

# **International Exhibition & Conference for Power Electronics, Intelligent Motion, Renewable Energy and Energy Management (PCIM Europe 2024)**

Nuremberg, Germany  
11 – 13 June 2024

Volume 1 of 5

ISBN: 978-1-7138-9966-2

**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© (2024) by Mesago Messe Frankfurt GmbH  
All rights reserved.

Printed with permission by Curran Associates, Inc. (2024)

For permission requests, please contact VDE VERLAG GMBH  
at the address below.

VDE VERLAG GMBH  
Bismarckstr. 33  
P.O.B. 12 01 43  
10625 Berlin, Germany

Phone: +49 30 34 80 01 - 0  
Fax: +49 30 34 80 01 - 9088

kundenservice@vde-verlag.de

**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

### **KEYNOTE**

K01	AI BETWEEN HYPE AND INDUSTRIAL-GRADE - THE IMPACT OF AI ON THE ENTIRE POWER ELECTRONICS LIFECYCLE.....	1
	<i>Rolf Hellinger</i>	
K02	INFRASTRUCTURE REQUIREMENTS FOR ELECTRIFIED HEAVY GOODS TRANSPORT IN GERMANY AND THE EU.....	7
	<i>Martin Wietschel</i>	
K03	CHALLENGES AND SOLUTIONS TO POWER LATEST PROCESSOR GENERATIONS FOR HYPER SCALE DATACENTERS .....	15
	<i>Gerald Deboy</i>	

### **GAN RUGGEDNESS**

OP001	AN IMPROVED ULTRAFAST DESATURATION-BASED PROTECTION SCHEME FOR GAN HEMT .....	19
	<i>Juncheng Lu</i>	
OP002	THE PERFORMANCE OF A GAN EMODE HEMT IN SURGE CURRENT SCENARIOS SUCH AS THE ACTIVE SHORT CIRCUIT .....	24
	<i>Dominik Nehmer</i>	
OP003	GATE RESISTANCE EFFECT ON SHORT-CIRCUIT ROBUSTNESS OF P-GAN HEMTS .....	34
	<i>Mohamed Lemine Dedew</i>	

### **ADVANCED PACKAGING TECHNOLOGIES**

OP004	NEURAL NETWORK ASSISTED NUMERICAL SIMULATION BENCHMARKING FOR ELECTRIC VEHICLE THERMAL MANAGEMENT SYSTEM.....	40
	<i>Ekin Alp Bicer</i>	
OP005	RELATIONSHIP BETWEEN POROSITY IN CU SINTERED BONDING AND BONDING RELIABILITY .....	49
	<i>Hideo Nakako</i>	
OP006	HIGH THERMAL DURABILITY OF THIN COPPER DIE-ATTACH LAYERS AND FINITE ELEMENT MODEL SIMULATION.....	56
	<i>Takaaki Eyama</i>	

### **THERMAL CYCLING RELIABILITY**

OP007	THERMAL SHOCK TEST LIFETIME IMPROVEMENT WITH OPTIMIZED ADHESIVE STRENGTH BETWEEN EPOXY RESIN AND COPPER .....	62
	<i>He Kangjia</i>	

OP008	POWER CYCLING RELIABILITY AND FAILURE MODE ANALYSIS OF POL.....	67
	<i>Kenichi Koi</i>	
OP009	ACCELERATED POWER CYCLING OF GAN HEMTS USING SWITCHING LOSS AND FAST TEMPERATURE MEASUREMENT .....	74
	<i>Wing Tai Leung</i>	

### **HIGH POWER CONVERTERS**

OP010	CONTROL OF AN MMC-BASED HYBRID TRANSFORMER WITH STAR-POINT VOLTAGE INJECTION .....	84
	<i>Rui Wang</i>	
OP011	PROTECTION AND CONTROL OF A DUAL MMC MEDIUM VOLTAGE SUPPLY .....	93
	<i>Max Dupont</i>	
OP012	STATION POWER ELECTRONICS CONVERTER WITH HIGH THERMAL ENDURANCE TO POLE-TO-POLE SHORT CIRCUITS FOR LVDC DISTRIBUTION GRID .....	103
	<i>Frédéric Reymond-Laruina</i>	

### **GATE DRIVERS**

OP013	SUPPRESSION OF OSCILLATIONS IN A SIC BRIDGE-LEG USING A CUSTOM SINGLE-CHIP DIGITAL ACTIVE GATE DRIVER WITH 2×255 STRENGTH LEVELS.....	113
	<i>Qilei Wang</i>	
OP014	SIC MOSFET SHORT-CIRCUIT PROTECTION: A FASTER SOFT SHUT DOWN METHOD FOR GATE DRIVERS .....	121
	<i>Julien Weckbrodt</i>	
OP015	PARAMETER IDENTIFICATION: GATE SENSOR FOR POWER TRANSISTOR TOLERANCE COMPENSATION IN ADVANCED GATE DRIVER ICS .....	128
	<i>Christopher Wille</i>	

### **ADVANCED CONTROL TECHNIQUES ON ELECTRICAL DRIVES I**

OP016	AN INNOVATIVE HIGH-SPEED TRACK RANGE RESTART STRATEGY FOR PERMANENT MAGNET SYNCHRONOUS MOTOR.....	135
	<i>Anna Corbitt</i>	
OP017	STEADY-STATE ERROR REDUCTION OF REINFORCEMENT LEARNING BASED INDIRECT CURRENT CONTROL OF PERMANENT MAGNET SYNCHRONOUS MACHINES .....	140
	<i>Tobias Schindler</i>	
OP018	PERFORMANCE COMPARISON OF USING SHUNT-BASED AND INTEGRATED CURRENT SENSING FOR SENSORLESS FIELD-ORIENTED CONTROL .....	150
	<i>John Emmanuel Tan</i>	

### **GAN CONVERTERS**

OP019	DESIGN OF HIGH-POWER INVERTER WITH 12 PARALLEL GAN DEVICES .....	161
	<i>Takashi Sawada</i>	

OP020 OVER 99.7% EFFICIENT GAN-BASED 6-LEVEL CAPACITIVE-LOAD POWER CONVERTER .....	167
<i>Stefan Mönch</i>	

OP021 CASCADED PRIMARY-SIDE-ONLY CONTROL OF A COMPACT 2 MHZ 500 W WIRELESS POWER TRANSFER SYSTEM.....	174
<i>Tim Krigar</i>	

### **ADVANCED MATERIALS AND TECHNOLOGIES**

OP022 POWER MODULE EVALUATION USING ULTRA HIGH HEAT DISSIPATION AND HIGH HEAT RESISTANCE RESIN SHEET CONTAINING CARD HOUSE TYPE BORON NITRIDE FILLER .....	180
<i>Ayano Imai</i>	

OP023 INVESTIGATING TEMPERATURE DEPENDENT WARPAGE IN METAL CERAMIC SUBSTRATES FOR POWER ELECTRONICS DEVICES .....	190
<i>Benjamin Fabian</i>	

OP024 DEGRADATION MODE ANALYSIS OF DIFFERENT BONDING TECHNOLOGIES OF SIC POWER SEMICONDUCTORS STRESSED BY ACTIVE POWER CYCLING.....	197
<i>Rasched Sankari</i>	

### **CHARGING STATION TECHNOLOGY**

OP025 IMPLEMENTATION AND VERIFICATION OF A 50KW OPPORTUNITY WIRELESS CHARGER DESIGN .....	205
<i>Carlos Costas Sos</i>	

OP026 PERFORMANCE EVALUATION OF SILICON-BASED 3-LEVEL VIENNA RECTIFIER IN ISOPLUS SMPD PACKAGE .....	214
<i>Karsten Haehre</i>	

OP027 PERFORMANCE ANALYSIS OF A 25-KW SIC-BASED DUAL ACTIVE BRIDGE CONVERTER BASED ON PARALLEL-CONNECTED DEVICES .....	222
<i>Francesco Porpora</i>	

### **MODELLING AND MONITORING**

OP028 SEMICONDUCTOR CHIP MODELS ARE THE KEY FOR ENABLING VIRTUAL DESIGN AND OPTIMIZATION WORKFLOWS OF POWER ELECTRONIC SYSTEMS .....	230
<i>Stefan Haensel</i>	

OP029 IMPROVED RESONANT FREQUENCY-BASED PARASITIC INDUCTANCE ESTIMATION METHOD FOR SIC MOSFET HALF-BRIDGE CIRCUIT .....	238
<i>Hongpeng Zhang</i>	

OP030 FAST SIMULATOR WITH INVERTER TEMPERATURE ESTIMATION FOR TRACTION EDIVES IN VEHICLES SUBJECTED TO DRIVING CYCLES.....	248
<i>Simone Giuffrida</i>	

## **SOLID STATE TRANSFORMERS**

- OP031 A NEW FAMILY OF THREE-PHASE-UNFOLDER-BASED MVAC-LVDC SOLID-STATE TRANSFORMERS..... 254  
*Jonas Huber*
- OP032 VOLTAGE BALANCING OF A SPLIT-CAPACITOR IGCT 3L-NPC LEG FOR THE RESONANT DC TRANSFORMER..... 264  
*Renan Pillon Barcelos*
- OP033 COMPARATIVE ANALYSIS OF UNIDIRECTIONAL HIGH STEP-UP CONVERTERS FOR MEDIUM VOLTAGE APPLICATIONS..... 274  
*Stefan Subotic*

## **ADVANCED CONTROL TECHNIQUES ON ELECTRICAL DRIVES II**

- OP034 STARTUP BEHAVIOR OF HARMONIC SUPPRESSION IN ELECTRICAL MACHINES USING ITERATIVE LEARNING CONTROL AND NEURAL NETWORKS..... 284  
*Annette Mai*
- OP035 ANALYTICAL APPROACH OF THE VECTOR CURRENT CONTROL FLUX-WEAKENING STRATEGY FOR PERMANENT MAGNET SYNCHRONOUS MACHINES ..... 290  
*Oriol Subirats Rillo*

## **POWER ELECTRONICS FOR E-MOBILITY**

- OP036 INVESTIGATION ON DIRECT LIQUID COOLING DESIGN OF POWER MODULES WITH FLAT BASEPLATE FOR AUTOMOTIVE APPLICATION..... 298  
*Nobuhide Arai*
- OP037 A NOVEL APPROACH FOR AFFORDABLE ELECTRIC VEHICLES BASED ON DUAL 48V BATTERY SYSTEM WITH MULTI-FUNCTIONAL 3-LEVEL CONVERTER..... 305  
*Radovan Vuletic*
- OP038 AN INNOVATIVE 3-LEVEL SOLUTION FOR AUTOMOTIVE APPLICATIONS: EMPACK..... 315  
*Pranav Panchal*
- OP039 GATED RECURRENT UNITS-ASSISTED STATE-SPACE MODELING FOR ELECTRIC VEHICLE TEMPERATURE PREDICTION ..... 322  
*Xinyuan Liao*
- OP040 NOVEL BIDIRECTIONAL SINGLE-STAGE ISOLATED 600-V GAN M-BDSBASED SINGLE/THREE-PHASE-OPERABLE EV ON-BOARD CHARGER..... 330  
*Sven Weihe*

## **ENCAPSULATION MATERIALS**

- OP041 APPLICATION-SPECIFIC INVESTIGATION OF INORGANIC POTTING MATERIAL IN DRIVE TRAINS ..... 338  
*Soenke Fleck*

OP042 THE INFLUENCE OF THE GLASS TRANSITION TEMPERATURE OF EPOXY MOLD COMPOUNDS ON THE RELIABILITY OF A SEMICONDUCTOR DEVICE .....	343
<i>Stefan Schwab</i>	
OP043 CORROSION RESISTANT PACKAGING FOR POWER SEMICONDUCTOR MODULES - MODIFIED INSULATION MATERIALS FOR CONTAMINATED ENVIRONMENTS .....	351
<i>Michael Hanf</i>	
OP044 INVESTIGATION OF INORGANIC ENCAPSULATION MATERIALS IN POWER ELECTRONIC SYSTEMS FOR HIGH POWER DENSITY APPLICATIONS .....	361
<i>Stefan Behrendt</i>	
OP045 CHARACTERIZATION OF THERMALLY AGED SILICONE GELS FOR POWER SEMICONDUCTOR MODULES.....	369
<i>Sonja Madloch</i>	

### **POWER QUALITY**

OP046 A COORDINATED CONTROL OF HYBRID SINGLE-PHASE AC/DC MICROGRIDS BASED ON THE NATURAL HARMONIC INJECTION CONCEPT .....	378
<i>Mehdi Baharizadeh</i>	
OP047 A HIGH-POWER DENSITY SIC BASED TP PFC WITH HIGH-FREQUENCY RIPPLE CANCELLATION LEG.....	383
<i>Serkan Dusmez</i>	
OP048 HIGH FREQUENCY ACTIVE FILTER FOR AC-DC HIGH POWER CONVERTERS .....	390
<i>Sarah Sifoune</i>	
OP049 LABORATORY SETUP FOR ACCURACY INVESTIGATION OF ELECTRICITY METERS AND MONITORS UNDER INDUSTRY-TYPICAL OPERATING CONDITIONS.....	397
<i>Matthias Schmidt</i>	

