:00
Integrated Current Sensor based on Magneto-resistive (MR) Technology
Simon Scherner, Christian Nau, Sensitec; Andreas Nebeling, Wolfgang Schreiber-Prillwitz, Elmos Semiconductor, Germany, D

Room Mailand
Power Quality Solutions

Chairman:
Silvio Colombi,
General Electric, CH

→ 14:00
Digitally Controlled Bridgeless PFC Converter without Inductor Current and Input Voltage Sensing
Wenqi Zhou, Manfred Reddig, UAS Augsburg; Manfred Schlenk, NMB-Minebea, D

→ 14:30
A new Power Quality and Energy Monitoring Technology – Bringing SmartGrid on the Factory and Automation Floor
Andreas Eberhard, Power Standards Lab, USA

→ 15:00
High Efficiency 500 kVA UPS using Advanced-NPC Topology with RB-IGBTs as Bi-directional Switches
Satoki Takizawa, K. Fujii, Y. Yamakata, Y. Okuma, Fuji Electric, J

→ 15:30 Coffee Break

→ 15:30 – 17:00 Foyer Ground Floor **Poster/Dialogue Session**

→ 17:15 **Get Together**

Conference Tuesday, 8 May 2012, Poster Dialogue Sessions

15:30 – 17:00, Foyer Ground Floor

Advanced Power Devices I

Chairman:
Romeo Letor,
ST Microelectronics, CN

PP01 **New Symmetric Voltage Suppressor with Peak Pulse Power and Increased Power Capacity**
Alexey Surma, Y. M. Loktaev, A. V. Stavtsev, A. A. Chernikov, Proton-Electrotex, RUS

PP02 **IGBT Leakage Current Prediction**
Paolo Soldi, Jorge Mari, Matthias Menzel, Thomas Zöls, GE Global Research; Fabio Carastro, GE Energy, D

PP03 **Design and Optimization of Two Kinds of Robust 700V DR-LDMOS Using a Thin Epitaxial Technology**
Bon-Keun Jun, Namchil Moon, Chil Moon, Kyung-Wook Kwon, Chang-Jun Lee, Jong-Min Kim, Jae-Hyun Yoo, Hee-dae Kim, Joo-Won Park, Nam-Joo Kim, Kwang-Dong Yoo, Lou Hutter, Dongbu HiTek, ROK

PP04 **Comparison of Output Power and Power Cycling Capability of BIGT and IGBT/Diode Inverters Dependent on Modulation Degree and Fundamental Frequency**
David Weiss, Daniel Wigger, Hans-Günter Eckel, University of Rostock, D

PP05 **Introducing the 5.5kV, 5kA HPT IGCT**
Tobias Wikström, Björn Backlund, Thomas Setz, Kenan Tugan, Thomas Stiasny, ABB Switzerland, CH

PP06 **Analysis of Light Load Waveform of Synchronous Buck Converters during Dead-Time**
Yen-Tang Wang, TW

PP07 **A Hole Barrier IGBT with Enhanced Breakdown Voltage by a Floating P well**
Giuseppe Consentino, Donato Corona, S. Amara, A.Grimaldi, S. Pisano, G. Sammatrice, STMicroelectronics, I

Advanced Power Devices II

Chairman:
Serge Bontemps,
Microsemi PMP Europe, F

PP08 **Process Simulation for Feasibility of Double Side Polished: Mosfet and Schottky Diode**
Giuseppe Consentino, Monica Miccichè, D. Cavallaro, G. Di Liberto, A. Grimaldi, A. Raffa, STMicroelectronics, I

PP09 **Top-Layout Design Influence on Electrical Performances and Short-Circuit Ruggedness of a Thin-wafer Trench-Gate IGBT**
Antonino Sebastiano Alessandria, Maria Silvia Cannizzaro, Domenico Fagone, Leonardo Fragapane, STMicroelectronics, I

PP10 **Scaling of Chip-Level to Module Level for RC-IGBTs and Conventional IGBTs**
Daniel Wigger, David Weiß, Hans-Günther Eckel, University of Rostock, D

PP11 **Surge Current Behavior of turned on 600 V IGBT²**
Ole Binder, Björn Bünsow, Michael Kurrat, Ernst-Dieter Wilkening, Braunschweig University of Technology, D

PP12 **AlphaIGBTTM – Making IGBTs Efficient and Easier to Use**
Roland Weber, G. Moxey, F. Wang, A. Bhalla, Alpha & Omega Semiconductor, D

PP13 **Short-Circuit Behavior of Diodes in Voltage Source Inverters**
Steffen Pierstorf, Hans-Günter Eckel, University of Rostock, D

PP14 **Simple Turn-off Description of Trench Field Stop IGBT – IGBT3/3.3 kV**
Daniel Heer, Reinhold Bayerer, Infineon Technologies, D

Wide Bandgap Devices

Chairman:
Chris Rexer,
Fairchild Semiconductor, USA

PP15 **Si IGBT-SiC JBS Rectifier Co-Packs Enable 28 % Lower Power Losses**
Ranbir Singh, Eric Lieser, Michael Digangi, Siddarth Sundaresan, GeneSiC Semiconductor, USA

PP16 **SiC »Super« Junction Transistors with Ultra-Fast (< 15 ns) Switching Capability**
Ranbir Singh, Eric Lieser, Michael Digangi, Siddarth Sundaresan, GeneSiC Semiconductor, USA

PP17 **Performance Evaluation of the New 1200 V SiC JFET**
Matthias Tauer, Michael Patt, Finepower, D

PP18 **Characterisation and Evaluation of 1700 V SiC-MOSFET Modules for Use in an Active Power Filter in Aviation**
Sebastian Liebig, Jürgen Engstler, Alfred Engler, Liebherr Elektronik; Josef Lutz, Chemnitz University of Technology, D

PP19 **Reverse Recovery Behavior of the Body Diode of the SiC MOSFET**
Tobias Appel, Hans-Günter Eckel, University of Rostock, D

PP20 **GaN-on-Si Solutions with in-situ Passivation for Fast Switching 600 V Devices**
Marianne Germain, Joff Derluyn, Stefan Degroote, EpiGaN, B

Converter Control and Drive I

Chairman:
Nejila Parspour,
University of Stuttgart, D

PP21 **Dimmer-Ballast Compatibility for Low-Consumption Lamps**
Laurent Gonthier, Benoit Renard, STMicroelectronics, F

PP22 **Failure Characteristics of Parallel Converters**
Stefan Schmitt, BLOCK Transformatoren-Elektronik, D

PP23 **Innovative Event Driven State Machine (SMED) Peripheral for Digital Control of Power Conversion & Lighting Applications with 8bit Microcontrollers**
Ales Loidl, Jakub Hajek, Giuseppe Bosiso, Ignazio Salvatore Bellomo, STMicroelectronics, CZ

PP24 **Power Line Communication for a High Insulated Power**
Lilia Galai, Bertrand Revol, SATIE; Francois Costa, UPEC, F

PP25 **Achieving Ultra Low Standby Power Consumption of Switched Mode Power Supply**
Hangseok Choi, Fairchild Semiconductor, USA

Converter Control and Drive II

Chairman:
Hans Ertl,
Vienna University of Technology, A

PP26 **Full Digital Implementation of an Optimized Modulation Strategy for Series-Parallel Resonant Converter**
Zhiyu Cao, Junbing Tao, Meng Sun, Norbert Fröhleke, Joachim Böcker, University of Paderborn, D

PP27 **The improved Burst Mode in the stand-by Condition of Switching Mode Power Supply**
Xiaowu Gong, Infineon Technology Asia Pacific, SGP

PP28 **Parametric Design Guidelines for MW Oven Inverter**
Cesare Bocchiola, International Rectifier, I

PP29 **Low Harmonic Rectifier Using 12-pulse Current Splitter/Merger**
Andrzej Pietkiewicz, Schaffner EMV; Kurt Schenk, NTB University of Applied Sciences, CH

