

International Exhibition and Conference for Power Electronics, Intelligent Motion and Power Quality 2010

(PCIM Europe 2010)

**Nuremberg, Germany
4-6 May 2010**

Volume 1 of 2

ISBN: 978-1-61738-967-2

Printed from e-media with permission by:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571



Some format issues inherent in the e-media version may also appear in this print version.

Copyright© (2010) by Mesago PCIM GmbH
All rights reserved.

Printed by Curran Associates, Inc. (2010)

For permission requests, please contact Mesago PCIM GmbH
at the address below.

Mesago PCIM GmbH
Rotebuehlstrasse 83-85
70178 Stuttgart Germany

Phone: 49 711 619 460
Fax: 49 711 619 4690

info@mesago.com

Additional copies of this publication are available from:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571 USA
Phone: 845-758-0400
Fax: 845-758-2634
Email: curran@proceedings.com
Web: www.proceedings.com

TABLE OF CONTENTS

VOLUME 1

KEYNOTES

Energy Storage: State of the Art and Future Trends	1
<i>Dirk Uwe Sauer</i>	
HVDC Light Can Deliver 1,100 MW	2
<i>Björn Jacobson</i>	
Towards Virtual Prototyping and Comprehensive Multi-Objective Optimisation in Power Electronics.....	5
<i>J. Biela, J.W. Kolar, A. Stupar, U. Drofenik, A. Muesing</i>	

APPLICATION OPTIMIZED SWITCHES

650v IGBT4: The Optimized Device for Large Current Modules with 10 µs Short Circuit Time.....	28
<i>Andreas Härtl, Marco Bässler, Martin Knecht, Peter Kanschat</i>	
A New IGBT Family Optimised for High Switching Speed	32
<i>Holger Hüskens, Davide Chiola, Thomas Kimmer</i>	
A New 1200V IGBT Module for High Switching Frequency Applications.....	38
<i>Taku Takaku, Shunta Horie, Shogo Ogawa</i>	
High Efficiency and Ease-of-use with a New Generation of Superjunction Devices	43
<i>W. Kaindl, H. Kapels, W. Jantscher, A. Steiner, F. Stückler, U. Kirchner</i>	

DIGITAL POWER AND ENERGY EFFICIENCY

Reducing Standby Energy Consumption of Consumer Electronic Applications to Virtually Zero.....	49
<i>Carsten Deppe, Georg Sauerländer</i>	
0W PC – New Opportunities for Energy Saving.....	55
<i>Willi Sterzik, Peter Busch</i>	
Zero Power Platform.....	60
<i>Daniel A. Lüthi</i>	
New Cost-effective Measuring Method for Bridgeless PFC Converter.....	64
<i>Wenqi Zhou, Manfred Reddig, Manfred Schlenk</i>	
IGBT Module with Integrated Current Measurement Unit Using Sigma-Delta Conversion for Direct Digital Motor Control.....	70
<i>Ulrich Schwarzer, Andre Arens, Martin Schulz</i>	

HIGH POWER CONVERTERS

Low Inductance – Low Temp Rise DC Bus Capacitor Properties Enabling the Optimization of High Power Inverters.....	75
<i>Edward Sawyer</i>	
A High Current Pulse-Power Supply for Flash Lamps in PV-panel Measurement-Facilities	81
<i>D. El Hage, Y. Birbaum, A. Rufner</i>	
High Power Density Three-Phase AC-DC 48V Power Supply.....	88
<i>Andrea Romanelli, Alessandro Lidozzi, Luca D'Errico, Luca Solero</i>	
Control of a Multilevel Modular DC/DC Converter for Mobile Applications.....	94
<i>Daniel Montesinos-Mircale, Oriol Gomis-Bellmunt, Antoni Sudrià-Andreu, Alfred Rufner</i>	

SENSORLESS DRIVES I

Sensorless Motor Drives in Industrial Applications	98
<i>Mario Pacas</i>	
Sensorless Control of PM Synchronous Machines in the Whole Speed Range Using a Novel Load Torque Observer and a Combined Inform/EMF-Model.....	104
<i>Wolfgang Staffler, Manfred Schrödl</i>	

Specific Features of Position-Sensorless Methods on Synchronous Linear Motors	111
<i>Roberto Leidhold, Peter Mutschler</i>	
An Analysis of the Position Measurement by HPI Method on the Axial Flux Permanent Magnet Motor	117
<i>Janusz Wisniewski, Piotr Dobron, Włodzimierz Koczara</i>	