### **GRID CONNECTED CONVERTERS**

OP050 REAL-TIME EVALUATION OF WEIGHTING FACTORLESS PREDICTIVE CONTROL OF LCL FILTER EQUIPPED GRID-SIDE CONVERTERS USING SORTING NETWORKS.....	403
<i>Kristóf Bándy</i>	
OP051 RELAXED ROBUST CONTROL WITH PRAGMATIC SHORTAGE OF PASSIVITY FOR WIND, STORAGE AND PV POWER CONVERTERS .....	411
<i>Sergio De Lopez Diz</i>	
OP052 AN EFFECTIVE DC VOLTAGE REGULATION OF ACTIVE FRONT-END RECTIFIER THROUGH MODEL PREDICTIVE CONTROL.....	419
<i>Mobina Pouresmaeil</i>	
OP053 BI-DIRECTIONAL 11KW MULTI-LEVEL ACTIVE-NEUTRAL-POINT-CLAMPED AC-DC CONVERTER USING 600V/750V SI SUPER-JUNCTION AND SIC MOSFETS FOR HIGH-EFFICIENCY AND HIGH-DENSITY APPLICATIONS.....	424
<i>Mengxing Chen</i>	

OP054 A STUDY OF GRID-FORMING INVERTER CONTROL STRATEGY FOR FAULT-RIDE-THROUGH CAPABILITY.....	433
<i>Hirofumi Uemura</i>	

**PASSIVE COMPONENTS**

OP055 FILM CAPACITORS FOR HIGH TEMPERATURE AC-DC INVERTER APPLICATIONS.....	440
<i>Adel Bastawros</i>	

OP056 LOSS REDUCTION IN HF-TRANSFORMERS USING LAMINATED FERRITE E-CORES.....	447
<i>Lukas Reißerweber</i>	

OP057 MULTIGAP TOROIDAL TRANSFORMER AND INDUCTORS FOR OVERCOMING FRINGING LOSSES IN HIGH FREQUENCY CONVERTERS.....	456
<i>Pau Colomer</i>	

OP058 STUDY ON SAMPLE GEOMETRIES FOR FERRITE CHARACTERISATION IN THE MHZ RANGE.....	463
<i>Till Piepenbrock</i>	

OP059 FEM-SUPPORTED AND NON-DESTRUCTIVE MAGNETIC CHARACTERIZATION METHOD FOR NON-LAMINATED STEEL.....	472
<i>Stefan Tobler</i>	

**DRIVES FOR HIGH DEMANDING APPLICATIONS**

OP060 HIGHLY-COMPACT BEARINGLESS AXIAL-FLUX MOTOR FOR A PEDIATRIC IMPLANTABLE FONTAN BLOOD PUMP.....	480
<i>Andreas Horat</i>	

OP061 A NOVEL PERMANENT MAGNET SYNCHRONOUS MOTOR DRIVE FOR REACTION WHEELS IN SATELLITES.....	490
<i>Baris Colak</i>	

OP062 EXPLORING HIGH FREQUENCY OPERATION OF MOTOR DRIVES: PRACTICAL INSIGHTS ON EFFICIENCY AND LOSS.....	497
<i>Asantha Kempitiya</i>	

OP063 HIGH POWER DENSITY SYSTEM DESIGN FOR GAN-BASED LV MOTOR DRIVES.....	502
<i>Marco Cannone</i>	

OP064 DESIGN OF GAN TRANSISTOR BASED VARIABLE SPEED DRIVE INVERTER WITH OUTPUT VOLTAGE FILTERING.....	510
<i>Kaspars Kroics</i>	

**IGBT**

OP065 THE 8TH GENERATION LV100 IGBT MODULE WITH HIGHER CURRENT RATING.....	518
<i>Daichi Otori</i>	



LOSS REDUCTION BY LAMINATING FERRITE E CORES.....	525
<i>Lukas Reißerweber</i>	
OP066 NEW PLANAR 4.5 KV SPLIT-GATE (SG) SI-IGBT DEVICE FOR IMPROVED SWITCHING CHARACTERISTICS AND HIGH FREQUENCY OPERATION .....	534
<i>Gaurav Gupta</i>	
OP067 4.5 KV DOUBLE-GATE REVERSE-CONDUCTING PRESS-PACK IEGT .....	543
<i>Satoshi Yoshida</i>	

### **DEVICE CONCEPTS**

OP068 EVALUATION OF A 3 KV POLARIZATION SUPERJUNCTION GAN HEMT.....	549
<i>Alireza Sheikhan</i>	
OP069 MORE THAN 1200 V BREAKDOWN AND LOW AREA-SPECIFIC ON STATE RESISTANCES BY PROGRESS IN LATERAL GAN-ON-SI AND GAN-ON-INSULATOR TECHNOLOGIES.....	557
<i>Richard Reiner</i>	
OP070 NOVEL 200 V MOSFET TECHNOLOGY PUSHES MOTOR DRIVE INVERTER EFFICIENCY TO AN UNPRECEDENTED LEVEL.....	564
<i>Mark Thomas</i>	

### **DEGRADATION MECHANISMS**

OP071 MOISTURE ROBUST CHIP DESIGN - IMPROVED EDGE-TERMINATIONS FOR HIGH LIFETIME UNDER HIGH HUMID CONDITIONS.....	571
<i>Michael Hanf</i>	
OP072 METHOD FOR MEASURING THE INITIAL STATE OF A SOLDER JOINT DELAMINATION IN A 3D PCB INTEGRATION ASSEMBLY OF SIC MOSFETS.....	581
<i>Souhila Bouzerd</i>	
OP073 GENERIC LIFETIME MODEL FOR WIRE BONDS DEGRADATION IN IGBT MODULES BASED ON A FRACTURE MECHANICS PARAMETER.....	589
<i>Merouane Ouhab</i>	

### **ADVANCED CONVERSION CONCEPTS**

OP074 MODULAR COAXIAL POWER CONVERTER FOR HIGH-DENSITY INTEGRATION INTO MEDIUM-VOLTAGE CABLES .....	599
<i>Mark Cairnie</i>	
OP075 CONTROLLED INDUCTOR BASED BCM BUCK CONVERTERS .....	608
<i>Ziv Gellman</i>	
OP076 INFLUENCE OF VARYING COMMON MODE CHOKE SIZES ON THE PERFORMANCE AND STABILITY OF AN ACTIVE EMI FILTER.....	615
<i>Patrick Körner</i>	

## **PHOTOVOLTAIC SYSTEMS**

- OP077 A HIGH EFFICIENCY BATTERY CHARGER WITH MAXIMUM POWER POINT TRACKING FOR MAGNETIC ENERGY HARVESTERS ..... 625  
*Antonio Miguel Munoz Gomez*
- OP078 SYMMETRIC FLYING-CAPACITOR BOOST CONVERTER FOR MEDIUM-VOLTAGE PHOTOVOLTAIC APPLICATIONS ..... 635  
*Luis Alves Rodrigues*
- OP079 COMPARISON OF SI IGBT, SIC MOSFET AND ADJUSTABLE HYBRID SWITCH PV INVERTERS FOR DIFFERENT GEOGRAPHICAL LOCATIONS ..... 645  
*Tanya Thekemuriyil*

## **MODEL BASED SYSTEM ANALYSIS**

- OP080 OPTIMISING A POWER MODULE FOR ELECTRICAL AND THERMAL PERFORMANCE AND SYMMETRY USING EDA TOOLS ..... 655  
*Wilfried Wessel*
- OP081 CONDUCTOR-BASED MODELING OF VOLTAGE DISTRIBUTION ALONG A SINGLE-TOOTH WINDING OF ELECTRICAL MACHINES ..... 665  
*Hujun Peng*
- OP082 REDUCTION OF PWM HARMONICS WITH CARRIER PHASE SHIFTING IN A DUAL-STATOR PMSM WITH MAGNETIC COUPLED WINDINGS ..... 672  
*Bünyamin Tekir*

## **VOLUME 2**

### **SIC DEVICES**

- OP083 THE NEW COOLSIC MOSFET 1200 V G2: ELECTRICAL PERFORMANCE AND COMPACT MODELLING ..... 681  
*Andreas Huerner*
- OP084 PARALLELING SIC-POWER-MOSFET BODY DIODES UNDER HARSH SWITCHING CONDITIONS ..... 690  
*Michael Rauh*
- OP085 3.3KV SBD-EMBEDDED SIC-MOSFET MODULE FOR TRACTION USE..... 699  
*Yoichi Hironaka*
- OP086 DEAD TIME OPTIMIZATION FOR HIGH POWER SIC MOSFET MODULE IN CONSIDERATION OF PARASITIC COMPONENTS ..... 707  
*Pham Ha Trieu To*

### **WBG RELIABILITY**

- OP087 PERFORMANCE INSTABILITY OF 650 V P-GAN GATE HEMT DEVICE UNDER TEMPERATURE-RELATED POSITIVE GATE BIAS STRESSES ..... 717  
*Renze Yu*

OP088	GATE OXIDE RELIABILITY OF CURRENT GENERATION 1.2 KV SIC MOSFETS UNDER STEP-WISE INCREASED GATE VOLTAGE.....	723
	<i>Roman Boldyrjew-Mast</i>	
OP089	AN ACCELERATED DYNAMIC GATE SWITCHING STRESS TEST CONCEPT OF SIC MOSFETS AT HIGH DRAIN-SOURCE VOLTAGE (HV-GSS) .....	731
	<i>Clemens Herrmann</i>	
OP090	SILICON CARBIDE POWER DEVICE USE IN SPACECRAFT AND AIRCRAFT .....	739
	<i>Akin Akturk</i>	

### **POWER ELECTRONICS FOR E-MOBILITY/ CONTROL**

OP091	CURRENT RIPPLE REDUCTION BY COMBINATION OF SI IGBT AND SIC MOSFETS IN HEAVY DUTY FUEL CELL TRUCKS.....	745
	<i>Yavuz Gürlek</i>	
OP092	EVALUATION OF ACTIVE GATE DRIVERS WITH SWITCHABLE GATE RESISTORS AND INTERMEDIATE VOLTAGE LEVELS FOR SIC MOSFETS IN WLTC .....	754
	<i>Michael Frank</i>	
OP093	PERFORMANCE EVALUATION OF TCM-BASED, ZERO-VOLTAGE SWITCHING (ZVS) THREE-PHASE INVERTER FOR ELECTRIC VEHICLE DRIVE SYSTEMS .....	764
	<i>Khizra Abbas</i>	
OP094	A PARTIAL LOAD THREE-PHASE TRIANGULAR CURRENT MODE MODULATION CONCEPT WITH AN OPTIMIZED FILTER INDUCTOR FOR HIGH EFFICIENCY TRACTION DRIVES .....	774
	<i>Bhaskar Chatterjee</i>	

### **DC-DC CONVERTERS I**

OP095	GAN VS SI SYNCHRONOUS RECTIFIER FOR LLC CONVERTER .....	784
	<i>Gokhan Sen</i>	
OP096	CO-SIMULATION DESIGN OF A GAN-BASED THREE-PHASE LLC CONVERTER WITH INTEGRATED THREE-PHASE MAGNETICS .....	791
	<i>Jih-Cheng Hu</i>	
OP097	SWITCHING ASSISTING CIRCUIT IMPROVING THE EFFICIENCY OF DC-DC CONVERTERS BASED ON PIEZOELECTRIC RESONATORS.....	797
	<i>Ghislain Despesse</i>	
OP098	TRANSFORMER-BASED FIXED-RATIO RESONANT DC-DC CONVERTERS FOR 48V DATA CENTERS .....	803
	<i>Xufu Ren</i>	

### **PFC CONVERTERS**

OP099	HIGH-DENSITY 3.3 KW GAN RECTIFIER FOR SERVER APPLICATIONS COMPRISING A 130 KHZ TOTEM-POLE PFC AND A 500 KHZ LLC.....	812
	<i>Manuel Escudero Rodriguez</i>	

OP100 ADDRESSING POWER SWITCH TECHNOLOGY SELECTION SI/SIC/GAN IN HIGH EFFICIENCY ZVS-PFC RESONANT CONVERTERS .....	822
<i>Marco Torrisi</i>	
OP101 BUCK-TYPE CURRENT UNFOLDING CONVERTER WITH DISCONTINUOUS CONDUCTION MODE IN ULTRA-LOW POWER-FACTOR OPERATION .....	831
<i>Tomoyuki Mannen</i>	
OP102 GAN BASED BI-DIRECTIONAL 6.6KW INTERLEAVED TOTEM-POLE PFC WITH 13KW/L POWER DENSITY AND HIGH EFFICIENCY .....	837
<i>Juncheng Lu</i>	