PP30 **Which Power MOSFET Technologies in LLC HB Converters?**
Giuseppe Consentino, Antonino Gaito, STMicroelectronics, I

PP31 **One-Quadrant DC Motor Drive with Nonlinear Step-Up-Down Characteristics**
Felix Himmelstoss, UAS Vienna; Karl H. Edelmoser, Vienna University of Technology, A

Mulitlevel and Other Advanced Converters I

Chairman:
Hilmar Darrelmann,
dbr-consult, D

PP32 **Current Sharing in a Three-Phase Interleaved Converter for CCM with Measurement of one Current**
Jens Christian Schroeder, Marinus Petersen, Friedrich W. Fuchs, University of Kiel, D

PP33 **Analytical Computation of Current Ripple for Interleaved Converters with Coupled Inductors**
Oneil Rodrigo Zarate Vargas, Hermann Wetzel, Volkswagen; Andreas Lindemann, Otto-von-Guericke-University Magdeburg, D

PP34 **Study on Next-Generation two-Stage Architecture for Synchronous Buck Converter in High-Power-Density Computing Power Supplies**
Tirthajyoti Sarkar, Mona Joshi, Ritu Sodhi, Fairchild Semiconductor; C. V. Bhargava, Indian Institute of Technology Madras, IND; Steven Sapp, Fairchild Semiconductor, USA

PP35 **Multiphase Resonant Inverters for Supercapacitor Charging**
Nikola Gradinarov, Nikolay Hinov, Dimitar Arnaudov, George Kraev, Nikolay Rangelov, Technical University of Sofia, BG

PP36 **Comparison of Output Rectifier Topologies in Case of a Low-Profile LLC Converter**
Christian Oeder, Alexander Bucher, Thomas Dürbaum, University of Erlangen, D

PP37 **Response Time Study for High Voltage Power Supply Based on Voltage Multipliers**
Saijun Mao, GE Global Research Center, CN

Mulitlevel and Other Advanced Converters II

Chairman:
Petar J. Grbovic,
Huawei Technologies, D

PP38 **Achieving Peak Current Controlled Cuk Converter Stability**
Nicola Femia, Walter Zamboni, A. De Nardo, University of Salerno, Italy

PP39 **Minimizing Power Components of Isolated DC-DC Converters**
Giulia Di Capua, Nicola Femia, University of Salerno, I

PP40 **Comparison of Transformerless Multilevel Topologies for Photovoltaic Application Concerning Efficiency, Leakage Current and Mechanical Volume**
Fabian Gebhardt, Hauke Vach, Friedrich W. Fuchs, Christian-Albrechts-University of Kiel, D

PP41 **LCL Filter Design for an NPC Three-Level Three-phase Grid-connected Inverter**
Daniel Montesinos-Miracle, Jordi Benet-Barberan, Marc Pagès-Giménez, Samuel Galceran-Arellano, Antoni Sudrià-Andreu, CITCEA-UPC, E

PP42 **A new Circuit Topology of Modular Multilevel Converter (MMC) with an Open End Transformer**
Anandarup Das, Hamed Nademi, Lars Norum, Norwegian University of Science and Technology, N

Converter and EMI I

Chairman:
Francisco Javier Azcondo,
University of Canabria, E

PP43 **How to Maximize SSCG Technique Effects in Order to Improve EMI of Stepper Motors Driver**
Alessandro Priscoglio, A. Longhitano, STMicroelectronics, I

PP44 **Frequency Domain EMI Noise Source Modelling for Power Converter**
Clement Marlier, University of Lille 1, F

PP45 **New Concept of Low-Loss, Hard Switching (LHS)**
Silvan Geissmann, Don Partridge, Eric Carroll, Munaf Rahimo, Ulrich Schlapbach, Raffael Schnell, Felix Jenni, UAS North Switzerland, CH

PP46 **Development of a Wireless Dimmable CFL for Domestic Application on the Basis of Bluetooth Technology**
Alexander Pawellek, M. Weinmann, T. Duerbaum, University of Erlangen, D

PP47 **Dynamic Study of the Phase-Controlled Parallel-Series (LCpCs) Resonant Converter to Drive High-Brightness Power LEDs**
Christian Branas, F. J. Azcondo, V. M. López, A. Navarro, R. Casanueva, F. J. Díaz, University of Cantabria, E

Converter and EMI II

Chairman:
Christopher Kocon,
Texas Instruments, USA

PP48 **Frequency Dither Circuit for Electronic Ballast EMI Reduction**
Peter Bredemeier, Tom Ribarich, International Rectifier, D

PP49 **Simple Control Circuits for Electronic Ballast Design**
Tom Ribarich, International Rectifier, USA

PP50 **Synthesis of Input Line Current in Power Factor Correction Control for Optimal Converter Operations**
Maurizio Salato, VICOR, USA

PP51 **Practical Evaluation of Rectangular-Voltage-Fed Distribution System**
Yasuyuki Nishida, Hiromichi Oyama, Chiba Institute of Technology; Takaharu Takeshita, Nagoya Institute of Technology, J

PP52 **Reduction of Total Harmonic Distortion (THD) for Interleaved Converters Operating in Discontinuous Conduction Mode (DCM)**
Tobias Grote, Delta Energy Systems; Sven Bolte, Norbert Fröhleke, Joachim Böcker, University of Paderborn, D

PP53 **Measuring Power Supply Noise with an RSA**
Steve Sandler, Picotest.com, USA

Motors & Magnetic Design

Chairman:
Ted Hopper,
Maccon, D

PP54 **Algorithmic Slot Geometry Determination for Automated Machine Design Process**
Quirin Hecker, Wolfgang Meyer, Hans-Georg Herzog, Munich University of Technology, D

PP55 **A Detailed Step-by-Step Description of the Measurement of Absolute Inductances of Permanent Magnet Synchronous Machines**
Sven Ludwig Kellner, Bernhard Piepenbreier, University of Erlangen, D

PP56 **Modeling of a Doubly Fed Induction Machine Considering Iron Saturation and Skin Effect**
Guido Tisborn, Christian Mehler, Bernd Orlik, University of Bremen, D

Intelligent Motion

Chairman:
Jens Onno Krah,
UAS Cologne, D

PP57 **A New Intelligent Power Module Device with the Fast Reverse Recovery MOSFET for Motor Drive Applications**
Bum-seung Jin, Min-sub Lee, Jun-ho Lee, Jun-bae Lee, Dae-woong Chung, LS Power Semitech, ROK

PP58 **Elastically Coupled Multi-Mass-Systems Considering Tooth Engagement Forces**
Christian Mehler, Matthias Joost, Bernd Orlik, University of Bremen, D

PP59 **Efficiency Improvement of Induction Machines with Load-dependent Rotor Flux Control**
Rudolf Mecke, UAS Harz, D

PP60 **Impact of Three-Phase Current Measurement on Field-Oriented Control**
Sebastian Ebersberger, Bernhard Piepenbreier, University of Erlangen, D

PP61 **Detection of Circuitry Faults in Electrical Machines**
Ludwig Brabetz, M. Ayeb, F. Dräger, A. Flach, University of Kassel, D

PP62 **FPGA-based PMSM Emulation: Concept and Verification**
Martin Oettmeier, Carsten Heising, Volker Staudt, Ruhr-University Bochum; Henrik Liebau, Henrik Jakoby, ETAS, D

PP63 **Analysis of Time/Area Performances of a FPGA-based Sensorless Speed Controller for AC Drive Applications**
Lahoucine Idkhajine, SATIE, F

Conference Wednesday, 9 May 2012

Room Paris
→ 08:45
KEYNOTE:
Solar Power
Speaker: Peter Zacharias, University of Kassel/ ISET e.V., D
Chairman: Leo Lorenz, ECPE, D

More information on page 19

→ 09:30 Coffee Break

Room Paris
SPECIAL SESSION »High Frequency Switching Technologies & Devices for Green Applications«

Chairman:
Achim Scharf,
Power Electronics Europe, D

→ 10:00
Efficient Power Electronics for the Price of Silicon – 3D-GaN Technology for GaN-on-Silicon
Ertugrul Sönmez, MicroGaN, D