POWER ELECTRONICS FOR EFFICIENT INVERTERS IN RENEWABLE ENERGY APPLICATIONS

Comparison of High Power Semiconductor Technologies for Renewable Energy Sources	124
<i>Björn Backlund, M. Rahimo</i>	
High Power Renewable Energy Applications, State-of-the-Art & New Design Proposals	129
<i>Dejan Schreiber</i>	
(GaN)-Based Power Device Technology and Its Impact on Future Efficient Solar Grid Connected Micro-Inverters, Power Optimizers and String Inverters.....	135
<i>Alberto Guerra, Jason Zhang</i>	
New Low Loss Transfer Mold IPM for Photovoltaic Generation.....	142
<i>Ming Shang, Hirofumi Oki, Kazuhiro Kuriaki, Toru Iwagami, Toshiya Nakano</i>	

THERMAL ASPECTS IN POWER SYSTEMS

Reduction of Conductor Lead Resistance in High Current Power Modules	147
<i>Samuel Hartmann, Dominik Trüssel, Daniel Schneider, R. Schnell</i>	
Thermal Characterization of Multi-die IC Products	152
<i>Lawrence Durfee</i>	
Power Electronics Module with Integral Micro-Channel Heatsink	153
<i>Ljubisa Stevanovic, Adam Pautsch, Richard Beaupre, Arun Gowda, Juan Sabate, Stephen Solovitz</i>	
Compact PCB-Packaging and Water Cooling of a 25-kW Inverter	159
<i>A. Munding, M. Thoben, T. Hong, M. Nold, M. Kerkhoff, E. Mongui, S. Lutz</i>	

POWER ELECTRONICS IN ENERGY GENERATION AND DISTRIBUTION

Modelling and Control of a DC/DC-Converter System for Fuel Cell – Direct Storage – Hybrid Units	165
<i>Thilo Bocklisch, René Warsitz, Karel Besorna, Martin Paulitschke, Wolfgang Schufft, Steffen Bocklisch</i>	
Methodical Design of Inductive Power Transmission Systems	171
<i>Daniel Kürschner, Christian Rathge, Axel Hoppe</i>	
Inverters As Smart Grid Interface – Standardized Feeding Modes for Different Distributed Generation Units and Grid Requirements.....	177
<i>M. Lingemann, E. Ortjohann, A. Schmelter, W. Sinsukthavorn, S. Jaloudi, P. Wirasanti</i>	
A Fuel-Cell Model Emulator, Including Temperature Effects	183
<i>V. Boscaino, G. Capponi, F. Marino</i>	

SENSORLESS DRIVES II

The Dynamics of Sensorless BLDC (PMSM) Drive Operation.....	189
<i>Charles Raskin</i>	
Sensorless Control for PMSM Using an 8bit Microcontroller and DC-Link Current Measurement	196
<i>M. Förster, G. Berger, J. Petzold, A. Rabenstein</i>	
Integrated Implementation of Multiple AC Motor Control and Two Phase Interleaved Power Factor Correction System Using Single Low Cost Microcontroller for HVAC Applications	201
<i>Bilal Akin, Manish Bhardwaj, Nene Hrishikesh, Brett Larimore</i>	
Position Sensorless MTPA Control for High-Speed IPMSM Drive Using Simple Expression of q-axis Inductance as Function of Rotor Speed	208
<i>Takashi Kosaka, Shoichiro Tanaka, Ju-Suk Lee, Sun-Kyong Lim, Nobuyuki Matsu</i>	

MODULE DESIGN

A New 1.7 kV CSTBTTM(III) for the Next Generation Power Module	214
<i>Kenji Suzuki, Tetsuo Takahashi, Ryoichi Fujii, Koichi Tsurusako, Yoshifumi Tomomatsu</i>	

New Assembly and Interconnects Beyond Sintering Methods	219
<i>Karsten Guth, Dirk Siepe, Jens Görlich, Holger Torwesten, Roman Roth, Frank Hille, Frank Umbach</i>	
New Module Generation for Higher Lifetime	225
<i>Alexander Ciliox, Jens Görlich, Karsten Guth, Frank Hille, Sandra Krasel, Piotr Luniewski, Dirk Siepe, Piotr Szczupak, Frank Umbach</i>	
Design Strategies for Stray Inductance Optimized Wire-Bond Power Modules	231
<i>Ole Mühlfeld, W.-Toke Franke, Friedrich W. Fuchs</i>	
Design of IGBT Module Packaging for High Reliability	236
<i>Yoshitaka Nishimura, Kazunaga Oonishi, Fumihiko Momose, Tomoaki Goto</i>	