### **SIC MODULES**

OP103 THE DESIGN OF A 2KV 1700A SIC MOSFET DUAL MODULE .....	843
<i>Jorge Mari</i>	
OP104 TECHNOLOGICAL APPROACHES TO HIGH-POWER DENSITY SIC POWER MODULE FOR AUTOMOTIVE .....	849
<i>Takeshi Tokorozuki</i>	
OP105 EXTREMELY COMPACT SIC POWER MODULE FOR EV TRACTION INVERTERS IN THE 250 KW CLASS .....	855
<i>Raffael Schnell</i>	
OP106 BENEFITS OF .XT INTERCONNECTION TECHNOLOGY FOR 3.3 KV XHP 2 MODULE WITH 3.3 KV COOLSIC MOSFET .....	863
<i>Matthias Bürger</i>	

### **ADVANCED COOLING**

OP107 LARGE-AREA BONDING WITH LMEE: SUPPRESSION OF THE DEGRADATION OF THE JUNCTION-TO-WATER THERMAL RESISTANCE IN POWER MODULES.....	870
<i>Yo Mochizuki</i>	
OP108 ACTIVE THERMAL CONTROL OF SIC MOSFETS UTILIZING TRANSIENT THERMAL CHARACTERIZATION .....	875
<i>Varaha Satya Bharath Kurukuru</i>	
OP109 THERMAL MANAGEMENT SOLUTIONS BY ADDITIVE MANUFACTURING – POWDER BED FUSION AND DIFFUSION BONDING .....	883
<i>Simon Jahn</i>	
OP110 ADVANCED PUMPED TWO-PHASE COLD PLATE FOR COOLING POWER ELECTRONICS .....	888
<i>Elizabeth Seber</i>	

### **DC-DC CONVERTERS II**

OP111 FEASIBILITY STUDY OF HIGH-POWER DENSITY ISOLATED CLLC DC-DC INTERFACE WITH WIDE RANGE OF VOLTAGE/CURRENT REGULATION .....	893
<i>Oleksandr Husev</i>	

OP112 DC-BIAS REDUCTION IN HIGH-FREQUENCY DUAL ACTIVE BRIDGE DC-DC CONVERTERS THROUGH SLOW DC MEASUREMENTS.....	903
<i>Patrick Lenzen</i>	
OP113 OPTIMIZED CURRENT SHARING TECHNIQUE FOR INTERLEAVED CLLC CONVERTERS FOR MINIMAL OUTPUT CURRENT DISTORTION .....	909
<i>Martin Gendrin</i>	
OP114 PRIMARY-SIDE OUTPUT REGULATION PRINCIPLES IN DYNAMIC MULTI-MHZ INDUCTIVE POWER TRANSFER SYSTEMS AND ISOLATED DC/DC CONVERTERS .....	916
<i>Ioannis Nikiiforidis</i>	

## **SMART GRID**

OP115 LOW VOLTAGE DC-GRIDS WITH GALVANIC ISOLATION: SYSTEM DISCUSSION, EFFICIENCY AND PERFORMANCE COMPARISON TO AC-FEEDING.....	926
<i>Lukas Fräger</i>	
OP116 IMPLEMENTATION AND EXPERIMENTAL EVALUATION OF AN ADAPTIVE DC GRID CONTROLLER FOR DECENTRALISED GRID CONTROL .....	933
<i>Steffen Menzel</i>	
OP117 DEMONSTRATING THE EFFECTIVENESS OF A DC SOLID-STATE CIRCUIT BREAKER'S FAST RESPONSE TIME.....	942
<i>Ehab Tarmoom</i>	
OP118 MODELLING AND SIZING SENSITIVITY ANALYSIS OF A FULLY RENEWABLE ENERGY-BASED ELECTRIC VEHICLE CHARGING STATION MICROGRID .....	949
<i>David A. Stone</i>	

## **MEASUREMENT TECHNIQUES AND METHODS**

OP119 LED POWERED ROTOR TELEMETRY SYSTEM.....	958
<i>Raphael Beyerle</i>	
OP120 'INFINITY GATE SENSOR': A DIFFERENTIAL MAGNETIC FIELD SENSOR FOR MEASURING GATE CURRENT OF SIC POWER TRANSISTORS .....	966
<i>Yushi Wang</i>	
OP121 CHARACTERISING WIDE BANDGAP POWER MODULES: VALIDATING THE M-SHUNT CONCEPT FOR HIGH-POWER APPLICATIONS IN THE KILOAMPERE RANGE .....	976
<i>Hauke Lutzen</i>	
OP122 CHARACTERIZATION OF POWER-MODULE PARASITICS: SUB-NANOSECOND LARGE SIGNAL PULSING VS. DOUBLE-PULSE TESTING .....	986
<i>Gerhard Groos</i>	
STATISTICAL VARIATIONS IN THE PARASITIC CAPACITANCE OF A COIL.....	997
<i>Kevin Talits</i>	

## **HIGH VOLTAGE SWITCHES**

PP001 A 4.5 KV FAST RECOVERY DIODE PLATFORM FOR HIGH-CURRENT IGBTs .....	1002
<i>Jan Vobecky</i>	

PP002	6.5 KV INNOVATIVE SILICON POWER DEVICE (I-SI) MODULE WITH HIGH POWER DENSITY AND LOW LOSS BY STORED CARRIER CONTROL .....	1007
	<i>Takashi Hirao</i>	
PP003	HIGH CURRENT DENSITY 4.5KV PRESSPACK IGBTs PUSH SOA LIMITS .....	1013
	<i>Hossein Davoodi</i>	
PP004	2.5KV IGBT MODULE WITH HIGH RELIABILITY FOR RENEWABLE APPLICATIONS .....	1018
	<i>Akiyoshi Masuda</i>	
PP005	NEW GENERATION 4.5KV IGCT AND FAST RECOVERY DIODE FOR RAILWAY POWER SUPPLY APPLICATIONS .....	1025
	<i>Umamaheswara Reddy Vemulapati</i>	
PP006	NEXT GENERATION 4.5 KV IGBT-ONLY STAKPAK MODULE WITH REDUCED LOSSES AND HIGH TEMPERATURE CAPABILITY .....	1031
	<i>Jeremy Jones</i>	

### **THERMAL MODELLING AND SIMULATIONS**

PP007	FINITE ELEMENT ANALYSIS OF THE UPSCALING OF WARPAGE AND BIFURCATION HYSTERESIS LOOPS: FROM CU/SI DIE TO LARGE WAFERS .....	1039
	<i>Vincenzo Vinciguerra</i>	
PP009	MAXIMUM JUNCTION TEMPERATURE SIMULATION AND VALIDATION FOR THE HOT SPOT IN MULTI-CHIP SIC POWER MODULE .....	1046
	<i>Wonjin Dylan Cho</i>	
PP010	INTEGRATION OF CFD-SIMULATION RESULTS IN PLECS USING LOOKUP TABLES .....	1051
	<i>Simon Cepin</i>	
PP011	PCB ONLY THERMAL MANAGEMENT TECHNIQUES FOR EGAN FETS IN A HALF-BRIDGE CONFIGURATION .....	1057
	<i>Adolfo Herrera</i>	

### **HIGH POWER DENSITY DESIGNS**

PP013	FROM 4X TO 3X STPAK – OPTIMIZATION FOR A MORE COMPACT EV TRACTION INVERTER SOLUTION .....	1065
	<i>Vittorio Giuffrida</i>	
PP014	A MULTI-OBJECTIVE STRUCTURAL OPTIMIZATION METHOD BASED ON MULTI-PHYSICS SIMULATIONS FOR POWER MODULE .....	1072
	<i>Baihan Liu</i>	
PP015	HOLISTIC APPROACH TO MAXIMIZE LIFETIME AND POWER DENSITY IN HIGH POWER SEMICONDUCTOR MODULES .....	1077
	<i>Martin Schulz</i>	
PP016	REGULATED HIGH DENSITY SWITCH CAPACITOR TOPOLOGY .....	1082
	<i>Pierrick Ausseresse</i>	

PP017 SILICON INTERPOSER AS A SUBSTRATE FOR POWER MODULES WITH HIGH POWER DENSITY AND SUPERIOR THERMAL PERFORMANCE .....	1087
<i>Ahmed Ammar</i>	

### **SPECIAL CONVERTER APPLICATIONS**

PP018 ANALYTICAL MODELING AND STABILITY CHARACTERIZATION OF A DAMPED VSCC CM ACTIVE EMI FILTER FOR SINGLE- AND THREE-PHASE AC-DC APPLICATIONS.....	1092
<i>Timothy Hegarty</i>	

PP020 A REPETITIVE HIGH VOLTAGE NANOSECOND PULSE GENERATOR: FIRST PROTOTYPE DESIGN AND TEST RESULTS.....	1101
<i>Serge Gavin</i>	

PP021 FREQUENCY SHIFT KEYED DUAL SIDE CONTROL OF INDUCTIVE POWER TRANSFER: AN APPLICATION OF TALKATIVE POWER CONVERSION .....	1105
<i>Hamzeh Beiranvand</i>	

PP022 STUDY OF A MULTI-ACTIVE BRIDGE CONVERTER FOR A DOMESTIC ELECTRICAL GRID.....	1113
<i>Abdennour Merrouche</i>	

### **INTEGRATION TECHNOLOGIES AND RELIABILITY DESIGN**

PP023 FABRICATION DEVELOPMENT FOR GATE DRIVER EMBEDDED DOUBLE-SIDED COOLING SIC POWER MODULE FOR ELECTRIC VEHICLE APPLICATION .....	1123
<i>Anna Corbitt</i>	

PP024 PRINTED CIRCUIT EMBEDDING OF PREPACKAGED 150V POWER MOSFETS IN A PORTABLE WELDING APPLICATION .....	1128
<i>Thomas Gebhard</i>	

PP025 PROCESS CHALLENGES AND PROGRESS TOWARDS DIRECT CONNECTION OF AUTOMOTIVE POWER MODULES (TMM) TO HEATSINK.....	1133
<i>Indrajit Paul</i>	

PP026 OPTIMIZING PCB STACKUPS FOR ENHANCED GAN TRANSISTOR PERFORMANCE IN HIGH-POWER APPLICATIONS.....	1139
<i>Philipp Czerwenka</i>	

PP027 NEW GENERATION CERAMIC SUBSTRATES – KEY COMPONENTS FOR POWER ELECTRONIC APPLICATIONS: PROCESSING AND CHARACTERIZATION .....	1147
<i>Stefanie Schindler</i>	

PP028 AI-ENHANCED VACUUM REFLOW OVEN: PRECISION CONTROL FOR RELIABLE LARGE-AREA SOLDERING .....	1152
<i>Chih Hui Lee</i>	

PP030 CORROSION-COMPATIBLE DRIVE ELECTRONICS FOR ELECTRIC VEHICLES AND INDUSTRIAL POWER MODULES .....	1158
<i>Tom Petzold</i>	

PP031	EVALUATING THE SAFETY ISOLATION OF THE PACKAGE IN AN INTEGRATED POWER DEVICE .....	1168
	<i>Thomas Anthony Capobianco</i>	

### **CONTROL METHODS I**

PP032	FLEXIBLE CONTROL SYSTEM FOR MODULAR ONE-PHASE INTERLEAVED GAN-BASED TOTEM POLE PFC USING REAL-TIME HARDWARE .....	1174
	<i>Oleksandr Solomakha</i>	

PP033	A PEAK CURRENT MODE CONTROL METHOD FOR PFC .....	1180
	<i>Sean Yu</i>	

PP034	ADAPTIVE RESONANT CONTROLLER FOR A THREE-PHASE PFC CONVERTER FOR AN ON-BOARD CHARGE APPLICATION .....	1185
	<i>Rami Troudi</i>	

PP035	SYNTHESIS OF A FIELD ORIENTED CONTROL ALGORITHM BY USING TWO DIFFERENT POLE-ZERO COMPENSATION APPROACHES.....	1192
	<i>Marco Denk</i>	

PP037	AVERAGE CURRENT MODE CONTROL AND ITS LOOP DESIGN .....	1200
	<i>Niklas Schwarz</i>	

PP038	NOVEL POWER FEED-FORWARD REGULATION FOR DUAL STAGE PFC+DCDC CONVERTERS .....	1207
	<i>Alfredo Medina-Garcia</i>	

### **HIGH POWER AC-DC AND DC-AC CONVERTER**

PP039	22 KW BI-DIRECTIONAL WALL-BOX CHARGER WITH 1200 V SIC MOSFET .....	1212
	<i>Sanbao Shi</i>	

PP040	DYNAMIC SWITCHING FREQUENCY SELECTION FOR EFFICIENCY OPTIMIZATION IN ON-BOARD CHARGER PFC STAGE BASED ON NOVEL SIC MOSFET POWER MODULE .....	1217
	<i>Giuseppe Aiello</i>	

PP041	DESIGN AND OPTIMIZATION OF SIC-BASED 11KW MOTOR DRIVE WITH HIGH EFFICIENCY .....	1222
	<i>Iris Liu</i>	

PP042	MODEL DESIGN DEVELOPMENT FOR FALSE TURN-ON CHARACTERIZATION IN SIC-BASED ACTIVE T-TYPE CONVERTER CONSIDERING ALL PARASITICS .....	1227
	<i>Amir Babaki</i>	