→ 10:30
The Status of HV GaN based Power Device Development at International Rectifier
Michael Briere, International Rectifier, USA

→ 11:00
Silicon Carbide BJT's in Boost Applications
Peter Haaf, Fairchild Semiconductor, D; Anders Lindgren, Martin Domeij, Fairchild Semiconductor, S

→ 11:30
Comparative High Frequency Performance of SiC MOSFETs Under Hard Switched Conditions
Bob Callanan, Julius Rice, Cree, USA

→ 12:00
Opportunities and Challenges for Wide Bandgap Power Devices in Megawatt PE Applications
Iulian Nistor, Munaf Rahimo, Liutauras Storasta, ABB Switzerland, CH

Room London
AC/DC Converters

Chairman:
Bruce Carsten,
Bruce Carsten Associates, USA

→ 10:00
Performance Comparison of a Standard and a Holistic AC/DC Converter for Computer Applications
Rosario Attanasio, F. Gennaro, STMicroelectronics, I

→ 10:30
DC Link Chopper for AC-DC Adapters
Bogdan Bucheru, Marco Davila, Ionel Dan Jitaru, Delta Energy Systems, USA

→ 11:00
Analysis of Parasitic Effects on Passive Compensation of Common Mode Noise in a Boost Converter
Martin Schmidt, Jürgen Stahl, Manfred Albach, University of Erlangen, D

→ 11:30
A Merged-Stage High Efficiency High Power Factor HB-LED Converter without Electrolytic Capacitor
Mor Peretz, Michael Chen, Nikhil Goyal, Aleksandar Prodić, University of Toronto, CDN

→ 12:00
High-Efficiency LED Lighting Need Not be a High-Cost Proposition
Andrew Smith, Power Integrations, USA

Room Amsterdam
DC/DC Converters

Chairman:
Bernhard Piepenbreier,
University of Erlangen, D

→ 10:00
An Integration of Dual Active Bridge DC/DC Converters Used in Micro Converters Networks
Jean-Christophe Crebier, Trung Hieu Trinh, N. Rouger, Y. Lembeye, Grenoble Electrical Engineering Laboratory, F

→ 10:30
Cost-effective Implementation of a Digital Controlled LLC Resonant Converter for Application in Server- and Telecom PSUs
Heiko Figge, T. Grote, N. Fröhleke, J. Böcker, University of Paderborn; F. Schafmeister, DELTA Energy Systems, D

→ 11:00
Resonant LLC and LCC Converter – Comparison Based on an Identical Hardware Set-Up
Christian Oeder, A. Pawellek, T. Duerbaum, University of Erlangen, D

→ 11:30
A ZVS Half Bridge DC-DC Converter in MHz Frequency Region using Novel Hybrid Power Transformer
Hari Babu Kotte, Radhika Ambatipudi, Stefan Haller, Kent Bertilsson, Mid Sweden University, S

→ 12:00
Smoothing Transformer for Differential Mode Noise Reduction
Jürgen Stahl, R. Junghaenel, M. Albach, University of Erlangen, D

Room München
New Photovoltaic Energy Systems

Chairman:
Mike Meinhardt,
SMA Solar Technology, D

→ 10:00
A novel Single-Phase Transformerless PV Inverter with Innovative Semiconductor Technologies
Mehmet Kazanbas, C. Nöding, T. Kleb, P. Zacharias, University of Kassel, D

→ 10:30
Design Optimization of a 250 W Microinverter for Distributed Photovoltaic Applications
Rosario Attanasio, F.Gennaro, G.Scuderi, STMicroelectronics; M. Cacciato, A. Consoli, University of Catania, I

→ 11:00
Three-Level DC/DC Converter for Utility-Scale Renewable Installations
Paul Drexhage, K. Haddad, SEMIKRON, USA

→ 11:30
Triangular Current Mode Operation of a Three Phase Interleaved T-Type Inverter for Photovoltaic Systems
David Leuenberger, D. Christen, J. Biela, ETH Zurich, CH

→ 12:00
First 99 % PV Inverter with SiC JFETs on the market – future role of SiC
Regine Mallwitz, SMA Solar Technolgy, D

Room Mailand
Gate Drives

Chairman:
Hubert Schierling,
Siemens, D

→ 10:00
1st Commercial SiC JFET Driver for Direct Drive JFET Topology
Karl Norling, Christian Lindholm, Dieter Draxelmayr, Infineon Technologies Austria, A

→ 10:30
Get tuned – A new Generation of Driver IC including Safe Isolation by Coreless Transformer Technology (1ED+)
Andre Arens, Peter Kanschat, Ulrich Schwarzer, Harmut Jasberg, Ralph Danklefsen, Infineon Technologies, D

→ 11:00
High Reliability 1200V High Voltage Integrated Circuit (1200 V HVIC) for Half Bridge Applications
Masahiro Yamamoto, Liang Xiaoguang, Manabu Yoshino, Takanobu Takeuchi,You Habu, Mitsubishi Electric, J; Marco Honsberg, Mitsubishi Electric Europe, D

→ 11:30
Parasitic Inductance in Gate Drive Circuits
Reinhold Bayerer, Daniel Domes, Infineon Technologies, D

→ 12:00
Full Digital controlled Gate Drive Unit for High Power IGBT
Karsten Handt, H. Koehler, M. Hiller, R. Sommer, Siemens, D

→ 12:30 Lunchbreak

Room Paris
Reliability

Chairman:
Uwe Scheuermann,
SEMIKRON Elektronik, D

→ 14:00
Power Cycling Capability of New Technologies in Power Modules for Hybrid Electric Vehicles
Christian Herold, Josef Lutz, Chemnitz University of Technology; Alexander Hensler, Siemens; Markus Thoben, Thomas Gutt, Infineon Technologies, D

→ 14:30
Bond Wire Life Time Model Based on Temperature Dependent Yield Strength
Samuel Hartmann, Emre Özkol, ABB Switzerland, CH

→ 15:00
Power modules combined failure factors effects in automotive applications
Souad Bachti, L. Dupont, G. Cocquery, S. Lefebvre, IFSTTAR; S. Loudot, Renault, F

Room London
Cooling

Chairman:
Reinhold Bayerer,
Infineon Technologies, D

→ 14:00
Analytical and Experimental Characterization of Erosion Effects According to Pin-Fin Shape in Electronics Cooling Loops
Ralph Remsburg, J. Gilmore, Amulaire Thermal Technology, USA

→ 14:30
Pushing the Limits of liquid Cooling: Design and Analysis of a Direct Cooling System for Power Modules
Jesus Moreno, Matt Reeves, Peter Beucher, Sy-Jenq Loong, Wolverine Tube, USA

→ 15:00
Investigation of Pulse Overload-Behavior of a High Current Connector with Transient-Thermo-Electric FEM Simulation
Olaf Bochow-Ness, A. Grams, E. Hoene, S. Huber, H. Pötter, T. Prewitz, O. Wittler, F. Wüst, Fraunhofer IZM; R. Gugel, H. Eberbach, John Deere Werke Mannheim; W. Müller, K.-D. Lang, Technical University Berlin, D

Room Amsterdam
Power Electronics in Automotive, Traction and Aerospace

Chairman:
Friedrich-Wilhelm Fuchs,
Christian-Albrechts-University of Kiel, D

→ 14:00
Increasing Packaging Density and Thermal Performance with Minimized Parasitics for High Power Inverters
Thomas Gottwald, Christian Rössle, Schweizer Electronic, D

→ 14:30
Characterization of SiC MOSFET dual Modules for Future Use in Railway Traction Chains
Joseph Fabre, Michel Piton, ALSTOM Transport; Philippe Ladoux, University of Toulouse, F

→ 15:00
Energy Saving Operation for Railway Inverter System with SiC Power Module
Tomohiro Kobayashi, Y. Nakashima, K. Kaneko, Y. Yamashita, A. Murahashi, Mitsubishi Electric, J