HIGH POWER DENSITY DESIGN

New Module Concepts Exclusively Built with Low Temperature Joining Technique for Single and Double-Sided Cooling	242
<i>Elisabeth Schulze, Christian Mertens, Andreas Lindemann</i>	
Integrated Base Plate (IBP) Power Modules Using Novel Metalized Ceramic Substrates and Sputtered Thick Coating (STC) Technology	248
<i>Youngpyong Kim, Hunchang Im, Dongkeun Jang, Youngmo Kim, Kabseog Kim</i>	
Small Size, Low Thermal Resistance and High Reliability Packaging Technologies of IGBT Module for Wind Power Applications	254
<i>K.Sasaki, M.Hiyoshi, K.Horiuchi</i>	
High Cell-Density, Shielded-Gate Power MOSFET for Improved DC-DC Converter Efficiency	260
<i>Ashok Challa, Jon Gladish, Steven Sapp, Chris Rexer</i>	
SMT High Power Density Construction of Industrial, Automotive and Lighting Electronics	265
<i>I. Josifovic, J. Popovic-Gerber, J.A. Ferreira, M. Stadler</i>	

HIGH SPEED SWITCHING APPLICATIONS

1200 V 6 A SiC BJTs with Very Low V_{CESAT} and Fast Switching	274
<i>M. Domeij, A. Lindgren, C. Zaring, A. O. Konstantinov, J.-O. Svedberg, K. Gummelius, I. Keri, H. Grenell, M. Östling, M. Reimark</i>	
Characteristics of A 1200 V, 550 A SiC DMOSFET Dual Module	280
<i>Robert A. Wood, Thomas E. Salem</i>	
CASCODE LIGHT – Normally-on JFET Stand Alone Performance in a Normally-Off Cascode Circuit	286
<i>Daniel Domes, Xi Zhang</i>	
1700 V Enhancement-Mode SiC VJFET for High Voltage Auxiliary Flyback SMPS	291
<i>Robin Kelley, Gray Stewart, Andrew Ritenour, Vlad Bondarenko, David C. Sheridan</i>	
A Hard Switching VIENNA Boost Converter for Characterization of AlGaN/GaN/AIGaN Power DHFETs	296
<i>Jordi Everts, Pieter Jacqmaer, Ratmir Gelagaeve, Jeroen Van den Keybus, Jo Das, Marianne Germain, Johan Driesen</i>	

ADVANCED CONTROL IN DRIVES

Sensorless Controller for the Purpose of Wear Reduction by Active Vibration Damping for Three-Phase Drives	302
<i>Ulrich Beckert, André Warschofsky</i>	
High Speed Digital Direct Current Controllers – A New Class of Intelligent Controllers for Future Needs	308
<i>Jens Baumeister, Ansgar Ackva, Harald Wießmann</i>	
Fast and High Precision Motor Control for High Performance Servo Drives	313
<i>Christoph Klarenbach, Jens Onno Krah</i>	
Mosolver™-Implementation	321
<i>Donald Labriola</i>	

RELIABILITY OF COMPONENTS

Comparison of the Power Cycling Stress Between IGBT and BiGt Inverters	325
<i>Daniel Wigger, Hans-Günter Eckel</i>	

Impact of Test Control Strategy on Power Cycling Lifetime	331
<i>S. Schuler, U. Scheuermann</i>	
Power Electronics Reliability - The Materials Behaviour is the Key	337
<i>Max H. Poech</i>	
Study of Ageing of the Metallization Layer of Power Semiconductor Devices	343
<i>S. Pietranico, S. Pommier, S. Lefebvre, Z. Khatir, S. Bontemps, E. Cadel</i>	

INTERLEAVED CONVERTERS

98% Efficiency Interleaved Soft-Switching Half-Bridge Bus Converter	349
<i>Bogdan T. Bucheru, Ionel Dan Jitaru</i>	
Input-Series and Output-Parallel Configuration Adopted Interleaved LLC Resonant Converter for High Current Applications	355
<i>Myungbok Kim, Donghye Cho</i>	
Bridgeless and Interleaved PFC Stages for High Efficiency – Comparison in a Wide-Mains, 300-W Application	360
<i>Joel Turchi</i>	
Phase-Shift Controlled Zero Current Switching High Frequency Inverter in the MHz Frequency Range	366
<i>Hiroyuki Matsuo, Hideto Yonemori, Yasuyoshi Yasaka</i>	