PP043	EFFICIENCY INVESTIGATIONS OF AN AUXILIARY RESONANT COMMUTATED POLE INVERTER.....	1233
	<i>Markus Zocher</i>	

PP044	A NOVEL HYBRID TWO-STAGE AC-DC CONVERTER WITH SOFT-SWITCHED CCM PFC STAGE FOR EVS CHARGING APPLICATIONS.....	1242
	<i>Lei Wang</i>	



PP045	A METHOD FOR TUNING LEAKAGE INDUCTANCE IN TRANSFORMERS .....	1249
	<i>Rosemary O'Keefe</i>	
PP046	LOW COST HIGH DENSITY 300W/20V AC-DC CONVERTER ENABLED BY GAN POWER ICS.....	1254
	<i>Tom Ribarich</i>	
PP047	25KVA GRID-TIED BI-DIRECTIONAL T-TYPE INVERTER WITH HIGH- EFFICIENCY AND HIGH-POWER DENSITY USING SIC MOSFETS.....	1259
	<i>Tamanna Bhatia</i>	
PP048	COST-EFFECTIVE EFFICIENCY ENHANCEMENT IN AC-DC CONVERTERS: A STUDY ACROSS THE FULL LOAD CYCLE .....	1264
	<i>Sebastian Gick</i>	

### **E-MOBILITY TRACTION I**

PP049	NEXT GENERATION POWER MODULE WITH PARALLEL CONNECTED SIC MOSFETS FOR BEV TRACTION INVERTERS.....	1272
	<i>Kohei Tanikawa</i>	
PP051	INVESTIGATION OF COMMON SOURCE FEEDBACK IN SIC POWER MODULES REGARDING PERFORMANCE AND SHORT CIRCUIT ROBUSTNESS .....	1277
	<i>Dominik Ruoff</i>	
PP052	HYBRIDPACK DRIVE POWER MODULES WITH SIC-MOSFET'S AND MONOLITHIC RC- SNUBBER CHIPS FOR OPTIMIZED POWER DENSITY.....	1283
	<i>Andre Uhlemann</i>	
PP053	ROBUST AUXILIARY POWER SUPPLY FOR EVS BASED ON INNOVATIVE STI2GAN 650V IC.....	1289
	<i>Federica Cammarata</i>	
PP054	IMPACT OF VARIOUS SILICON DIODES ON THE HYBRID SWITCH INVERTER .....	1297
	<i>Michael Walter</i>	
PP055	ADVANCED PULSE SEQUENCE FOR SALIENCY-BASED HIGH-ACCURATE ROTOR POSITION ESTIMATION OF RAILWAY TRACTION LOCOMOTIVE MOTORS .....	1307
	<i>Markus Vogelsberger</i>	

### **CONTROL TECHNIQUES**

PP056	OPTIMIZED HALF-BRIDGE GATE-DRIVE WITH LOW TIME-SKEW FOR RC- IGBTs AND SIC-MOSFET DEAD-TIME CONTROL .....	1315
	<i>Jan Fuhrmann</i>	
PP057	DESIGN OF A TRACTION INVERTER BASED ON PCB-EMBEDDED GAN DEVICES .....	1322
	<i>Maurizio Tranchero</i>	
PP058	OPTIMIZING ELECTRIC VEHICLE PERFORMANCE WITH GAN DESIGN.....	1330
	<i>Andrew Patterson</i>	

PP059	FAST ANALYTICAL CALCULATION OF THE MAGNETIC FIELD IN PERMANENT MAGNET SYNCHRONOUS MACHINES WITH FLUX BARRIERS INCLUDING SATURATION .....	1336
	<i>Martin Ackermann</i>	
PP060	MODELING AND CONTROL OF LCL FILTERED 3L-VSCS IN INTERLEAVED TOPOLOGY .....	1346
	<i>Adeel Jamal</i>	
PP062	ENHANCING SAFETY AND EFFICIENCY FOR ISOLATED PLC I/O DESIGNS WITH SPI DAISY CHAIN .....	1352
	<i>Travis Lenz</i>	

### VOLUME 3

PP063	COST-EFFECTIVE METHOD TO DISCHARGE DC LINK CAPACITORS WITH SIC POWER MODULES.....	1361
	<i>Paul Kanatzar</i>	

### **POWER QUALITY**

PP064	A STUDY ON CIRCULATION CURRENT IN PARALLEL OPERATION OF TRANSFORMER LESS UPS.....	1368
	<i>Koji Kato</i>	
PP065	DESIGN CHALLENGES AND CONSIDERATIONS FOR GATE DRIVERS OF SIC MOSFETS AND THEIR TESTING.....	1374
	<i>Niranjan Hegde</i>	
PP066	A PORTABLE EFFICIENCY CHARACTERIZATION SETUP FOR TECHNOLOGY DEMONSTRATION OF POWER MODULES.....	1380
	<i>Sebastian Tengvall</i>	
PP067	FAST EME CHARACTERIZATION OF BARE-DIE SIC MOSFETS .....	1385
	<i>Robert Kragl</i>	
PP068	THEORETICAL COMPARISON OF COMPONENT-RELATED MEASUREMENT METHODS OF PHOTOVOLTAIC INVERTERS FOR LONG-TERM TESTING.....	1393
	<i>Niclas Reitz</i>	
	DYNAMIC TRANSIENTS AND RELIABILITY OF HIGH-VOLTAGE SILICON & 4H-SIC BIPOLAR JUNCTION TRANSISTORS UNDER AVALANCE AND SHORT-CIRCUITS .....	1402
	<i>Mana Hosseinzadehlish</i>	
PP069	POWER CYCLING TEST OPTIMIZATION TOWARD RELIABILITY ASSESSMENT OF SINTERED POWER MODULES.....	1410
	<i>Robert Graham</i>	
PP070	REAL-TIME ESTIMATION AND SENSITIVITY ANALYSIS OF PARASITIC CAPACITANCES IN ELECTRIC DRIVE SYSTEMS .....	1418
	<i>Mohammadreza Bagheribavaryani</i>	

## **MODELLING AND TESTING**

PP071 PARASITIC COMPONENT EFFECTS OF INTERNAL AND EXTERNAL PACKAGE LEVEL ON SWITCHING PERFORMANCE OF SIC POWER MODULE .....	1428
<i>Nguyen Nghia Do</i>	
PP072 A MULTI-PHYSICS ITERATIVE APPROACH FOR TEMPERATURE ESTIMATION IN SIC POWER MODULE FOR ELECTRIC VEHICLE .....	1434
<i>Stefano Orlando</i>	
PP073 VOLTAGE BALANCING METHOD FOR SERIES CONNECTION OF 50 SIC MOSFETS .....	1441
<i>Antoine Philippe</i>	
VOLTAGE BALANCING METHOD FOR SERIES-CONNECTION OF 50 SIC MOSFETS .....	1449
<i>Antoine Philippe</i>	
PP074 A LABORATORY-SCALE MMC-BASED DC SYSTEM WITH RCP AND PHIL SIMULATION CAPABILITIES .....	1457
<i>Marc René Lotz</i>	
PP075 FILM CAPACITOR STANDARD SERIES DIGITALIZATION: ELECTROMAGNETIC & THERMAL MODELLING IMPLEMENTATION IN CLARA WEB TOOL .....	1467
<i>Fernando Aunon</i>	
PP076 ACCURACY EVALUATION AND PROPOSED DYNAMIC TUNING PROCEDURE OF A COMPACT SIC SPICE MODEL.....	1475
<i>Austin Curbow</i>	
PP077 INVESTIGATION OF USE-CASE-DEPENDENT MODELING APPROACH FOR SWITCHED-MODE POWER CONVERTER FOR LVDC GRID EVALUATION .....	1485
<i>Melanie Lavery</i>	
PP078 AVERAGED MODEL WITH BLOCKING CAPABILITY FOR SOLID-STATE TRANSFORMERS .....	1495
<i>Ahmed Meligy</i>	

## **ADVANCED COMPONENTS**

PP080 SURFACANT-MODIFIED NANOCOMPOSITE THIN-FILM CAPACITORS .....	1504
<i>Bartosz Gackowski</i>	
PP081 INCREASING ENERGY STORAGE CAPABILITIES OF POWDER CORES BY ADAPTING THE WINDING AND THE USE OF FRINGING FLUX .....	1511
<i>Paul Winkler</i>	
PP082 PEEC-BASED THERMAL MODELING OF PASSIVE COMPONENTS.....	1516
<i>Sascha Langfermann</i>	
PP083 GALVANICALLY ISOLATED POWER SUPPLY FOR GATE DRIVERS IN HIGH VOLTAGE APPLICATIONS .....	1523
<i>Priyanka Ghosh</i>	

PP084 FABRICATION TECHNIQUE FOR NOVEL NANOCRYSTALLINE CORES WITH HIGH SATURATION POLARIZATION AND LOW LOSSES ..... 1532  
*Merlin Thamm*

PP085 EXCITATION-DEPENDENT TEMPERATURE BEHAVIOR OF THE QUASI-STATIC HYSTERESIS LOSS ENERGY DENSITY OF N87 FERRITE MATERIAL..... 1538  
*Jeremias Kaiser*

PP087 PASSIVE METHODS LIMITING LEAKAGE CURRENT IN METAL-OXIDE VARISTOR AS VOLTAGE CLAMPING DEVICE USED DC LOW VOLTAGE POWER ELECTRONICS-BASED CIRCUIT BREAKERS ..... 1545  
*Kenan Askan*

### **GAN DEVICES AND APPLICATIONS**

PP088 ESD SOLUTIONS FOR 650V NORMALLY-OFF ALGAN/GAN HEMTS ..... 1555  
*Thanh Hai Phung*

PP089 A SIMULATIVE STUDY OF MEASUREMENT ERRORS DURING DOUBLE PULSE TESTING OF GAN DEVICES ..... 1561  
*Severin Klever*

PP090 PARALLEL CONNECTION OF GAN FETS: AN EXPERIMENTAL INVESTIGATION APPROACH..... 1568  
*Marco Palma*

PP091 REPETITIVE SHORT CIRCUITS ON 650 V GAN ..... 1574  
*Adrien Lambert*

PP092 COMPARISON OF SWITCHING LOSSES AND DYNAMIC ON RESISTANCE OF 600 V-CLASS GAN HEMTS..... 1584  
*André Thönnessen*

PP093 PERFORMANCE EVALUATION OF DEADTIME AND GATE RESISTANCE FOR PARALLEL CONNECTED GAN HEMTS ..... 1590  
*Junhyeok Jegal*

PP094 REACHING BEYOND 1200V: LATERAL GAN HEMTS FOR HIGH-RELIABILITY EV AND INDUSTRIAL APPLICATIONS ..... 1598  
*Kamal Varadarajan*

### **SIC DEVICES AND TECHNOLOGIES**

PP095 SMARTSIC 150 & 200MM ENGINEERED SUBSTRATE: INCREASING SIC POWER DEVICE CURRENT DENSITY UP TO 30%..... 1604  
*Eric Guiot*

PP096 DYNAMIC TRANSIENTS IN HIGH-VOLTAGE SILICON AND 4H-SIC NPN BIPOLAR JUNCTION TRANSISTORS ..... 1610  
*Mana Hosseinzadehlish*

PP097 AN ADVANCED MULTI-ASPECT PERFORMANCE ANALYSIS OF PLANAR-GATE 1.2 KV SIC POWER MOSFETS ..... 1613  
*Anja Katerina Brandl*

PP098	SIC MOSFET DIE SORTING AND PARALLEL FOR OPTIMAL MODULE DESIGN .....	1621
	<i>Zhong Ye</i>	
PP099	SIMULATION APPROACH FOR RADIATED ELECTRO-MAGNETIC FIELDS ESTIMATION ON ACEPACK DRIVE SIC POWER MODULE .....	1627
	<i>Andrea Cusumano</i>	

## **CONTROL METHODS II**

PP100	EXACT ANALYSIS OF CONTROL-TO-OUTPUT TRANSFER FUNCTIONS OF PWM-CONVERTERS - A COMPARISON OF TWO METHODS.....	1634
	<i>Daniel Breidenstein</i>	
PP101	3-LEVEL FLYING CAPACITOR MULTILEVEL TOPOLOGY WITH DELTA-SIGMA MODULATION .....	1642
	<i>Jannik Maier</i>	
PP102	MODEL BASED CONTROLLED POWER CONVERTER TEST PLATFORM.....	1651
	<i>Dawid Koczy</i>	
PP103	EDUCATIONAL HARDWARE TRAINER FOR TEACHING THE DUAL ACTIVE BRIDGE IN A DC GRID .....	1658
	<i>Peter Van Duijsen</i>	
PP104	STUDY OF THE OPERATING PERFORMANCE OF A FCS-MPC-CONTROLLED MATRIX-CONVERTER FOR PMSM AT DIFFERENT FREQUENCY RATIOS .....	1664
	<i>Robert Zipprich</i>	
PP105	ENHANCING REACTIVE POWER CAPACITY IN BATTERY-FED POWER CONDITIONING SYSTEMS.....	1673
	<i>Lucas Araujo</i>	
PP106	PULSE SHARING: ACHIEVING HIGH EFFICIENCY AND EXCELLENT REGULATION IN MULTI-OUTPUT FLYBACK POWER SUPPLIES .....	1680
	<i>Xingda Yan</i>	
PP107	RELIABILITY-OPTIMIZED SPACE VECTOR MODULATION (RO-SVM) FOR SEMICONDUCTORS LIFETIME ENHANCEMENT .....	1686
	<i>Amin Rezaeizadeh</i>	