→ 15:30
9 kW Isolated DC-DC Converter for Hybrid Bus
Alexander Isurin, Vanner, USA

Room München
Energy Storage

Chairman:
Jean-Paul Beaudet,
SCHNEIDER ELECTRIC, F

→ 14:00
Autobus with four Minutes Recharges at the Ends of the Line
Daniel Chatroux, CEA, F

→ 14:30
Novel Voltage Balancing and Monitoring for a Stack of Electric Double Layer Capacitors
Nejat Mahdavi, Michael Kipp, Erich Riedisser, Liebherr-Elektronik; Aly Mashaly, Karl E. Brinkmann, D

→ 15:00
A Small Flywheel Energy Storage for Hybrid Cars
Jacques Laeuffer, Dtalents, F

Room Mailand
Sensorless Drives

Chairman:
Manfred Schroedl,
Vienna University of Technology, A

→ 14:00
Operating Performance of Modular Multilevel Converters in Drive Applications
Johannes Kolb, Felix Kammerer, Michael Braun, Karlsruhe Institute of Technology (KIT), D

→ 14:30
Cost-effective Implementations of Sensorless Control Strategies
Giacomo Scelba, A. Consoli, A. Gaeta, G. Scarcella, University of Catania; A. Cucuccio, D. Costanzo, L. Billè, ST Microelectronics, I

→ 15:00
Initial Rotor Position Detection in Electrically Excited Medium Voltage Synchronous Machines
Simon Feuersänger, Jose Mario Pacas, University of Siegen, D

→ 15:30 Coffee Break

→ 15:30 – 17:00 Foyer Ground Floor **Poster/Dialogue Session**

Conference Wednesday, 9 May 2012, Poster Dialogue Sessions

15:30 – 17:00, Foyer Ground Floor

Power Modules

Chairman:
Yoshiyuki Uchida,
Curamik Electronics, J

PP64 **Advanced Neutral-Point-Clamped IGBT Module**
Kosuke Komatsu, S. Okita, Y. Kobayashi, O. Ikawa, T. Fujihira, Fuji Electric, J; Thomas Heinzel, Fuji Electric Europe, D

PP65 **New Thyristor mega-Module for Megawatt-Range Frequency Converters**
Alexey Grishanin, V. A. Martynenko, A. A. Khapugin, G. M. Varyanova, Electrovipryamitel, RUS; A. Y. Baru, Scientific and Production Enterprise »EOS«, UA

PP66 **A New Generation of 1200V Intelligent Power Module for the High Power Motor Drive Applications**
Jeong-su Cho, Sungbum Park, Jun-ho Lee, Jun-bae Lee, Dae-woong Chung, LS Power Semitech, ROK

PP67 **250A/1200V Intelligent Phase Leg IGBT Power Modules in the EP3 Package for Aerospace Applications**
Serge Bontemps, Alain Calmels, Microsemi Power Module Products, F; Jeff Graham, John Neel, Fairchild Controls, USA

PP68 **Emergency Power Supply of Elevator based on DIPIPM**
Sun Jian, He Hongtao, Song Gaosheng, Mitsubishi Electric & Electronics (Shanghai); Yu Shufei, Shenyang Brilliant Elevator, CN

PP69 **Smart Module Series – A New Industrial Package Standard**
Olaf Kirsch, Infineon Technologies, D

PP70 **Latest Small Intelligent Power Module for Energy-Saving**
Tadanori Yamada, Ryu Araki, Tohru Shirawakawa, Eiji Mochizuki, Hiroyuki Ota, Fuji Electric, J; Thomas Heinzel, Fuji Electric Europe, D

PP71 **Thermal Interface – A Key Factor in Improving Lifetime in Power Electronics**
Martin Schulz, Infineon Technologies, D

PP72 **Warpage of DBC Substrates as a Function of Temperature: A Description of Systematic and Random Factors of Influence**
Alexander Legath, Curamik Electronics, D

PP73 **Improved Heat Sink Structure by Utilizing Chimney Effect**
Angel Marinov, Dimitar Bozalakov, Technical University of Varna, BG; Alex van den Bossche, University of Gent, B

PP74 **Dual Switch Quasi-Resonant (QR) Flyback Converter**
Hangseok Choi, Fairchild Semiconductor, USA

Thermal Management

Chairman:
Yasuyuki Nishida,
Chiba Institute of Technology, J

PP75 **Power Loss Measurement using a Fast and Accurate Open Calorimeter**
Jens Goettle, Daniel Kübrich, Thomas Dürbaum, University of Erlangen, D

PP76 **Implementation of a Real-Time Thermal Model for a Multichip IGBT-Module**
Jussi Karttunen, S. Kallio, P. Silventoinen, Lappeenranta University of Technology, FIN

PP77 **Current Capability Enhancement of Busbars or PCBs by Thermal Conduction**
Tao Hong, Infineon Technologies, D

PP78 **The Importance of Packaging and Second Level Interconnection in Power Electronics Applications**
Heratch Amirkhani Namagerdi, S. Oknaian, H. Shah, International Rectifier, USA

PP79 **Ultra Compact Power Module for Liquid Cooled Inverter**
Thomas Grasshoff, Peter Beckedahl, Ralf Ehler, SEMIKRON International, D

PP80 **High Thermal Conductivity Technology to Realize High Power Density IGBT Modules for Electric and Hybrid Vehicles**
Shinichiro Adachi, Fumio Nagaune, Hiromichi Gohara, Hiroki Shibata, Takahisa Hitachi, Akira Morozumi, Akira Nishiura, Fuji Electric, J; Peter Dietrich, Fuji Electric Europe, D

PP81 **A Novel SiC Power Module with High Reliability**
Yuji Iizuka, Yuichiro Hinata, Norihiro Nashida, Masafumi Horio, Yoshinari Ikeda, Fuji Electric, J

PP82 **Power Dissipation Considerations in High Precision Chip Resistors and Networks (high Temperature Applications)**
Dominique Vignolo, Vishay, F

Automotive and Aerospace Applications

Chairman:
Manfred Schlenk,
NMB-Minebea, D

PP83 **Contactless Charging System for Electric Vehicles**
Nikolay Madzharov, Anton T. Tonchev, Gabrovo University of Technology, BG; Darin N. Madzharov, Catholic University of Leuven, B

PP84 **New Transfer-mold Power Module Series for Automotive Power-Train Inverters**
Mikio Ishihara, T. Nakano, Mitsubishi Electric; K. Hiyama, K. Yamada, MELCO Semiconductor Engineering, J; T.Radke, M.Honsberg, Mitsubishi Electric Europe, D

PP85 **Grid-bound Charging of an eCar, using the Inverter**
Jürgen Rupp, Tilo Moser, Siemens, D

PP86 **A Unified Inverter//Charger for Plug-In-Hybrid Vehicles**
Fred Flett, Global Power Electronics & QUANTUM Technologies, USA

PP87 **Partial Discharges Identification and Characterization: Design Rules for Aerospace Power Electronic Systems**
Rodolphe De Maglie, Rainer Büsching, Benjamin Cella, Alfred Engler, Liebherr Electronik, D

PP88 **Optimized Design Approach for High Power DC/DC-Converters in Aerospace Applications**
Tim Hilden, Peter Jänker, EADS Deutschland; Lothar Frey, University of Erlangen, D

Renewable Energy, Energy Storage, Smart Grid I

Chairman:
Steffan Hansen,
Danfoss Solar Inverters, DK

PP89 **A hybrid HVDC Transmission Scheme for Grid Connection of offshore Wind Farms**
Florian Fein, Bernd Orlik, University of Bremen, D

PP90 **Influence of the grid Impedance on the Operating Range of n-parallel connected Inverters**
Jan Reese, Friedrich W. Fuchs, University of Kiel, D

PP91 **Advantages and Benefits of High Voltage Power Optimizers in Photovoltaic Applications**
Rosario Attanasio, N. Aiello, F. Gennaro, G. Scuderi, STMicorelectronics, I