ENERGY STORAGE

Performance Improvement of a Small Car with LiFePO₄ Batteries	372
<i>Daniel Chatroux, Bruno Beranger, Sébastien Fiette, Marion Perrin, Eric Fernandez</i>	
Energy Storage on Board of Railway Vehicle	378
<i>Michael Fröhlich, M. Klohr, J. Rost</i>	
Efficiency Evaluation of a Novel Supercapattery Stack with a Power Electronic Interface for Energy Storage Systems	385
<i>P. Kulsangcharoen, C. Klumpner, X. H. Zhou, C. Peng, G. Z. Chen, M. Rashed, G. Asher</i>	
Investigations on the Power Cycle Lifetime of Supercapacitors	391
<i>B. Veit, M. Wittig, M. Bodach</i>	

INVERTER CONTROL IN MOTOR DRIVES

Advanced Design Features of a Dedicated IGBT Power Stack Controller Board	395
<i>Tim Friederich, Edward Hopper</i>	
Lifetime Oriented Control of a Three-Phase Voltage Source Inverter	399
<i>Marco Weckert, Jörg Roth-Stielow</i>	
Switched Diamond Hysteresis Control	405
<i>Harald Wießmann, Ansgar Ackva, Jens Baumeister</i>	
On-Line Semiconductor Junction Temperature Estimation for Frequency Inverters	411
<i>Jens Onno Krah, Christoph Klarenbach</i>	

POWER ELECTRONICS IN AUTOMOTIVE AND TRACTION

Facing High Thermal Loads on Power Modules in Hybrid Electrical Vehicles	419
<i>André Christmann, Krzysztof Mainka</i>	
Test-platform for Starter-Alternators or High Efficiency Alternators and First Test Results and Conclusions	426
<i>Benno Köppl, Dušan Graovac, Ingo Voss, Frank Auer, Michael Scheffer</i>	
Combined Supercapacitor-Batteries Power Converter for Traction Drives	433
<i>C. Attianese, M. Di Monaco, V. Nardi, G. Tomasso</i>	
Connection of a 3 MVAR STATCOM Based on AC Chopper Topology to a 25 kV / 50 Hz Railway Substation. Modelling and Simulations of Harmonic Interactions	439
<i>Luc Lowinsky, Philippe Ladoux, Yvon Chéron, Hervé Caron</i>	
Pole Restraining - A Novel Control Approach for Power-Electronic Systems	445
<i>Carsten Heising, Martin Oettmeier, Volker Staudt, Andreas Steimel</i>	

HIGH VOLTAGE COMPONENTS

The Next Generation 3300V BIGT HiPak Modules with Current Ratings Exceeding 2000A	451
<i>A. Kopita, M. Rahimo, R. Schnell, M. Bayer, U. Schlapbach, J. Vobecky</i>	
Wide Temperature Operation of High Isolation HV-IGBT	457
<i>Kenji Hatori, Shuichi Kitamura, Shigeru Hasegawa, Shinichi Iura, Masuo Koga, Eugen Stumpf</i>	
Six Inch Thyristors for UHVDC Transmission	463
<i>Virgiliiu Botan, Jürg Waldmeyer, Magnus Kunow, Kranthi Akurati</i>	
10kV HPT IGCT Rated at 3200A, A New Milestone in High Power Semiconductors	467
<i>I. Nistor, T. Wikström, M. Scheinert, M. Rahimo, S. Klaka</i>	
GaN-based Lateral and Vertical Power Devices for High Voltage Switching Applications	472
<i>Umesh Mishra</i>	

MOTOR DRIVES

Ultrahigh Speed AC Motor Drive Applied in the Utilisation of Waste and Renewables and Recovering Waste Energy	473
<i>Peter Stumpf, Rafael K. Jardan, Istvan Nagy</i>	
Hybrid Servo Control System for Highly Dynamic Axes	479
<i>Christian Brecher, Michael Merz, Dominik Lindemann, Manfred Zavelberg</i>	
Regenerating Operation of the Z-Source Inverter	485
<i>Moritz von Zimmermann, Lothar Sack, Bernhard Piepenbreier</i>	
Multilevel Inverter for Low Inductance Permanent Magnet Synchronous Motor	491
<i>Rudolf Mecke</i>	