## **INTELLIGENT POWER MODULES**

PP108	ANALYSIS AND OPTIMIZATION OF INTERNAL COUPLING INTERFERENCE IN INTEGRATED SIC POWER MODULE BASED ON DBC .....	1693
	<i>Chenhang Zeng</i>	
PP109	MULTISPECTRAL ELECTROLUMINESCENCE SENSING OF SIC MOSFETS FOR JUNCTION TEMPERATURE AND CURRENT EXTRACTION.....	1703
	<i>Lukas Ruppert</i>	
PP110	SIC-IPM FOR COMPACT AND ENERGY EFFICIENT LOW-POWER MOTOR DRIVES .....	1712
	<i>Jongmu Lee</i>	

PP111	CONCEPT FOR A GAN-BASED INTELLIGENT MOTOR CONTROLLER WITH INTEGRATED FAILURE PREDICTION FOR THE INVERTER AND THE DRIVE .....	1717
	<i>Christoph Blechinger</i>	
PP112	INTRODUCING THE NEW 1200 V CIPOS MAXI IM817 INTELLIGENT POWER MODULE FOR MOTOR DRIVE APPLICATIONS .....	1724
	<i>Kihyun Lee</i>	
PP113	THERMAL PERFORMANCE OF INFINEON'S NEW 600 V CIPOSTM MICRO IM241 IPM FOR LOW POWER MOTOR DRIVE SYSTEMS WITHOUT HEATSINK .....	1732
	<i>David Jo</i>	
	INTRODUCING THE NEW 1200 V CIPOSTM MAXI IM12BXXXC1 INTELLIGENT POWER MODULE FOR MOTOR DRIVE APPLICATIONS .....	1737
	<i>Kihyun Lee</i>	

### **INTELLIGENT GATE DRIVE UNITS**

PP114	AN ADAPTIVE DEAD TIME CONTROL BASED ON SWITCH NODE VOLTAGE DERIVATIVE.....	1745
	<i>Lukas Knappstein</i>	
PP115	COUPLING COIL DESIGN AND POSITIONING OPTIMIZATION ON NEW HIGH POWER SEMICONDUCTOR MODULE FOR FAST SHORT CIRCUIT DETECTION .....	1751
	<i>Yannick Dumollard</i>	
PP116	ENABLING ACTIVE THERMAL CONTROL VIA AN ADAPTIVE MULTI-VOLTAGE GATE DRIVER.....	1759
	<i>Tianlong Albert</i>	
PP117	INNOVATIVE GATE DRIVE METHOD TRIC3 FOR MOTOR.....	1765
	<i>Hisashi Sugie</i>	
PP118	A NEW CLASS OF SOLID STATE ISOLATORS ENHANCES THE RELIABILITY OF SOLID STATE RELAYS .....	1770
	<i>Wolfgang Frank</i>	
PP119	A SELF-DRIVING 3-LEVEL ACTIVE GATE DRIVER NETWORK TO CONTROL THE SWITCHING SLEW RATE FOR SIC MOSFETS .....	1775
	<i>Vin Loong Choo</i>	

### **E-MOBILITY TRACTION II**

PP121	ANALYSIS OF LONG-TERM RELIABILITY OF SIC IN TRACTION INVERTER CONSIDERING VTH INSTABILITY .....	1781
	<i>Chi Zhang</i>	
PP122	EFFICIENT MAPPING OF ON-DEMAND DRIVE LOAD PROFILES ON INVERTER STRESS.....	1788
	<i>Zlatko Bosnjic</i>	
PP123	EV TRACTION INVERTER OPTIMAL DESIGN IS DOMINATED BY 3-LEVEL ANPC .....	1797
	<i>Timothe Delaforge</i>	

PP124	INTRODUCTION OF POWER SEMICONDUCTOR OPTIONS FOR AN EXCITER OF ELECTRICALLY EXCITED SYNCHRONOUS MOTOR .....	1804
	<i>Yeriel Bai</i>	
PP125	A NOVEL HIGH POWER DENSITY THREE PHASE TRACTION INVERTER ARCHITECTURE FOR ELECTRIC VEHICLE (EV) APPLICATIONS.....	1809
	<i>Yiyang Yan</i>	
PP126	A MODULAR DC-LINK CAPACITOR SOLUTION FOR THE MAIN POWERTRAIN INVERTER OF XEV .....	1814
	<i>David Olalla</i>	
PP127	FAULT IDENTIFICATION TESTING METHODS FOR A COMMERCIAL TRACTION INVERTER .....	1821
	<i>Anna Corbitt</i>	
PP128	SHORT CIRCUIT ROBUSTNESS FOR TRACTION INVERTERS FROM AN APPLICATION POINT OF VIEW .....	1828
	<i>Karl Oberdieck</i>	

### **INVESTIGATIONS OF PARTICULAR SIC DEVICE PHENOMENON**

PP129	THE IMPACT OF THE DEADTIME ON THE STABILITY OF 1.2KV SIC MOSFET BODY DIODE UNDER HARD SWITCHING WITH SYNCHRONOUS RECTIFICATION.....	1835
	<i>Mohammed Amer Karout</i>	
PP130	RC-DC SNUBBER IMPLEMENTATION FOR SUPPRESSION OF DIODE VOLTAGE PEAK AND RINGING IN A FULL SIC HALF-BRIDGE POWER MODULE .....	1844
	<i>Emanuela Alfonzetti</i>	
PP131	SUB-5 SECOND WIDE-BANDGAP POWER DEVICE CALORIMETRIC MEASUREMENTS UTILIZING OPTICAL SENSORS AND PELTIER ELEMENTS .....	1851
	<i>Ruben Schnitzler</i>	
PP132	SIC TRENCH MOSFETS IN AVALANCHE MODE WITH RC SNUBBER CIRCUIT.....	1858
	<i>Sebnem Tuncay</i>	
PP133	HIGH-FREQUENCY OSCILLATIONS IN SIC MOSFET POWER MODULES DURING TURN-ON SWITCHING TRANSIENT – ANALYSIS BASED ON SIMULATIONS AND MITIGATION METHODS.....	1865
	<i>Rajani Kumar Thirukoluri</i>	
PP134	A DYNAMIC CURRENT BALANCING METHOD USING FULL-COUPLED INDUCTORS IN PARALLELED GATE BRANCHES.....	1872
	<i>Jianwei Lv</i>	
PP135	QUANTITATIVE PERFORMANCE COMPARISON OF LARGE-FORMAT SIC MOSFET AND SI IGBT MODULES .....	1878
	<i>Arthur Boutry</i>	

### **THERMAL MANAGEMENT AND ADVANCED COOLING**

PP136	SOLDER PREFORM TECHNOLOGY FOR IMPROVED THERMOMECHANICAL PERFORMANCE IN MOLDED POWER MODULE PACKAGE-ATTACH .....	1886
	<i>Joseph Hertline</i>	

PP138	EFFECT OF FLIP-CHIP DIE-ATTACH ON THE THERMAL BEHAVIOR OF POWER GAAS DIODES .....	1891
	<i>Felix Steiner</i>	
PP139	INFLUENCES OF SOLDER DELAMINATION ON THE THERMAL PERFORMANCE IN AUTOMOTIVE TRACTION MODULE .....	1896
	<i>Hansol Seo</i>	
PP141	DEVELOPMENT OF A PASSIVE CAPILLARY-PUMPED COOLING SYSTEM FOR HIGH-PERFORMANCE ELECTRONICS .....	1902
	<i>Justin Fey</i>	
PP143	ADVANCED COOLING OF POWER ELECTRONICS WITH COPPER COLD SPRAYED ALUMINIUM HEATSINKS & BUSBARS .....	1907
	<i>Michael Dasch</i>	
PP144	COLD PLATE DESIGN FOR COOLING LV100 SILICON CARBIDE POWER MODULE PACKAGING .....	1910
	<i>Wahid Cherief</i>	
PP145	AN IMPROVED DOUBLE-LAYER SPACER IN DOUBLE-SIDED COOLING POWER MODULE .....	1917
	<i>Linhao Ren</i>	

## **RELIABILITY TESTING**

PP146	POWER CYCLING OF 1.7KV MULTI-CHIP POWER MODULES – SIC MOSFETS VS SILICON IGBTs .....	1923
	<i>Nick Baker</i>	
PP147	POWER CYCLING CAPABILITY OF DISCRETE SIC MOSFET DEVICES WITH DIFFERENT DESIGNS .....	1930
	<i>Luhong Xie</i>	
PP148	MODEL-BASED PARAMETER TUNING OF SEMICONDUCTOR DEVICES IN DC POWER CYCLING TEST .....	1936
	<i>Yi Zhang</i>	
PP149	INFLUENCE OF TRANSFER MOLDING ON THE RELIABILITY OF DCM SIC POWER MODULES .....	1942
	<i>Jacek Rudzki</i>	
PP150	DAMP HEAT BEHAVIOR OF HIGH HEAT CAPACITORS FOR APPLICATIONS IN ELECTRIC VEHICLES .....	1951
	<i>Adel Bastawros</i>	
PP151	INFLUENCE OF THE GATE VOLTAGE DURING ON-TIME ON THE POWER CYCLING CAPABILITY OF SIC MOSFETS .....	1955
	<i>Patrick Heimler</i>	
PP152	INVESTIGATION OF THE TEMPERATURE MEASUREMENT VIA VSD(T)-METHOD APPLIED TO PARALLELED SIC MOSFET CHIPS DURING POWER CYCLING .....	1964
	<i>Kevin Ladentin</i>	
PP153	APPROACHES OF TSEP MEASUREMENTS FOR POWER SEMICONDUCTORS .....	1969
	<i>Philipp Hauenschield</i>	



PP154	REALTIME JUNCTION TEMPERATURE ESTIMATION IN SIC POWER MODULES BASED ON MULTIPLE TSEP ACQUISITION .....	1978
	<i>Kevin Muñoz Barón</i>	

### **HIGH VOLTAGE WBG DEVICES**

PP155	ENHANCED CURRENT MEASUREMENT APPROACH FOR NON-ISOLATED 6.5 KV SILICON CARBIDE MOSFETS .....	1987
	<i>Xinyuan Du</i>	

PP156	NEW 2KV SIC-MOS TECHNOLOGY FOR APPLICATION FIELDS IN THE INDUSTRIAL LANDSCAPE.....	1991
	<i>Igor Kasko</i>	

PP157	HIGH TEMPERATURE EXPERIMENTAL CHARACTERIZATIONS OF COSS OF 3.3 KV SIC MOSFET FOR MEDIUM VOLTAGE PV APPLICATIONS.....	1999
	<i>Paul Schmidt</i>	

PP158	IMPACT OF GATE CONTROL ON THE SWITCHING PERFORMANCE OF 3.3KV SBD-EMBEDDED SIC-MOSFET.....	2006
	<i>Junya Sakai</i>	

PP159	COMPARATIVE ASSESSMENT OF OVERLOADABILITY POTENTIAL OF 3.3 KV SI-IGBTs AND SIC-MOSFET POWER MODULES.....	2013
	<i>Muhammad Nawaz</i>	

PP160	IMPROVED RELIABILITY OF A 2200 V SIC MOSFET MODULE WITH AN EPOXY- ENCAPSULATED INSULATED METAL SUBSTRATE.....	2022
	<i>Hiroshi Kono</i>	

PP161	PARALLELING 3.3-KV/800-A RATED SIC-MOSFET MODULES – AN OPTIMIZATION METHOD.....	2028
	<i>Hiroyuki Irifune</i>	

PP162	PERFORMANCE ASSESSMENT OF 10 KV SIC MOSFET AND PIN DIODE IN 3L- NPC CONVERTER TOPOLOGY .....	2036
	<i>Renato Amaral Minamisawa</i>	

### **VOLUME 4**

PP163	PERFORMANCE EVALUATION OF COOLSIC 2 KV SIC MOSFET DISCRETE IN 1500 V DC LINK SYSTEMS .....	2041
	<i>Ajith Kumar Sekar</i>	

PP164	A NEW 2.3 KV RATED SIC MOSFET MODULE WITH LOW-INDUCTANCE HIGH- POWER PACKAGE HPNC FOR 1500 VDC APPLICATIONS .....	2049
	<i>Junya Kawabata</i>	