PP92 **Effects of Shadows on Power and Reliability of PV Plants**
Nicola Femia, G. Di Capua, University of Salerno, I

PP93 **Dimming-Based Energy Management of PV-Fed LED Lighting System**
Nicola Femia, Walter Zamboni, Edoardo Cavallaro, Universiy of Salerno, I

PP94 **DC-DC Power Converter Topology for PEM Fuel Cell Large Stack Operating in Potential Cycling Mode for Embedded Applications**
Alexandre De Bernardinis, Denis Candusso, Fabien Harel, IFSTTAR; Ibrahima Diaw, ENS Cachan, F

Renewable Energy, Energy Storage, Smart Grid II

Chairman:
Daniel Chatroux,
CEA-LITEN, F

PP95 **Cell Balancing of a Multi-Cell Battery Storage System for Renewable Energy DC Micro-Grids**
Helmut Votzi, Hans Ertl, Vienna University of Technology, A

PP96 **Solar Inverter with Active Current Ripple Compensation**
Karl Edelmoser, Felix Himmelstoss, Vienna University of Technology, A

PP97 **Modeling of the Li-ion Battery Parameters and State-of-Charge Estimation for Different Driving Conditions**
Pavol Bauer, Subhadeep Bhattacharya, Delft University of Technology, NL

PP98 **The Peak Power Corrector for the Apartment Buildings**
Nikolay Dyakin, S. Dyakin, S. Volskiy, Transconverter, RUS

PP99 **Experimental Test-Bed for Investigation of multi-Storage hybrid Systems**
Thilo Bocklisch, Martin Paulitschke, Chemnitz University of Technology, D

Capacitors, Inductors, Transformers

Chairman:
Klaus F. Hoffmann,
Helmut-Schmidt-University, D

PP100 **Characterization of Equivalent Series Inductance for DC Link Capacitors and Bus Structures**
Edward Sawyer, M. A. Brubaker, T. A. Hosking, SBE, USA

PP101 **How Storage Capacitor Properties will Affect the Performance of Energy Harvester Systems**
Tomas Zednicek, AVX Czech Republic, CZ

PP102 **An Accurate Method for Measuring Capacitor ESL**
Steve Sandler, Picotest.com, USA

PP103 **A new Technology for Ceramic Power Capacitors**
Günter Engel, Markus Koini, Jürgen Konrad, Michael Schossmann, EPCOS, A

PP104 **Modeling Inductors in Frequency Domain Considering Different Flux Densities for Optimized Control Design in Terms of Efficiency and Stability**
Dennis Kampen, BLOCK-Transformatoren-Elektronik; Nejila Parspour, University of Stuttgart, D

PP105 **Nonlinear Power Inductors for Large Current Crest Factors**
Alexander Stadler, Tobias Stolzke, Christof Gulden, STS Spezial-Transformatoren-Stockach, D

PP106 **Analytical Calculation of the Current Sharing in Copper Coils with Parallel Windings**
Anne-Christine Leicht, M. Albach, M. Spang, D. Kübrich, University of Erlangen, D

PP107 **Integration of high Power Planar Transformers**
Koen Hollevoet, Rogers Corporation, B; Danny Ireland, Himag Solutions, UK

PP108 **New Passive Filter for PWM Based Devices**
Valentin Dzhankhotov, Mikko Pääkkönen, The Switch Drive Systems; Juha Pyrhönen, Lappeenranta University of Technology, FIN

System Reliability

Chairman:
Christopher A. Soule,
Thermshield, USA

PP109 **Arbitrary Load Profile Emulator Based on µC Controlled Switchable Resistor Network**
Christian Oeder, T. John, T. Dürbaum, University of Erlangen, D

PP110 **Influence Measurement of Time Shifting of IGBT Current and Voltage Signals during Switching Process**
Ole Binder, M. Kurrat, Technical University of Braunschweig; J. Meisner, M. Schmidt, Physikalisch-Technische Bundesanstalt, D

PP111 **Impedance Characterization of Gate Drive Circuits for Silicon-Carbide Field-Effect Transistors**
Michael Meisser, Karsten Hähre, Karlsruhe Institute of Technology, D

PP112 **Fault Tolerant Electric Power Steering System with Multi-Functional Converter Drive Using Two-Phase Operation**
Thomas Hackner, Johannes Pforr, UAS Ingolstadt, D

PP113 **New Design and Evaluation of a Fully Integrated PCB Dual-switch Fuse – Energetic Materials Assisted. Application for New Fail-safe Converters**
Zhifeng Dou, Frederic Richardeau, Emmanuel Sarraute, Vincent Bley, Jean-Marc Blaquiere, University of Toulouse; Claire Vella, Gilles Gonthier, SAFRAN, F

PP114 **Reliability of Power Semiconductor Modules Combining Active and Passive Temperature Cycling**
Jens Goehre, Stefan Schmitz, Martin Schneider-Ramelow, Klaus-Dieter Lang, Fraunhofer IZM, D

PP115 **Laboratory Setup for Power Cycling of IGBT Modules with Monitoring of ON-State Voltage and Thermal Resistance for State of Aging Detection**
Matthias Böttcher, Marco Paulsen, Friedrich W. Fuchs, University of Kiel, D

PP116 **Active Self-Calibration of Samples According Vce(T)-Method in Advance of Power Cycling Tests**
Marco Bohlländer, Sebastian Hiller, Chemnitz University of Technology, D

Sensors

Chairman:
Wolfram Teppan,
LEM, CH

PP117 **A Precise and Robust Three Phase Current Sensor Module with a Special Digital Modulated Interface**
Abdoulkarim Bouabana, Constantinos Sourkounis, Ruhr University Bochum, D

PP118 **Split Core Closed Loop Hall Effect Current Sensors and Applications**
Yixiao Wang, Ji-Gou Liu, Jing Zhao,Yongcai Yang, ChenYang Technologies, D

PP119 **Resolver Based Position Sensing in Automotive Applications**
Bernhard Frenzel, Peter Kurzweil, UAS Amberg; Nejila Parspour, University of Stuttgart, D

PP120 **Two Wire Position Signal Conversion for Brush-less DC Motors**
Angel Marinov, Emilian Bekov, Technical University of Varna, BG; Alex van den Bossche, University of Gent, B

PP121 **Parameter Optimization of Hall Effect Gear Tooth Speed Sensors**
Junwen Lu, Ji-Gou Liu, Zhe Zheng; ChenYang Technologies, D; Yunfei Mai, University of Shanghai for Science and Technology, CN

PP122 **PVDF Based Rain Sensor for Weather Assessment Relevant to Renewable Energy Sources**
Emilian Bekov, Angel Marinov, Vencislav Valchev, Technical University of Varna, BG

Conference Thursday, 10 May 2012

Room Paris
→ 08:45
KEYNOTE:
Grid Integration of Renewables
Speaker: Frede Blaabjerg, Aalborg University, DK
Chairman: Friedrich W. Fuchs, Christian-Albrechts-University of Kiel, D

More information on page 19

→ 09:30 Coffee Break

Room Paris
SPECIAL SESSION »E-Mobility – Battery Chargers«

Chairman:
Enrique Dede,
University of Valencia, E

→ 10:00
Advantages and Challenges of Contact less Charger
Rainer Knorr, Siemens, D

→ 10:30
A general Overview of the Need of the Charging Infrastructure and its Integration in the Smart Grids
Michael Tiegelkamp, Siemens, D

→ 11:00
DC Charging of Electric Vehicles – The Combined (Combo) Charging System as Universal Solution
Robert Weber, BMW, D

→ 11:30
Batteries and SMART Battery Management
Martin März, Fraunhofer-IISB, D

→ 12:00
High Power DC Chargers for eMobility: Topologies, Requirements and Interconnectivity
José Miguel Magraner, GH Electrotermia, E

Room London
High Power Converters

Chairman:
Philippe Ladoux,
University of Toulouse, F

→ 10:00
Potential of Two-Level and Three-Level Inverter Techniques for Medium Power Inverter Applications
Marc-André Ocklenburg, Siemens, D