NEW COMPONENTS AND COOLING

Optimisation of Surface Protection by Super Hydrophobic Surfaces for Medium Sized Distribution-transformers or Inductive Components in Outdoor Areas	497
<i>Heinz-Herbert Berger</i>	
Efficient Water Cooled Transformer for High Frequency Induction Heating Applications	501
<i>Alexander Stadler, Christof Gulden</i>	
Film Capacitor with Integral Water Cooling Provide Efficient Heat Transfer and System Thermal Management	505
<i>R. Kerrigan</i>	
Development of Silicon Nitride Substrates with High Thermal Conductivity for Heat Sink Applications Based on Economic Technologies	510
<i>Ina Sichert</i>	
New Superior Assembly Technologies for Modules with Highest Power Densities	515
<i>Roland Ott, Marco Bäßler, Roman Tschirbs, Dirk Siepe</i>	

VOLUME 2

INVERTERS FOR RENEWABLE ENERGY AND UPS

Comparison of Transformerless Topologies for Solar Application Concerning Efficiency, Leakage Current and Volume	519
<i>W.-Toke Franke, Nils Oestreich, Friedrich W. Fuchs</i>	
Evaluation of a Three-Phase Two-HF-Switch PV Inverter with Thyristor-Interface and Active Power Factor Control	525
<i>Christian Nöding, Benjamin Sahan, P. Zacharias</i>	
Utility Interactive 3-Phase Pulse Modulated PV Inverter Embedding Neutral Point Voltage Shifting Scheme Into Instantaneous Current Control Implementation	530
<i>Nobuyuki Hattori, Noriyuki Morotomi, Shuji Miyake</i>	
A Study of High Efficiency UPS Using Advanced Three-Level Topology	537
<i>Makoto Yatsu, Kansuke Fujii, Satoki Takizawa, Yoshihiko Yamakata, Kousuke Komatsu, Haruo Nakazawa, Yasuhiro Okuma</i>	

SENSORS AND METERING

Realization of a (400 A/DC-10 MHz) Clamping HOKA Current Probe	543
<i>Boris Hudoffsky, Nico Karrer, Jörg Roth-Stielow</i>	
Compact Current Transducer for High-Voltage, Direct Current (HVDC) Electric Power Transmission	549
<i>Wolfram Teppan, Marc Schaerrer</i>	
Precise Loss Measurement for 60 MW Railway System Intertie.....	553
<i>Helmut Weiss, Pascal Mauron, Yvonne Zickermann, Hugo Baldauf</i>	
Innovative Design to Communicate and Supply in High Voltage Environment	559
<i>Marc Schaerrer, Wolfram Teppan</i>	

ELECTRICAL MACHINES

Torque Pulsations Reduction for a Permanent Magnet Synchronous Steering Feedback Actuator	563
<i>Milorad Risticovic, Dorin Iles</i>	
On Construction of a Compact In-wheel Transverse Flux Machine with Distributed Windings	567
<i>Salwa Baserrah, Keno Rixen, Bernd Orlik</i>	
Selecting the Best Magnetic Materials for Use in Electric Machines	574
<i>Dan Jones</i>	
High Precision Identification Method for Differential dq-inductances of Permanent Magnet Synchronous Machines.....	582
<i>Josef Reill, Sven L. Kellner, Sebastian Ebersberger, Markus Seilmeier, Bernhard Piepenbreier</i>	

POSTER PRESENTATIONS

Considerations on Switching Losses and Electromagnetic Compatibility (EMC) of Innovative Semiconductor Technologies	588
<i>Samuel V. Araújo, Mehmet Kazanbas, P. Zacharias, Nobert Henze, Jörg Kirchhof</i>	
Vector Control of Induction Generator with Parallel Stator Resistance and Rotor Speed Estimation.....	595
<i>Boris Dunnic, Djura Oros, Dragan Milicevic, Dragan Matic, Veran Vasic</i>	
Comparison of Different Concepts of Distributed Power Generation with Fuel Cells	600
<i>Yuriy Bessarab, Igor Merfert, Andreas Lindemann</i>	
Comparison Between Energy Battery and Power One for Electrical Vehicle Applications.....	606
<i>Julien Dauchy, Daniel Chatroux</i>	
Improving Efficiency of Parallel UPS Installations in Low-load Conditions.....	612
<i>Lorenzo Giuntini</i>	
Measurements of Mains Impedances in the Frequency Range Up to 20 kHz and Analysis of Harmonics Up to 10 kHz in Low Voltage Mains.....	618
<i>Eugen Balzer, Holger Borcherding, Heyno Garbe</i>	
Power Losses of Induction Motors in Relation to Supply Voltage Quality	623
<i>Toomas Vinnal, Heljut Kalda, Kuno Janson</i>	
Comparison Between Optimal Control Strategies Applied to a System with Unified Power Flow Controller, Shunt Converter and Series Converter for Power Quality Improvement.....	630
<i>Hedaya Alasooly, Mohammed Redha</i>	
MOSFETs or IGBTs in the Modern ERC and Sustain Modules of PDPs? An Empirical Approach for Choosing Suitable Power Switches.....	636
<i>Giuseppe Consentino, Andrea Perri</i>	
Morphological Analysis of Analog, Digital and Hybrid-Digital Power Supply Control Architectures	642
<i>Stefan Schmitt</i>	
Time-Shift Control of LLC Resonant Converters	648
<i>Claudio Adragna</i>	
Turn-off Active Gate Control of Low Voltage Automotive Power MOSFETs with High Current Ratings.....	654
<i>Björn Wittig, W.-Toke Franke, Friedrich W. Fuchs</i>	
Dynamic Performance Evaluation of a Non-Linear Digital Control Technique for Multiphase VRMs	660
<i>V. Bosacino, M. Gaeta, G. Capponi, F. Marino</i>	
Design by Optimization of a Boost Converter; Integration of the Control Aspect.....	666
<i>K. Ejjabraoui, C. Larouci, P. Lefranc, C. Marchand</i>	
Capacitive DC-DC Converter for Electric Vehicle Applications	673
<i>Christopher Pelczar, Oliver Zirn</i>	