### **PACKAGING AND INTERCONNECTION MATERIALS**

PP166	MECHANISM FOR IMPROVING THE HEAT-RESISTANCE OF ADHESIVE INTERFACE IN FLEXIBLE PRINTED CIRCUITS.....	2053
	<i>Keita Suzuki</i>	

PP167	A SYSTEMATIC COMPARISON STUDY OF DIFFERENT BONDING TECHNOLOGIES FOR SUBSTRATE ATTACHMENT OF POWER ELECTRONICS.....	2060
	<i>Lisheng Wang</i>	
PP168	STABILITY OF PRESSURE SINTERED INTERCONNECTS AS A FUNCTION OF TEMPERATURE AND ENVIRONMENTAL CONDITIONS.....	2067
	<i>Kentaro Yoshioka</i>	
PP169	THE EFFECT OF NANO-CU INTERCONNECTION MATERIALS ON THE THERMOMECHANICAL PROPERTIES OF SIC DOUBLE-SIDED POWER MODULES .....	2074
	<i>Suhang Wei</i>	
PP170	ALL-IN-ONE-SINTERING: DIE-ATTACH AND SUBSTRATE-ATTACH ON BARE COPPER IN A PRESSURE ASSISTED SINTERING ONE-STEP PROCESS.....	2082
	<i>Battist Rabay</i>	
PP171	SEQUENTIAL MANUFACTURING OF HIGHLY FUNCTIONALIZED THREE-DIMENSIONAL CERAMIC COMPONENTS FOR POWER ELECTRONICS .....	2088
	<i>Lars Rebenklau</i>	
PP173	PARAMETRIC STUDY OF DAMAGE EVOLUTION IN SILVER SINTERED LAYERS OF DOUBLE SIDED POWER ELECTRONICS MODULES OF ELECTRICAL VEHICLES.....	2094
	<i>Saeed Akbari</i>	

### **DC-DC CONVERTER I**

PP174	TRISTATE MODIFIED BOOST CONVERTER.....	2104
	<i>Johannes Gragger</i>	
PP175	COMPARATIVE EVALUATION OF THE CENTER TAPPED BOOST CONVERTER TOPOLOGY .....	2112
	<i>Bryan Radix</i>	
PP176	COMPARISON OF MULTI-LEVEL TOPOLOGIES TO REDUCE THE COMPONENTS VOLTAGE STRESSES WHEN POWERED FROM INDUSTRIAL DC GRIDS.....	2119
	<i>Katharina Machtinger</i>	
PP177	HARD-SWITCHING HIGH-FREQUENCY GAN-BASED DC-DC CONVERTERS WITH CONCOMITANT DATA TRANSMISSION FUNCTIONALITY .....	2128
	<i>Abdelmoumin Allioua</i>	
PP178	EFFICIENT DESIGN OF HIGH-CURRENT, LOW-OUTPUT VOLTAGE DC-DC CONVERTERS USING ARTIFICIAL INTELLIGENCE-BASED TOPOLOGY SELECTION AND OPTIMIZATION .....	2138
	<i>Thomas Harmand</i>	

### **HIGH POWER DC-DC CONVERTER I**

PP180	A SIC BASED 60KW LLC CONVERTER WITH NOVEL TRANSFORMER DESIGN FOR IMPROVING VOLTAGE BALANCE .....	2146
	<i>Frank Wei</i>	

PP181	ANALYSIS OF INVERTER OPERATION MODES OF AN IGBT-BASED ZCS LLC CONVERTER FOR A 2 KW AUTOMOTIVE ON-BOARD DC-DC .....	2152
	<i>Daniel Urbaneck</i>	
PP182	DUAL OUTPUT HYBRID CONVERTER FOR 48 V DATA CENTERS: M-HSC.....	2162
	<i>Simone Mazzer</i>	
PP183	3.6KW HIGH EFFICIENCY SIC-BASED HV/LV DC-DC CONVERTER FOR EVS .....	2167
	<i>Veera Bharath Chandra Reddy Gandluru</i>	
PP184	BIDIRECTIONAL DC-DC TOPOLOGIES COMPARISON FOR 800 V AUTOMOTIVE APPLICATIONS INTEGRATING 650 V GAN-ON-SI DEVICES.....	2175
	<i>Ilias Chorfi</i>	
PP185	ANALYSIS OF PHASE SHIELDING METHOD BASED ON $\Delta$ -CR-Y THREE-PHASE INTERLEAVED LLC CONVERTER.....	2182
	<i>Jin Wen</i>	
PP186	22KW IMS-BASED BIDIRECTIONAL DC-DC CONVERTER USING SURFACE MOUNT SIC MOSFETS FOR OBCS .....	2185
	<i>Hamlin Wang</i>	
PP187	COMPARATIVE ANALYSIS OF DC-DC CONVERTERS FOR ELECTROLYZERS USING GEOMETRIC PROGRAMMING .....	2190
	<i>Tim McRae</i>	
PP188	DESIGN CONSIDERATION OF BI-DIRECTIONAL CLLC RESONANT CONVERTER IN ENERGY STORAGE SYSTEMS .....	2200
	<i>Sheng-Yang Yu</i>	
 <b><u>SMART-GRID TECHNOLOGIES</u></b>		
PP189	ADAPTIVE FAST CHARGING SYSTEM WITH SECOND LIFE BATTERIES - AN OVERVIEW OF A RESEARCH PROJECT .....	2208
	<i>Lukas Böhning</i>	
PP190	PARALLEL OPERATION AND SYNCHRONIZATION OF MICROGRIDS BY USING THE THEVENIN THEOREM.....	2217
	<i>Marius Block</i>	
PP192	21 KA SOLID STATE DC BREAKER FOR SUPERGRID INSTITUTE'S HIGH POWER TEST FACILITY .....	2227
	<i>Christophe Conilh</i>	
PP193	DESIGN AND ANALYSIS OF A 50KW SIC-BASED ACTIVE FRONT END WITH A VERY SMALL LINE CHOKE FOR DC-GRIDS.....	2234
	<i>Raphael Otte</i>	
PP194	INVESTIGATION OF LOAD TRANSITIONS BETWEEN LOADED AND LOAD FREE CONDUCTOR SEGMENTS IN INDUSTRIAL CONDUCTOR SYSTEMS .....	2240
	<i>Jan-Niklas Koch</i>	
PP195	A METHOD TO CONTROL VOLTAGE AND POWER FLOW IN A DC GRID .....	2248
	<i>Peter Van Duijsen</i>	

## **ENERGY STORAGE SYSTEMS**

PP196 CONSIDERATIONS ON A HIGH-CELL-COUNT CONVERTER-BASED BATTERY STORAGE SYSTEM WITH REDUCED COMMUNICATION EFFORT .....	2258
<i>Paul Aspalter</i>	
PP197 STUDYING CONVERTORS FOR VOLTAGE EQUALIZATION IN ENERGY STORAGE SYSTEM WITH ACTIVE BMS.....	2268
<i>Dimitar Arnaudov</i>	
PP198 CHALLENGES OF HIGH SIDE GATE DRIVER AND DISCONNECT MOSFET FOR BATTERY PROTECTION UNIT DURING START-UP, TURN-OFF AND OVER CURRENT EVENTS.....	2273
<i>Niranjana Suravarapu Reddy</i>	
PP199 ELECTRIC INSULATION COORDINATION TO PREVENT ELECTRIC ARCS IN LITHIUM ION BATTERIES .....	2278
<i>Daniel Chatroux</i>	
PP201 BATTERY CHARGER WITH IMPEDANCE SPECTROSCOPY CAPABILITY FOR LI-ION CELLS.....	2286
<i>Christian Branas</i>	

## **EMC**

PP202 EFFICIENCY, VOLUME AND CO2 EMISSIONS IMPACT IN A PFC CONVERTER WITH AN ACTIVE FILTER SOLUTION FOR OBC APPLICATION.....	2294
<i>Kelly Ribeiro</i>	
PP203 ANALYTICAL AND EXPERIMENTAL VALIDATION COMMON MODE FEEDBACK LOOP FOR A THREE-PHASE _LEVEL VIENNA RECTIFIER.....	2303
<i>Daniel San Laureano Igartuburu</i>	
PP204 ROBUSTNESS OF FREQUENCY-DOMAIN TERMINAL MODELING OF ELECTROMAGNETIC INTERFERENCES IN STATIC CONVERTERS .....	2309
<i>Mehyeddine Singer</i>	
PP205 STUDY OF EMI BEHAVIOR OF A 2-LEVEL GAN-INVERTER – SIMULATION AND MEASUREMENT.....	2316
<i>Benedikt Kohlhepp</i>	
COMMON MODE CURRENTS IN RESONANT CIRCUITS GENERATED WITH A DELTA-SIGMA MODULATED VOLTAGE SOURCE INVERTER.....	2326
<i>Tobias Haas</i>	
PP206 ANALYSIS OF COMMON-MODE NOISE GENERATED DUE TO FAST-SWITCHING GAN DEVICES IN TOTEM-POLE PFCS .....	2334
<i>Serkan Dusmez</i>	
PP207 CONDUCTED EMI FROM GAN-BASED 48V TO 12V DC-DC-CONVERTERS FOR AUTOMOTIVE APPLICATIONS.....	2342
<i>Erik Kampert</i>	

## **ADVANCED DESIGN**

PP208	APPLIED DESIGN AUTOMATION FOR FINDING FEASIBLE DESIGNS FOR HIGH-FREQUENCY PLANAR TRANSFORMERS.....	2350
	<i>Rando Raßmann</i>	
PP209	FREQUENCY DEPENDENT AREA PRODUCT METHOD.....	2359
	<i>Alfonso Martínez</i>	
	HIGH RESOLUTION MIXED-SIGNAL PULSE WIDTH MODULATOR FOR HIGH-FREQUENCY DC-DC CONVERTERS.....	2364
	<i>Tim McRae</i>	
PP210	DESIGNING A CONTROL LIBRARY FOR GRID-FOLLOWING AND GRID-FORMING POWER INVERTERS.....	2370
	<i>Lars Lindner</i>	
PP211	INTELLIGENT OPTIMISATION OF A WIND TURBINE DIGITAL TWIN MODEL.....	2377
	<i>René Reimann</i>	
PP212	THERMAL TRANSIENT DIGITAL TWIN MODELLING FOR POWER CONVERTERS.....	2386
	<i>Xianghao Mo</i>	
PP213	A DIGITAL TWIN APPROACH TOWARD LIFETIME ANALYSIS AND PREDICTIVE MAINTENANCE OF POWER SEMICONDUCTORS FOR RAILWAY APPLICATION.....	2394
	<i>Emmanuel Batista</i>	

## **INDUCTORS**

PP214	SATURABLE FERRITE CORE INDUCTORS IN LCL FILTERS OF THREE-PHASE VOLTAGE SOURCE INVERTERS.....	2400
	<i>Marius Kaufmann-Bühler</i>	
PP215	2D COPPER LOSS ANALYTICAL MODEL FOR PLANAR INDUCTOR COMBINING HIGH AND LOW PERMEABILITY MATERIALS.....	2408
	<i>Idriss Nachete</i>	
PP216	CNC-MANUFACTURED POWER INDUCTORS WITH EXCELLENT BANDWIDTH FOR MULTI-MEGAWATT CONVERTERS.....	2416
	<i>Thomas Kreppel</i>	
PP217	ANALYTICAL EVALUATION OF DIFFERENTIAL MODEL DC EMI FILTER INDUCTORS USING MATERIAL SATURATION COEFFICIENT.....	2425
	<i>Lukas Mueller</i>	
PP218	DESIGN AND PERFORMANCE EVALUATION OF AIR CORE INDUCTORS FOR VERY HIGH FREQUENCY POWER CONVERSION.....	2431
	<i>Florentin Salomez</i>	
PP220	IMPROVING MULTI-PHASE FERRITE MAGNETICS BY COUPLING FOR MV AND UPS CONVERTERS.....	2438
	<i>Michael Schmidhuber</i>	