→ 10:30
Soft Switching Characterization of a 6.5 kV IGBT for High Power LLC Resonant DC-DC Converter
Drazen Dujic, Gina Steinke, E. Bianda, F. Canales, ABB Corporate Research; S. Lewdeni-Schmid, C. Zhao, J. Steinke, ABB Power Electronics, CH

→ 11:00
The Hybrid Multilevel Converter: A New Voltage Source Converter Topology for Improved Efficiency
Ralph Niederer, Vivatec, CH

→ 11:30
Modular Multilevel Shunt Reactive Compensator: a Viable Solution for Flicker Mitigation
Gianluca Postiglione, G. Borghetti, G. Torre, A. Piccoli, M. Perna, F. Punghellini, Ansaldo Sistemi Industriali, I

→ 12:00
Modular Multilevel Converters with Reverse-Conducting IGBT
Hans-Günter Eckel, Daniel Wigger, University of Rostock, D

Room Amsterdam
New Materials for Power Electronics

Chairman:
Eric Carroll,
EIC Consultancy, F

→ 10:00
Novel Silver Contact Material for Applications on DCB
Yvonne Löwer, Heraeus Materials Singapore, SGP; Thomas Krebs, Susanne Duch, Sebastian Fritzsche, Wolfgang Schmitt; Heraeus Materials Technology, D

→ 10:30
Optimizing Thermal Interface Material for the Specific Needs of Power Electronics
Martin Schulz, Infineon Technologies; Wilhelm Pohl, Hala Contec, D; Scott T. Allen, Henkel, USA

→ 11:00
Silicon Nitride Substrates for Power Electronics
Manfred Goetz, Nico Kuhn, Bernd Lehmeyer, Andreas Meyer, Curamik Electronics, D

→ 11:30
A new Concept for a Bimetal Al-Cu Clad IGBT Base Plate for Automotive Applications
Andre Uhlemann, Alexander Herbrandt, Infineon Technologies, D

→ 12:00
New Generation of Silicone Gels for Power Devices Encapsulation
Eric Vanlathem, Dow Corning, B; Hiroji Enami, Dow Corning Toray, J; D. S. Hyun, Dow Corning Corporation, USA

Room Mailand
Control Techniques in Intelligent Motion Systems

Chairman:
Jose Mario Pacas,
University of Siegen, D

→ 10:00
Parameter Sensitivity of Extended Adaptive Observer for the Encoderless Identification of Two-Mass-Systems
Henning Zoubek, Jose Mario Pacas, University of Siegen, D

→ 10:30
Optimization of the Passive Components of the Modular Multilevel Matrix Converter for Drive Applications
Felix Kammerer, Johannes Kolb, Michael Braun, Karlsruher Institut für Technologie (KIT), D

→ 11:00
Dynamic Behaviour and Efficiency of Multimotor Drives for Electric Vehicles using MHF-Converters
Martin Schulz, Lukas Lambertz, Anna Mayer, Rainer Marquardt, University of the Federal Armed Forces Munich, D

→ 11:30
A Strategy for Suppressing Residual Vibrations in Motion Control
Loay Alkafafi, Carsten Hamm, Siemens; Tomas Sauer, Justus-Liebig-University Gießen, D

→ 12:00
Advanced Models for Non-linear Multi-variable Model-based Control
Carsten Hamm, Siemens, D

→ 12:30 Lunchbreak

Room Paris
New Wide Bandgap Devices

Chairman:
Stefan Linder,
ABB Switzerland, CH

→ 14:00
Depletion-Mode SiC VJFET Simplifies High Voltage SMPS
Nigel Springett, Robin Schrader, Jeff Casady, Semisouth Laboratories, USA

→ 14:30
1200 V, 450 A Power Module with 36 mm² of SiC VJFET Area
Kevin M. Speer, Robin Schrader, David C. Sheridan, Jeffrey B. Casady, SemiSouth Laboratories; Jim Gafford, Chris Parker, Michael S. Mazzola, Mississippi State University, USA

→ 15:00
1,7kV Hybrid SiC Power Module With Large Current Capacity and Low Power Loss
Shigeru Hasegawa, K. Morishita, S. Iura, K. Kurachi, I. Umezaki, H. Yamaguchi, Y. Matsuno, T. Harada, H. Watanabe, Y. Nakayama, T. Miki, M. Iwasaki, T. Oi, T. Oomori, H. Sumitani, Mitsubishi Electric; Y. Hayashida, Melco Semiconductor Engineering, J; E. Stumpf, Mitsubishi Electric Europe, D

→ 15:30
A Class D Audio Amplifier as an Application for Silicon Carbide Switches
Verena Grifone Fuchs, C. Wegner, S. Neuser, M. Schröder, D. Ehrhardt, University of Siegen, D

Room London
Wire Bonds in Power Modules

Chairman:
Martin März,
Fraunhofer Institute for Integrated Systems and Device Technology (IISB), D

→ 14:00
A Measure on the Effect of Aluminium Reconstruction and Bond Wire Lift off in Power Semiconductor Modules
Tien Anh Nguyen, P.-Y. Joubert, S. Lefebvre, G. Chaplier, SATIE; Serge Bontemps, Microsemi PMP, F

→ 14:30
Large Cu Wire Wedge Bonding on Wafers with Cu Pad Metallization
Jamin Ling, Tao Xu, Christoph Luechinger, Kulicke & Soffa Industries, USA; Petra Backus, Oliver Worm, Atotech Deutschland, D

→ 15:00
Al-Cladded Cu Wire Bonds Multiply Power Cycling Lifetime of Advances Power Modules
Uwe Scheuermann, R. Schmidt, SEMIKRON Elektronik; E. Milke, Heraeus Materials Technology, D

→ 15:30
Novel Cu-bond Contacts on Sintered Metal Buffer for Power Module with Extended Capabilities
Jacek Rudzki, Frank Osterwald, Danfoss Silicon Power; Martin Becker, Ronald Eisele, UAS Kiel, D

Room Amsterdam
High Power Devices

Chairman:
Gourab Majumdar,
Mitsubishi Electric, J

→ 14:00
3.3 kV High Speed IGBT Module For Bi-directional and Medium Frequency Application
Masashi Shinagawa, Takashi Waga, Yoshiaki Toyota, Yasushi Toyoda, Katusaki Saito, Hitachi Europe, UK

→ 14:30
StakPak IGBT Press-Packs for the Industrial Market
Franc Dugal, Evgeny Tsyplakov, Liutauras Storasta, Thomas Clausen, ABB Switzerland, CH

→ 15:00
Short-Circuit Behaviour of High-Voltage IGBTs in Circuits with di/dt Snubbers
Thomas Basler, Josef Lutz, Chemnitz University of Technology; T. Brückner, R. Jakob, P. Sadowski, G. Junge, Converteam, D

→ 15:30
1700 V Reverse-Blocking IGBTs with V-Groove Isolation Layer for Multi-Level Power Converters
David H. Lu, Masaaki Ogino, Tohru Shirakawa, Haruo Nakazawa, Yoshikazu Takahashi, Fuji Electric, J

Room Mailand
SPECIAL SESSION »FPGAs in Intelligent Motion II«

Chairman:
Frede Blaabjerg,
Aalborg University, DK

→ 14:00
High Fidelity Hybrid Hardware-in-the-Loop Simulator with FPGA and Processor for AC Locomotive Drives
Meng Sun, Joachim Böcker, Zhiyu Cao, University of Paderborn, D; Laisheng Tong, Huanqing Zou, CSR Zhuzhou Electric Locomotive, CN

→ 14:30
Boosting Dynamics of ac Machines by Using FPGA Based Controls
Oleg Buchholz, Joachim Böcker, University of Paderborn, D; Shashidhar Mathapati, Delta Energy Systems, D

→ 15:00
Efficient Space Vector PWM Scheme for Multi-Level Inverters
Markus Höltgen, Jens Onno Krah, UAS Cologne; Ingo Staudt, SEMIKRON Elektronik, D

→ 15:30
A Novel and Flexible Test Stand for Medium Voltage Drives Using a Hardware-in-loop (HIL) Simulator
Weihua Wang, Jean Bélanger, Christian Dufour, Opal-RT Technologies, CDN; Ata Douzdouzani, ABB Switzerland, CH

General Information

Venue
The seminars on Sunday 6 May 2012 and the tutorials on Monday 7 May 2012 will take place at Arvena Park Hotel, Görlitzer Str. 51, 90473 Nuremberg, phone: +49-911-89220

The conference from Tuesday 8 May until Thursday 10 May 2012 will take place at Congress Center West/Mitte NürnbergMesse, Otto-Bärnreuther-Strasse, 90471 Nuremberg

Accommodation and Travel
Hotel Information
For hotel booking please contact the hotel directly.