A DC/DC High Voltage Power Supply.....	679
<i>Nikolay D. Madzharov, Miroslav S. Gardevski</i>	
Eoff and Eon Characterisation of SiC Diodes	685
<i>J. Jordán, J. M. Magraner, C. Cases, V. Esteve, E. Dede, E. Sanchis, E. Maset, A. Ferreres, J. B. Ejea</i>	
Novel Characterization and Reliability Estimation of 1200V IGBTs for Domestic Induction Heating	691
<i>C. Bocchiola, J. Cerezo</i>	
Influence of the Gate Drive on the Short-Circuit Type II and Type III Behaviour of HV-IGBT	696
<i>Jörg Schumann, Steffen Pierstorff, Hans-Günter Eckel</i>	
Superjunction MOSFETs Utilized in Resonant ZVS-Inverters for Higher Frequencies – Analysis of the Inverse Diodes.....	702
<i>Klaus F. Hoffmann, Werner Mijbfeldt</i>	
Power MOSFETs for Automotive Battery Management Systems.....	708
<i>Marco Pürschel</i>	
SP3 Boost Chopper Module with ESBT® Switch and SiC Boost Diode for Highest Efficiency Power Converters.....	713
<i>Serge Bontemps, Alain Calmels, Hans Oppermann</i>	
ΔT and Over Temperature Protection of Smart Power Mosfets Using Integrated Seebeck Difference Temperature Sensors.....	719
<i>Donald Dibra, Matthias Stecher, Andreas Lindemann, Josef Lutz, Christoph Kadow</i>	
Thermal-mechanical Analysis of Solder Layers in Power Modules Under Superimposed Cycling Conditions	724
<i>Tilo Poller, Marco Feller, Josef Lutz</i>	
Direct Liquid Cooling of Power Modules in Converters for the Wind Industry.....	729
<i>Klaus Olesen, Frank Osterwald, Michael Tønnes, Ryan Drabek, Ronald Eisele</i>	
Thermally Enhanced 5x6 mm PowerQFN Packaging for MOSFETs	735
<i>Dennis Lang</i>	
Method and Test Assembly for Power Cycling Tests at Converter Conditions	741
<i>Alexander Hensler, Josef Lutz, Jörg Zill, Reinhold Bayerer</i>	
Active Power Cycling for End of Life Tests of Heavy Wire Bond Interfaces on Power Semiconductors	747
<i>Jens Göhre</i>	
Reaching New Limits with High Power Bipolar Devices.....	748
<i>Jens Przybilla, Joerg Dorn, Reiner Barthelmeiss, Ralf Joerke, Uwe Kellner-Werdehausen</i>	
EMI Analysis of Flyback Topology for SMPs	754
<i>Allen Wang</i>	
A Novel Series of Intelligent Power Modules “V1” with Internally Paralleled FULL GATE CSTBT™ and Mirror Emitter Technology for Short Circuit Sensing	760
<i>Nishida Nobuya, Uota Shiori, Yoneyama Rei, Tametani Fumitaka, Orita Shoichi, Marco Honsberg, Thomas Radke</i>	
FPGA-based Digital Implementation of a Hybrid Spread-spectrum Technique for EMI Mitigation in DC-DC Converters	766
<i>Gamal M. Dousoky, Masahito Shoyama</i>	
New Technologies Boost Performances on Photovoltaic Applications	772
<i>Gaetano Belverde, Giuseppe Sorrentino</i>	
A Zero Voltage Transition Isolated CUK Current Source Inverter for Photovoltaic Module Integrated Converter Applications.....	778
<i>G. Lempidis, M. Rzeszut, P. Zacharias, N. Polyzos</i>	
A New Dual Buck Chopper-Assisted PFC Converter with Minimized Ripple Output Voltage Characteristics and Its Extended Circuit Topologies	782
<i>Kazunori Nishimura, Nobuhiro Yokoyama, Katsuya Hirachi, Soon-kurl Kwon, Mutsuo Nakaoaka</i>	
New Current Balancing Topology for Backlight Inverters	789
<i>Robert Weger</i>	
Single Period Sinusoidal Pulse Generator for Efficient Drive of Dielectric Barrier Discharges	795
<i>Michael Meisser, Mark Paravia, Wolfgang Heering, Rainer Kling</i>	
High Performance HB-LLC Resonant Adapter Implements Advanced Synchronous Rectification Controlling	801
<i>Alberto Stroppa, Claudio Spini</i>	
Environment-Friendly Uninterruptible Power Supply (UPS) Systems.....	806
<i>Ibrahim Gunes, Bulent Ustuntepe, Mehmet Islek, Nihat Ece, Ahmet M. Hava</i>	
A New Gate Control Approach for Power MOSFET to Reduce Conductive EMI	812
<i>Matthias Rose, Jörg Krupar</i>	
Oscillation Circuit Analysis of Switching Mode Power Supplies.....	818
<i>Vera Höch, Thomas Ellinger, Mai Linh Pham, Andreas Schlägl, Holger Kapels, Gerald Deboy, Jürgen Petzoldt, Tobias Reimann</i>	