## **E-MOBILITY CHARGING**

PP221	22-KW BIDIRECTIONAL SINGLE-STAGE DIRECT-AC-AC POWER CONVERSION ON-BOARD CHARGER WITH HIGH-POWER-DENSITY IMPLEMENTATION.....	2448
	<i>Oscar Lucia</i>	
PP222	BENCHMARKING DC FAST CHARGERS: A COMPARATIVE ANALYSIS OF POWER CONVERTER STRUCTURES FOR WIDE VOLTAGE RANGE .....	2453
	<i>Sadik Cinik</i>	
PP223	PERFORMANCE OPTIMIZATION OF SINGLE-PHASE ON-BOARD CHARGERS WITH RIPPLE PORT .....	2461
	<i>Davide Gottardo</i>	
PP224	A REDUCED-SENSOR MODULAR DUAL ACTIVE BRIDGE-BASED BATTERY CHARGING SYSTEM FOR ELECTRIC VEHICLES USING AN IMPROVED LINEAR EXTENDED STATE OBSERVER.....	2469
	<i>Armel Asongu Nkembi</i>	
PP225	BIDIRECTIONAL NON-ISOLATED THREE-PHASE ONBOARD CHARGER WITH A LOW-VOLTAGE LOWER-PHASE OPERATION MODE .....	2478
	<i>Steffen Frei</i>	
PP226	CONTROL OF A THREE-PHASE INDUCTIVE POWER TRANSFER SYSTEM BASED ON DD <sup>2</sup> Q COIL TOPOLOGY .....	2488
	<i>Nikola Mirkovic</i>	
PP227	COMPARISON OF TWO BIDIRECTIONAL 11KW 400V CLLC AND CLLLC RESONANT CONVERTERS FOR EV APPLICATIONS .....	2494
	<i>Hasan Mousavi Somarin</i>	
PP228	DYNAMIC WIRELESS CHARGING SYSTEM DESIGN FOR EXTRA-URBAN AREAS BASED ON RESONANT INDUCTIVE POWER TRANSFER .....	2503
	<i>Irene Maria Torres Alfonso</i>	
PP229	BIDIRECTIONAL ISOLATED 400-12V DC-DC CONVERTER WITH IMPROVED POWER DENSITY AND FULL-RANGE OPERAION FOR EV APPLICATIONS .....	2513
	<i>Oscar Lucia</i>	

## **HIGH POWER DC-DC CONVERTER II**

PP230	GAIN OPTIMIZATION CONTROL METHOD FOR CLLLC RESONANT CONVERTERS UNDER PHASE SHIFT MODE .....	2518
	<i>Sean Yu</i>	
PP231	ANALYSIS OF COMMON AND SPLIT DC-BUS INTERLEAVED H-BRIDGE CONVERTERS FOR HIGH-CURRENT LOW-RIPPLE APPLICATIONS.....	2524
	<i>Bhavana Gudala</i>	
PP232	OPTIMAL FREQUENCY OPERATING POINTS FOR HYBRID SWITCHED CAPACITOR CONVERTERS AND LOSSLESS CURRENT SENSE METHOD .....	2532
	<i>Simone Mazzer</i>	

PP233 DESIGN AND TESTING OF A 250 KW 50 KHZ SIC-BASED HALF-BRIDGE-SERIES-RESONANT-CONVERTER .....	2538
<i>Daniel Haake</i>	

PP234 30KW - 97% EFFICIENCY ISOLATED DC-DC CONVERTER WITH LARGE INPUT VOLTAGE RANGE BASED ON A BOOST DAB ASSOCIATION.....	2547
<i>Jean-Jacques Huselstein</i>	

PP235 ANALYSIS OF A FULL-BRIDGE PUSH-PULL FORWARD DUAL ACTIVE BRIDGE DC-DC CONVERTER.....	2557
<i>Gean Sousa</i>	

## **DC-DC CONVERTER II**

PP236 SYMMETRICAL OPERATION OF FOUR CHANNEL RESONANT BOOST DC-DC CONVERTERS IN CONTINUOUS CONDUCTION MODE .....	2566
<i>Kristóf Bándy</i>	

PP237 IMPACT OF MAGNETICS TOLERANCE ON THE POWER SHARING OF PARALLEL DUAL-OUTPUT PHASE-SHIFT FULL-BRIDGE CONVERTERS.....	2576
<i>Riccardo Mandrioli</i>	

PP238 A BALANCING CONVERTER WITH SERIES CONNECTED MOSFETS FOR +/- 700V BIPOLAR DC GRIDS.....	2583
<i>Sachin Yadav</i>	

PP239 OPTIMIZATION AND DESIGN OF LOW-VOLTAGE AND HIGH-CURRENT POINT-OF-LOAD CONVERTER UNDER 48V BUS ARCHITECTURE.....	2591
<i>Jiajia Guan</i>	

PP240 INTERLEAVED BOOST CONVERTER EFFICIENCY AND POWER DENSITY MODEL FOR ACTIVE AND PASSIVE COMPONENT DESIGN.....	2596
<i>Damien Lemaitre</i>	

## **NOVEL AND ADVANCED SEMICONDUCTOR DEVICES**

PP241 EVALUATION OF A HYBRID POWER SWITCH BASED ON TRENCH CLUSTERED IGBT AND SIC MOSFET .....	2606
<i>Alireza Sheikhan</i>	

PP242 CONTRIBUTIONS FOR BUILDING BLOCKS FOR NORMALLY-OFF 650V GAN-ON-SI POWER INTEGRATED CIRCUITS.....	2612
<i>Thanh Hai Phung</i>	

PP243 NEW BIDIRECTIONAL ASYMMETRIC HIGH VOLTAGE TVS (TRANSIENT VOLTAGE SUPPRESSOR) DIODE.....	2620
<i>Boris Rosensaft</i>	

PP244 ISO247: HIGH PERFORMANCE CERAMIC BASED ADVANCED ISOLATED DISCRETE PACKAGE TO FULLY EXPLOIT THE ADVANTAGES OF SIC MOSFET .....	2627
<i>Sachin Shridhar Paradkar</i>	

PP245 IMPACT OF CURRENT RIPPLE REDUCTION USING HIGH SWITCHING FREQUENCIES ON PMSM EFFICIENCY .....	2632
<i>Jannik Fuchs-Gade</i>	

PP246	MAXIMIZING COST-EFFICIENCY IN ELECTRIC DRIVETRAINS: A SIC/SI FUSION SWITCH APPROACH .....	2638
	<i>Matthias Ippisch</i>	

### **ADVANCED CONTROL**

PP247	CONCISE AND RELIABLE SIC MOSFET DRIVER CIRCUITS .....	2646
	<i>Zhong Ye</i>	

PP248	ARTIFICIAL INTELLIGENCE ENHANCED RESOLVER SYSTEM FOR AUTOMOTIVE TRACTION INVERTER APPLICATIONS BASED ON AURIX TC4X.....	2651
	<i>David Zipperstein</i>	

PP250	MULTIFUNCTIONAL GRID MANAGER TOPOLOGY WITH CONFIGURABLE OUTPUT .....	2657
	<i>Peter Van Duijsen</i>	

PP252	CO2 FOOTPRINT OF MEDIUM VOLTAGE DC SOLID STATE TRANSFORMER .....	2663
	<i>Adriana Campos</i>	

### **SIC MOSFET**

PP253	THERMO-ELECTRICAL ANALYSIS AND PERFORMANCE: A COMPARATIVE STUDY BETWEEN MODULAR AND DISCRETE APPROACHES .....	2673
	<i>Stefano Orlando</i>	

PP254	IMPACT OF PARAMETER SPREAD IN PARALLEL-OPERATED SIC MOSFETS FOR HARD-SWITCHING CONVERSION.....	2680
	<i>Andrea Piccioni</i>	

PP255	ASSESSMENT OF THE RDS,ON OF SIC MOSFET DIES THROUGH KELVIN WIRE CONNECTION .....	2686
	<i>Philipp Rehlaender</i>	

PP256	CHALLENGES IN SCALING SIC SINGLE-CHIP MEASUREMENTS TO CORRESPONDING POWER MODULES .....	2693
	<i>Hao Wang</i>	

PP257	SWITCHING PERFORMANCE EVALUATION OF HIGH-POWER 1.7 KV SIC MOSFET MODULES USING A COMMON BUSBAR DESIGN.....	2700
	<i>Sebastian Neira</i>	

PP258	CHARACTERIZING THE SWITCHING BEHAVIOR OF A 1.2 KV MIXED SIC JFET AND MOSFET HALF BRIDGE.....	2708
	<i>Tim Ringelmann</i>	

## **VOLUME 5**

### **WBG HIGH FREQUENCY APPLICATION**

PP259	PERFORMANCE EVALUATION OF THE PACKAGING OF SIC DIODES IN A 6.78 MHZ WIRELESS POWER TRANSFER SYSTEM.....	2718
	<i>Ioannis Nikiforidis</i>	



PP260	VOLTAGE WAVEFORM GENERATION FOR SAWYER-TOWER COSS LOSS MEASUREMENTS USING A HYBRID POWER CONVERTER .....	2724
	<i>Malachi Hornbuckle</i>	
PP261	EVALUATION OF SIC DEVICES FOR OVER 500KHZ APPLICATION BASED ON BUCK CIRCUIT .....	2730
	<i>Minli Jia</i>	
PP262	LINEARIZATION OF DRAIN-SOURCE CAPACITANCES FOR ANTISERIAL CONFIGURATED SIC MOSFETS IN HIGH FREQUENCY SOLID STATE SWITCHES.....	2737
	<i>Lars Dresel</i>	

### **SIC RUGGEDNESS**

PP263	EFFECTS OF NON-KILLER DEFECTS ON SIC MOSFET SHORT-CIRCUIT RUGGEDNESS AND RELIABILITY.....	2745
	<i>Sara Kuzmanoska</i>	
PP264	DYNAMIC REVERSE BIAS TEST: ELECTRO-THERMAL CHARACTERIZATION OF SIC MOSFETS.....	2751
	<i>Giuseppe Mauromicale</i>	
PP266	RADIATION HARDNESS OF SIC BASED INVERTERS BASED ON AN EV MISSION PROFILE .....	2758
	<i>Hadiuzzaman Syed</i>	
PP267	RAPID SHORT CIRCUIT PROTECTION USING DIDT DETECTION FOR SIC POWER MODULES.....	2764
	<i>Koki Samura</i>	
PP268	COMPARISON OF DYNAMIC GATE STRESS TEST RESULTS OF SIC MOSFETS .....	2769
	<i>Mathias Gebhardt</i>	
PP279	EXTENDING SIC MOSFET SHORT-CIRCUIT WITHSTANDING TIME BY TWO-LEVEL TURN-OFF GATE DRIVING .....	2778
	<i>Kwokwai Ma</i>	
PP270	EXPERIMENTAL INVESTIGATIONS ON PARASITIC TURN-ON OF 1.2KV SIC MOSFET DISCRETE DEVICES.....	2786
	<i>Thanh-Toan Pham</i>	
PP271	BEHAVIOR MODELLING THE SHORT CIRCUIT CHARACTERISTICS OF SIC MOSFETS USING COMPACT MODELS.....	2791
	<i>Qing Sun</i>	

### **THERMAL CHARACTERIZATION**

PP273	THERMAL ANALYSIS AND MODELLING OF CHARGING STATIONS FOR ELECTRIC VEHICLES.....	2796
	<i>Ruben Kopischke</i>	
PP274	JUNCTION TEMPERATURE MEASUREMENT OF A 3.3 KV SILICON CARBIDE MOSFET POWER MODULE .....	2803
	<i>Michael Gleissner</i>	

PP275	INNOVATIVE 3D POWER MODULE DEFAULTS DETECTION VIA THERMAL IMPEDANCE ANALYSIS AND SIMULATIONS.....	2811
	<i>Louis Alauzet</i>	

PP276	THERMAL CHARACTERIZATION OF AN AIR-COOLED PEBB BASED ON SIC MOSFET POWER MODULES .....	2819
	<i>Alexandre Marie</i>	

PP277	THERMAL BEHAVIOUR OF SIC MOSFET WITH PLANAR PACKAGING TECHNOLOGY .....	2826
	<i>Yijun Ye</i>	

## **RELIABILITY AND AVAILABILITY**

PP279	IMPLEMENTING MODULE HEALTH MONITORING IN EV TRACTION INVERTERS .....	2831
	<i>Karol Rendek</i>	

PP280	RELIABILITY TESTS OF COPPER THICK-FILM SUBSTRATES FOR POWER ELECTRONIC APPLICATIONS.....	2838
	<i>Henry Barth</i>	

PP281	POWER MODULE SOLUTIONS WITH IMPROVED RELIABILITY FOR ELEVATOR DRIVE APPLICATIONS .....	2843
	<i>Tiago Jappe</i>	

PP282	FAIL-OPERATIONAL LLC TOPOLOGIES WITH FAULT-TOLERANCE INTEGRATED REDUNDANT CAPABILITIES .....	2850
	<i>Aswathy M. Prince</i>	

PP283	THERMAL AND RELIABILITY OPTIMIZATION OF CLIPS IN SIC MOSFET POWER MODULES.....	2860
	<i>Zexiang Zheng</i>	

PP284	CONDITION MONITORING OF A GAN FULL-BRIDGE BY MEANS OF FORWARD VOLTAGE IN CONTINUOUS OPERATION.....	2866
	<i>Michael Vogt</i>	

PP285	A SIMPLE AND LOW COST OVERCURRENT PROTECTION SYSTEM BASED ON COMMERCIAL SHUNT FOR WIDE-BANDGAP DEVICES.....	2874
	<i>Emanuele Martano</i>	

PP286	SVM-BASED FAULT-TOLERANT CONTROL FOR A CASCADED H-BRIDGE MULTILEVEL CONVERTER UNDER MULTIPLE OPEN-CIRCUIT SWITCH FAULTS.....	2880
	<i>Dong Xie</i>	