PCIM Europe Head Quarter Hotel
Hotel Arvena Park
Görlitzer Str. 51
D-90473 Nuremberg
Tel: ++49 911 89 22 0
Fax: ++49 911 89 22 115
eMail: info@arvenapark.de
3 min. by underground U1 to the conference site.
For more travel and hotel information please visit www.pcim.de

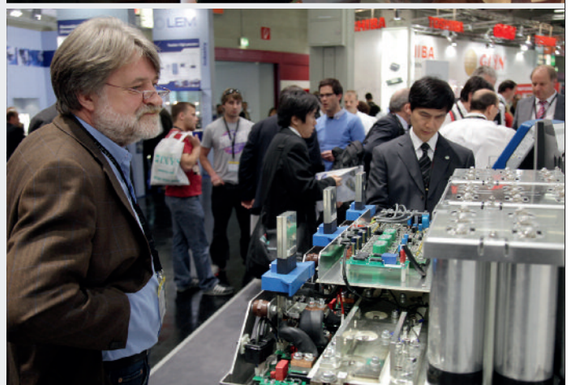
Registration Counter Opening hours
Arvena Park Hotel
Sunday 6 May 2012 from 13.00 until 17.00
Monday 7 May 2012 from 8.00 until 14.00
CCN West NürnbergMesse
Monday 7 May 2012 from 16.00 until 18.00
8 – 10 May 2012 from 8.00 until 17.00

Questions?
Please contact
Ms. Bianca Steinmetz

phone: +49 711 61946-29
bianca.steinmetz@mesago.com
for any question you might have concerning your registration or participation in the conference.

Parallel event
smthybrid**packaging**

The SMT Hybrid Packaging Exhibition and Conference – Europe's largest event on system integration in micro electronics is held in parallel to PCIM Europe.
Visiting SMT Hybrid Packaging is free of charge for visitors of PCIM Europe. **www.smt-exhibition.com**



Registration Information

Registration Terms
Registration for the PCIM Europe Seminars, Tutorials and the Conference from 6–10 May 2012 is binding and only accepted online at **www.pcim.de**. Participation fees are due on registration with payment by credit card (VISA, Master/Euro Card and Amex) via the Saferpay gateway. An invoice for the fees will be issued by mail.
Once the registration process is complete, you will receive an email booking confirmation. Please make sure to bring this along. Your conference documents will be issued on site at the conference counter.
Cancellations will be accepted in writing only. Cancellations received by Mesago by 19 April 2012 will incur a processing fee of 80 EUR. Thereafter if the participant does not attend, the full fee will be due. If a participant is unable to attend, a substitute can be nominated.
Mesago reserves the right to cancel the conference/tutorials/seminars due to poor bookings or other reasons beyond our control. No further claims beyond the reimbursement participation fees already paid will be accepted. The program or speakers are subject to change and no claims may be made in this respect.
The conference language is English.

Payment of fees entitles you to the following services:
→ Conference:
Participation at the conference days as booked, proceedings, free admission to the exhibition (3 day ticket worth 44.00 EUR), exhibition catalogue, lunch and entry to the get together on 8 May 2012.
→ Seminars/Tutorials:
Participation at the seminars/tutorials booked, printed course documentation, free admission to the exhibition (3 day ticket worth 44.00 EUR), exhibition catalogue, lunch (tutorial only) and entry to the get together on 8 May 2012.

To register please go to www.pcim.de

Registration Fees

	Until 3 April 2012	From 4 April 2012
These are per named delegate as follows:		
One Conference Day	590 €	690 €
Two Conference Days	990 €	1,090 €
Three Conference Days	1,190 €	1,290 €
Tutorial Full Day	690 €	790 €
Seminar Half Day	300 €	350 €
University Staff*	850 €	850 €
Students	40 % Discount	40 % Discount
Exhibitor special rate**	50 €	50 €

* 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 can not be combined with the University Staff fee. Please contact Ms. Bianca Steinmetz at Bianca.steinmetz@mesago.com for registration.
** a transferable ticket valid for the three keynote presentations is only available to PCIM Europe 2012 exhibitors. A special registration code is required.

On-site registration: please add 30 EUR per participant.
All fees plus 19 % VAT

Exhibition

Find topics and solutions discussed at the conference live at the exhibition grounds.

The PCIM Europe exhibition brings power electronics together with all the relevant user industries, including intelligent motion, energy efficiency, power quality, renewable energies and e-mobility. This is where the European user market gathers to find the latest information on products and solutions from the field of power electronics. The show is the meeting point for product and system designers, R & D managers, corporate managers and purchasers with the highest expertise and decision making powers.

Exhibition highlights

→ **Compact and comprehensive forum program**
Over 50 technical presentations by well known and new exhibitors on recent trends in technology – free of charge.

→ **Panel discussions with experts from industry and science**
Experienced experts from leading companies discussing the topics that drive the industry.

→ **ECPE pavilion**
The European Center for Power Electronics (e.V.) combines research and industry.

→ **Jobs forum**
Whether freshly qualified or experienced and seeking a new career opportunity, the jobs forum offers support to everyone working in the field of electronics.

Facts and Figures

Exhibitors: 310 companies from 26 countries
Exhibition space: 14,500 sqm
Visitors: approx. 7,000 trade visitors from more than 40 countries are expected.