High-Temperature Operation Stability of SOI Single Chip Inverter IC	825
<i>H.Akiyama, K.Watabe, T.Terashima</i>	
Current Sensorless Power Factor Corrector Applied to Electronic Ballast for HID Lamps	830
<i>Victor M. López, F. Javier Díaz, Francisco J. Azcondo</i>	
A Dynamic Control Method for a Multiphase DC/AC Converter with Interleaved Pulse Width Modulation Using a Decoupling Network	836
<i>Christian Nemec, Jörg Roth-Stielow</i>	
High Efficiency AC/DC Power Supply for Onboard Aircraft Gallery Equipment	842
<i>G. Rasool, B. Orlik, H. Raffel, T. Christ</i>	
Simple Design Techniques for Optimizing Efficiency and Overvoltage Spike of Synchronous Rectification in DC to DC Converters	847
<i>Christian Mößlacher, Lutz Görgens</i>	
Cost-Effective, High-Efficiency Boost Converter for Photovoltaic Applications	853
<i>Giovanni Mangaviti, Marc Mario Laudani Fichera</i>	
Double Resonant Topology for 72V Battery Charger Used in a Hybrid Electric Locomotive – Study and Experimental Validation	859
<i>Stéphane Butterbach, Alexandre De Bernardinis, Richard Lallemand, Gérard Coquery, Yannick Evain, Alain Jeunesse, Philippe Aubin</i>	
New DC-DC Converters Circuits with Better Features and Zero Commutation of All Appliances	865
<i>Nikola Gradinarov, Nikolai Hinov, George Kraev, Dimitar Arnaudov</i>	
Design Considerations for DC-DC Converter Comprising Parasitical Parameters of Transformer with the Air-Gap	873
<i>Saijun Mao</i>	
Latest ST MOSFET and IGBT Technologies for the Best Efficiency in Solar Inverters	874
<i>L. Abbatelli, S. Buonomo, R. Scollo, M. Cacciato, A. Consoli, V. Crisafulli</i>	
A Novel Approach to Stabilize the Automotive Energy Net Using a Floating Converter	880
<i>Thomas Hackner, Johannes Pforr</i>	
Multilevel DC/DC Converter Design for Mobile Applications	886
<i>Daniel Montesinos-Miracle, Oriol Gomis-Bellmunt, Antoni Sudrià-Andreu, Alfred Rufé</i>	
Fast and Accurate Simulation Method for Switch-Mode Power Supplies	891
<i>Markus Schmid, Marc Doebroenti, Alexander Bucher, Thomas Duerbaum</i>	
Design of a Transverse Flux Machine for Small Direct Driven Wind Turbines	897
<i>Markus Rüter, Wolfgang Oberschelp, Uwe Baader, Günter Schröder</i>	
Diagnosis Method for Monitoring the Electrical Frequency of AC-Machines on Basis of PWM Signals	903
<i>Heiko Zatocil, Sebastian Villwock, Ulrich Strunz</i>	
Sensorless Control of Induction Motor Using an 8bit Microcontroller with Low Cost Current Measurement	909
<i>M. Förster, G. Berger, J. Petzoldt, H. Eisenreich</i>	
A Low-Cost Energy-Saving Control Technique for Induction Motor Drives	914
<i>A. Consoli, G. Scarcella, G. Scelba, S. Billè, D. Costanzo, A. Cuccio</i>	
Grid-Tied PV Inverter by Using PV-IPM	920
<i>Cuijiao Ma, Song Gaosheng, Haitao Xiang, Haijiang Jiang</i>	
Thermal Simulation of Smart Power Devices on PCB with SPICE	924
<i>Wim Teulings, Iko Schmadlak, Torsten Hauck</i>	
MOSFET Temperature Estimation Using Several Variable Correlations for CPU Multi-Phase Voltage Regulators	930
<i>Chong-Sheng Wang, Steve Zhou</i>	
Self Acting PressFIT Module	934
<i>Thilo Stolze</i>	
Novel Silver Contact Paste, Lead Free Solution for Die Attach	940
<i>Wolfgang Schmitt</i>	
An IGBT Gate Driver for Operation in High Pressure Hydrostatic Environment	946
<i>Riccardo Pittini, Magnar Hernes, Kjell Ljøkelsøy</i>	
SKiiP4 System – Switching and Thermal Aspects	952
<i>Detlev Richter, Ingo Staudt, Gert Köbernik, S. Schuler</i>	
Power Losses Analysis in a Single Switch Resonant Reset Forward Converter Implemented with a SiC Power JFET	958
<i>N. Polyzos, E. P. Drakakis, K. Siderakis, E. C. Tatakis, G. Lempidis</i>	
Analysis of Zero-Voltage-Switching Conditions in Multi-Level Inverter with Resonant Tank	964
<i>Christian Düerkop, Jörn Bergmann, Klaus F. Hoffmann</i>	