List of Exhibitors

A Media – Bodo Power Systems, D
Aavid Thermalloy, I
ABB France, F
ABB Switzerland Ltd. Semiconductors, CH
Acal BFi Germany GmbH, D
ACC Silicones Ltd, GB
AEROVOX Corp., USA
Agilent Technologies Sales & Services GmbH & Co. KG, D
AGS Media Group – Power Systems Design Europe, USA
AIC EUROPE elektronische Bauteile GmbH, D
AISMALIBAR, E
AixControl GmbH Ges. für leistungselektronische Systemlösungen mbH, D
ALCON Electronics Private Ltd, IND
Alpha, GB
Alpha and Omega Semiconductor, USA
ALPHA-Numerics GmbH, D
alpitronic GmbH, I
alutec Metallwaren GmbH & Co.KG, D
Alutronic Kühlkörper, D
Amantys Ltd., GB
AMS Technologies AG, D
Analog Devices GmbH, D
Analog Devices Ltd., GB
ANSYS Germany GmbH, D
Arcel, F
Arcotronics GmbH (Kemet), D
austerlitz electronic gmbh, D
AUXEL FTG, F
Avago Technologies GmbH, D
AVX Corporation, GB
AVX Limited, GB
Behrens KG, Arthur, D
The Bergquist Company GmbH, D
BHC Components Ltd. (KEMET), GB
Bicron Electronics Company, USA
Biricha Digital Power, GB
BLOCK Transformatoren-Elektronik GmbH, D
Blume Elektronik Distribution GmbH, D
Robert Bosch GmbH, D
BROXING SA, CH
BSAB Elektronik GBR, D
CADFEM GmbH, D
Calogic LLC, USA
CapXon Europe GmbH, D
CEFEM GROUPE, F
CeramTec GmbH, D
Chang Sung Corporation, ROK
CKE Products by Dean Technology Inc., USA
COILCRAFT, GB
Constellium, D
Contrinex GmbH, D
cool tec Electronic GmbH, D
COOLTECH S.r.l., I
CPS Technologies Corporation, USA
Cree Inc., USA
CT-Concept Technologie AG, CH
curamik electronics GmbH, D
Danfoss Silicon Power GmbH, D
Danotherm Electric A/S, DK
dataTec GmbH, D
Datatel Elektronik GmbH, D
DAU GmbH & Co. KG, A
Dean Technology, Inc., USA
Denka Chemicals GmbH, D
DERBIO, I
DETAKTA Isolier- und Meßtechnik GmbH & Co.KG, D
DEWETRON GmbH, D
DFA Media Ltd. Power Electronics Europe, GB
Diotec Semiconductor AG, D
DONGBU Fine Chemicals, ROK
Dongbu HiTek, ROK
DOWA HD Europe GmbH, D
DUCATI energia S.p.A., I
Dynetics, D
Dynex Semiconductor Ltd., GB
EA Elektro-Automatik GmbH &Co.KG, D
EBG RESISTORS, A
EBV Elektronik GmbH & Co. KG, D
ECPE European Center for Power Electronics e.V., D
ELDIS Ehmki & Schmid oHG, D
Eldre SAS, F
Electronic Concepts, IRL
ELECTRONICON Kondensatoren GmbH, D
ELECTROVIPRYAMITEL, RUS
Endrich Bauelemente Vertriebs GmbH, D
ENMATEK, CN
EPCOS AG A Member of TDK-EPC Corporation, D
EpiGaN, B
EUROCOMP ELEKTRONIK GMBH, D
EVOX RIFA, FIN
F.E.EM. SAS, I
Fachhochschule Kiel, D
Fairchild Semiconductor, D
FERROXCUBE DEUTSCHLAND GmbH, D
Filcap GmbH, D
Finepower GmbH, D
Fischer & Tausche Capacitors, D
Fischer Elektronik GmbH & Co. KG, D
Flir Systems GmbH, D
FlowCAD EDA-Software Vertriebs GmbH, D
Flux A/S, DK
Fraunhofer IISB, D
Fraunhofer IZM, D
Fraunhofer ISIT, D
Freicomp GmbH, D
Friedrich-Alexander-Universität Nürnberg-Erlangen Lehrstuhl FAPS, D
FRIZLEN, D
Fuji Electric Europe GmbH, D
Fujipoly Europe Ltd. c/o Nucletron Technologies GmbH, D
GED Gesellschaft für Elektronik und Design mbH, D
Gemballa Electronics GmbH & Co. KG, D
Georg-Simon-Ohm-Hochschule Nürnberg, Institut für Elektro- nische Systeme ELSYS, D
GINO AG-Elektrotechnische Fabrik, D
GLYN GmbH & Co. KG, D
GM2 Publicaciones Ténicas, S.L., E
GMC-I Messtechnik GmbH, D
GvA Leistungselektronik GmbH, D
HAHN GmbH & Co. KG, D
Hangzhou Xenbo Electric Co., Ltd, CN
Götz-Udo Hartmann GmbH & Co. KG, D
Hauber & Graf Electronics GmbH, D
HÄUSERMANN GmbH, A
HE System Electronic GmbH & Co. KG, D
HEIDEN power GmbH, D
HEINE Resistors GmbH, D
Heraeus Materials Technology GmbH & Co. KG, D
Hesse & Knipps GmbH, D
High Voltage Power Solutions Products by Dean Technology Inc., USA
Himag Solutions Ltd. Unit A The Aquarius Centre, GB
Hitachi AIC Inc., J
Hitachi Europe Ltd., GB
Hitachi-Metals-Europe GmbH, D
Hoffmann & Co Elektrokohle AG, A
Höganäs, S
HolyStone (Europe) Limited, GB
Huawei Electronic Co., Ltd., TW
HV Components Associates Products by Dean Technology Inc., USA
HVC-Technologies GmbH Büro München, D
HVP High Voltage Products GmbH, D
HVR International GmbH, D
HY-LINE Power Components Vertriebs GmbH, D
ICAR S.P.A., I
IDEALEC, F
Ineltron GmbH Gesellschaft für Industrie-Elektronik, D
Infineon Technologies AG, D
InPower Systems GmbH, D
International Rectifier, D
iQXPRZ Power Inc, RP
Isabellenhütte, D
ISAHAYA Electronics Corporation, J
Iskra MIS d.d., SLO
ITELCOND s.r.l., I
IXYS Semiconductor GmbH, D
JIANGHAI EUROPE Electronic Components GmbH, D
Junior Kühlkörper GmbH, D
Kaschke Components, D
KCC Corporation (AM Department), ROK
KEMET Electronics Corp., USA
KEMET Electronics GmbH, D
KENDEIL, I
KERAFOL Keramische Folien GmbH, D
KOA Europe GmbH, D
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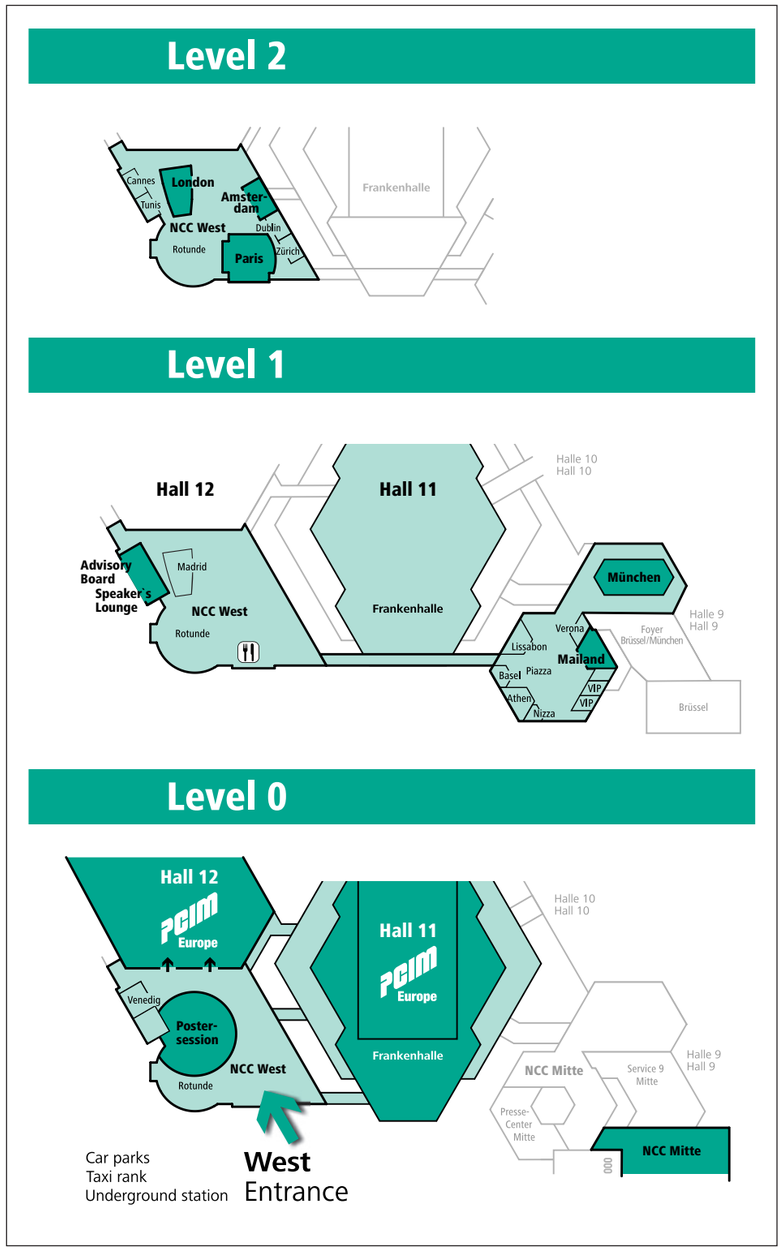

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