A New 650V Super Junction Device with Rugged Body Diode for Hard and Soft Switching Applications.....	970
<i>G. Aloise, D. Zippnick, M.-A. Kutschak, H. Kapels, A. Ludsteck-Pechloff</i>	
Admittance Representation of an Advanced Multivariable Control for 16.7-Hz Railway Traction Line-Side Converter	975
<i>Carsten Heising, Martin Oettmeier, Roman Bartelt, Volker Staudt, Andreas Steimel</i>	
Flux-Based Multivariable Control of a Static Converter Feeding a 16.7-Hz Single-phase Load Under Different Fault Conditions	981
<i>Martin Oettmeier, Carsten Heising, Matthias Gorski, Volker Staudt, Andreas Steimel</i>	
Carrier Based PWM Technique for a Novel Three-to-Five Phase Matrix Converter	987
<i>Atif Iqbal, SK. Moin Ahmed, Haitham Abu-Rub, Mohd. Rizwan Khan</i>	
New Multi-Zone Soft Starters for Alternating-Voltage Machines.....	993
<i>Gennadiy Stepanovich Zinoviev, Aleksei Vjacheslavovich Udovichenko, Helmut Weiss</i>	
Comparison of Losses Between Matrix and Indirect Matrix Converters with an Improved Modulation	999
<i>François Gruson, Philippe Le Moigne, Philippe Delarue, Michel Arpillière, Xavier Cimetière</i>	
High Frequency Leakage Current to the Building Structure from PWM Inverter-Motor System.....	1005
<i>Masayuki Morimoto</i>	
Analysis of Common Mode Currents in Inverter Fed Drives	1011
<i>Dominic Wode, Rudolf Mecke, Immo Spengler</i>	
Investigations on a High Performance Control Structure for Accelerator Magnet Power Supplies	1017
<i>Xinhua Ke, Felix Jenni, René Künzi</i>	
Simulation Tool for Coupled But Independently Controlled Power-Electronic Systems Applied to NPC Converters.....	1023
<i>Carsten Heising, Roman Bartelt, Martin Oettmeier, Volker Staudt, Andreas Steimel</i>	
Design and Characterization of Planar Integrated Passive Component for Power Converters	1029
<i>Saijun Mao, Yingqi Zhang, Xiaoming Yuan</i>	
Author Index	