PP287	REVOLUTIONIZING MOBILITY: THE SECOND LIFE OF ONBOARD CHARGING SYSTEMS IN COMMERCIAL VEHICLES.....	2886
	<i>Ajay Krishna Voppu Muralikrishna</i>	

## **LOW VOLTAGE SWITCHES**

PP288	A BEHAVIORAL TRANSIENT MODEL FOR IGBT DEVICE WITH ANTI PARALLEL FREEWHEELING DIODE.....	2893
	<i>Shiwu Zhu</i>	

PP289	PARAMETER EXTRACTION FOR AN ANN-ASSISTED IGBT MODEL IN TRANSIENT SIMULATIONS .....	2901
	<i>Huaiyuan Zhang</i>	
PP290	FABRICATION OF 600V RC-IGBT USING 300MM WAFER .....	2909
	<i>Masaki Ueno</i>	
PP291	NEXT LEVEL OF POWER MODULE SOLUTION FOR PV C&I STRING INVERTER WITH 1200V H7 TECHNOLOGY IN EASY3B PACKAGE .....	2914
	<i>Tilo Poller</i>	
PP292	ANALYSIS OF MOSFET SWITCHING LOSSES IN RESONANT CONVERTERS USING ELECTRICAL AND THERMAL MEASUREMENTS AND LOSS TRENDS WITH MOSFET SIZE VARIATION.....	2921
	<i>Alfio Scuto</i>	
PP293	OPTIMOS 6 135V FOR HIGH POWER MOTOR DRIVES .....	2930
	<i>Kunal Jha</i>	
PP294	AUTO POWER-SOI: SHAPING THE FUTURE OF BATTERY MONITORING TECHNOLOGY .....	2937
	<i>Alex Lim</i>	

### **LIFETIME MODELLING AND CONDITION MONITORING**

PP295	UNDERSTANDING THE IMPACT OF IEC60747-17 ON CAPACITIVE AND MAGNETIC COUPLERS.....	2942
	<i>Shu Ee Ong</i>	
PP296	PARIS LAW APPLIED TO WIRE BONDS DEGRADATION USING CRACK GROWTH MEASUREMENT .....	2948
	<i>Merouane Ouhab</i>	
PP297	CONDITION MONITORING TECHNIQUE OF POWER ELECTRONIC MODULES VIA SQUARE-WAVE GATE SIGNAL EXCITATION .....	2956
	<i>Isabel Austrup</i>	
PP298	STATISTICS-BASED LIFETIME SIMULATION ENVIRONMENT FOR POWER MODULES INCORPORATING DEGRADATION MODELS.....	2963
	<i>Karthik Debbadi</i>	
PP299	POWER CYCLING RESULTS FOR RELIABILITY STUDIES OF SIC-INVERTERS .....	2972
	<i>Robert Keilmann</i>	
PP300	GAN CASCODE IN HIGH SPEED DRIVEN AIR COMPRESSORS FOR AUTOMOTIVE FUEL CELLS.....	2981
	<i>Florian Lippold</i>	
PP301	PROGNOSTIC ANALYSIS OF IGBT HEALTH: REAL-TIME ON-STATE VOLTAGE PREDICTION THROUGH MACHINE LEARNING .....	2986
	<i>Tanya Thekemuriyil</i>	
PP302	ROBUSTNESS ANALYSIS OF TEMPERATURE-SENSITIVE ELECTRICAL PARAMETERS OF IGBTs .....	2995
	<i>Laurids Schmitz</i>	

PP303	OBSERVATION OF THERMAL-RESISTANCE INCREASE OF DEGRADED IGBT MODULES BY VCE (SAT) MEASUREMENT IN A CHOPPER CIRCUIT .....	3002
	<i>Kazunori Hasegawa</i>	

**PULSE WITH MODULATION METHODS**

PP304	MODULATION TECHNIQUE FOR REDUCED AC CONTENT OF THE DC LINK CURRENT IN THREE-PHASE TWO-LEVEL INVERTERS .....	3007
	<i>Steffen Frei</i>	

PP305	COMMON MODE CURRENTS IN RESONANT CIRCUITS GENERATED WITH A DELTA-SIGMA MODULATED VOLTAGE SOURCE INVERTER.....	3017
	<i>Tobias Haas</i>	

PP306	EVALUATION OF NEW MODULATION SCHEME FOR 3L-ANPC USING BOTH CURRENT PATHS IN ZERO STATE .....	3020
	<i>Felix Eichler</i>	

PP307	AN INNOVATIVE SYNCHRONOUS RECTIFICATION METHOD FOR 11KW CLLC CONVERTER.....	3029
	<i>Sanbao Shi</i>	

PP308	INTERLEAVED ASYNCHRONOUS DELTA-SIGMA MODULATION CONCEPT FOR DYNAMIC POWER CONVERTERS .....	3034
	<i>Philipp Czerwenka</i>	

PP309	HIGH RESOLUTION MIXED-SIGNAL PULSE WIDTH MODULATOR FOR HIGH-FREQUENCY DC-DC CONVERTERS .....	3042
	<i>Tim McRae</i>	

PP310	IMPLEMENTATION AND CONTROL OF OPTIMIZED PULSE PATTERNS FOR SALIENT PERMANENT MAGNET SYNCHRONOUS MACHINES IN ELECTRIC VEHICLES.....	3045
	<i>Maximilian Hepp</i>	

PP311	A 3-LEG INTERLEAVED TP PFC WITH A 90° PHASE-SHIFTED ASYMMETRIC LEG FOR REDUCED MAGNETICS.....	3060
	<i>Serkan Dusmez</i>	

PP312	FAULT-TOLERANT OPERATION ANALYSIS OF A FIVE-PHASE THREE-LEVEL TNPC INVERTER FOR ELECTRIC AIRCRAFT PROPULSION SYSTEMS.....	3067
	<i>Chanuch Chaisakdanugull</i>	

**AC-DC AND DC-AC CONVERTER**

PP313	CCM TOTEM-POLE PFC FOR ULTRA-HIGH POWER DENSITY USB-PD CHARGERS.....	3077
	<i>Manuel Escudero Rodruigez</i>	

PP314	COMPARISON OF HYBRID SI/SIC AND SIC TWO-LEVEL AND THREE-LEVEL CONVERTERS FOR LOW-VOLTAGE LOW-POWER APPLICATIONS.....	3086
	<i>Tim Augustin</i>	

PP315	ANALYSIS OF ANALOGUE CURRENT AND FLUX BALANCING FOR THE DUAL-ACTIVE-BRIDGE CONVERTER.....	3096
	<i>Christophe Basso</i>	

PP316	DESIGN AND OPTIMIZATION OF A SINGLE-STAGE PHOTOVOLTAIC MICROINVERTER WITH INTEGRATED MAGNETICS .....	3103
	<i>Jin Wen</i>	
PP317	EXPERIMENTAL INVESTIGATION OF CLASS F INVERTER UNDER VARIOUS LOAD CONDITIONS.....	3110
	<i>Baptiste Daire</i>	
PP318	ANALYSIS, MODELING, DESIGN, AND LIMITATIONS OF CURRENT INJECTION BASED UPF RECTIFIER WITH SMALL DC-LINK CAPACITOR.....	3118
	<i>Ramkrishan Maheshwari</i>	
PP319	HIGH-EFFICIENT ISOLATED AC-DC CONVERTER WITH CIRCULATING CURRENT REDUCTION FOR AC ADAPTERS .....	3125
	<i>Hiroki Watanabe</i>	
PP320	A PHASE-LOCKED LOOP (PLL) BASED STRATEGY FOR ACCURATE BLANKING TIMES IN BRIDGELESS TOTEM-POLE PFCS.....	3130
	<i>Sandu Tigira Tigira</i>	
PP321	CIRCULATING CURRENTS IN COUPLED MULTI-TERMINAL HYBRID AC-DC GRIDS.....	3136
	<i>Fabian Herzog</i>	

### **ADVANCED CONVERTER TOPOLOGIES**

PP322	COMPARISON OF 4500V STATE-OF-THE-ART XHP3 IGBT AND CONVENTIONAL IHV IGBT FOR 3300V 3-LEVEL ANPC MEDIUM VOLTAGE DRIVES .....	3142
	<i>Martin Knecht</i>	
PP323	GENERALIZED SWITCHING SEQUENCE FOR VOLTAGE BALANCING IN A FLYING CAPACITOR DC-DC CONVERTER WITH QUASI-2-LEVEL MODULATION.....	3150
	<i>Jose Andres Aguilar Croston</i>	
PP324	OPTIMIZATION-BASED SIZING OF A MODULAR MULTILEVEL CONVERTER BASED ON 650 V GAN MODULES FOR NEW LVDC/MVDC GRIDS.....	3160
	<i>Gregoire Le Goff</i>	
PP325	A NOVEL THREE-PHASE LOW-SWITCH-COUNT AC-DC GRID CONVERTER TOPOLOGY WITH GALVANIC ISOLATION.....	3169
	<i>Liska Steenbock</i>	
PP326	SINGLE-STAGE LED DRIVER BASED ON COUPLED INDUCTOR POWER FACTOR CORRECTION AND LLC CONVERTER.....	3175
	<i>Alireza Ramezan Ghanbari</i>	
PP327	A INVERSE COUPLED DC-DC BOOST INDUCTOR WITH 2-KV SIC MOSFET MODULE FOR 1500V SOLAR INVERTER MPPT.....	3181
	<i>Yusi Liu</i>	
PP328	ENVIRONMENTAL IMPACT OF MODULAR POWER ELECTRONICS SYSTEMS CONSIDERING DIAGNOSTIC-DRIVEN UNIT REPLACEMENT .....	3187
	<i>Briac Baudais</i>	

## **POWER ELECTRONICS FOR RAILWAY APPLICATIONS**

PP329 SWITCHING PERFORMANCE COMPARISON OF 3.3 KV SIC MOSFET AND SI IGBT POWER MODULES FOR RAILWAY TRACTION SYSTEMS .....	3197
<i>Yue Zhao</i>	
PP330 COMPARISON OF THREE-LEVEL INVERTER TOPOLOGIES FOR MVDC REVERSIBLE RAILWAY SUBSTATIONS .....	3206
<i>Luc Bimmel</i>	
PP331 CONTROL OF BIDIRECTIONAL POWER FLOW IN RAILWAY CATENARY OVERHEAD LINES.....	3213
<i>Peter Van Duijsen</i>	
PP332 A RAIL TRACTION CONVERTER PLATFORM BASED ON POWER MODULE IMPLEMENTATIONS WITH 450 A, 600 A AND 800 A 3.3 KV IGBT MODULES.....	3221
<i>Ekrem R. Gunes</i>	
PP333 COMPARISON OF SELECTED MEGAWATT-LEVEL TRACTION CONVERTER POWER MODULE IMPLEMENTATIONS IN TERMS OF COMMUTATION INDUCTANCE AND PRACTICALITY.....	3229
<i>Abdulkerim Ugur</i>	

## **CURRENT RELATED TESTING**

PP334 PITFALLS AND THEIR AVOIDABILITY IN THE DOUBLE-PULSE TEST .....	3237
<i>Nikolas Förster</i>	
PP335 MODELING AND SIMULATION OF FLUXGATE BASED CURRENT SENSOR .....	3247
<i>Yunus Çay</i>	
PP336 SIGMA-DELTA BASED CURRENT ACQUISITION WITH REDUCED SETTling TIME.....	3256
<i>Joschka Randerath</i>	
PP337 CHARACTERISATION OF WIDE-BANDGAP SEMICONDUCTORS IN DOUBLE PULSE TESTING USING OPTICALLY ISOLATED PROBES.....	3264
<i>Lennart Hoffmann</i>	
PP338 NON-INVASIVE BATTERY CONDITION TESTING USING ELECTRICAL SIGNALS AND OSCILLOSCOPES.....	3269
<i>Srikrishna N. H</i>	
PP339 INSTRUMENTATION REQUIREMENTS FOR FAST 130 V/NS SWITCHING OF 1700 V, 35 M? SIC MOSFETS .....	3276
<i>Matthew Appleby</i>	

## **POWER ELECTRONICS FOR AEROSPACE APPLICATIONS**

PP340 CONCEPTUALIZATION AND EXPERIMENTAL ASSESSMENT OF DESIGN ASPECTS FOR 3-LEVEL ANPC INVERTERS .....	3286
<i>Lukas Radomsky</i>	

PP341	DESIGN OF A HIGH POWER DENSITY INVERTER AND FOC IMPLEMENTATION FOR UAVS .....	3296
	<i>Matthias Neuner</i>	
PP342	HIGHLY-INTEGRATED, FLEXIBLE POWER SOLUTION FOR AEROSPACE 5KVA – 20 KVA MOTOR DRIVE APPLICATIONS .....	3305
	<i>Alain Calmels</i>	
PP343	DATABASE-SUPPORTED PRELIMINARY DESIGN, SIMULATION AND EVALUATION OF POWER CONVERTERS IN ELECTRIC AIRCRAFT PROPULSION SYSTEMS .....	3315
	<i>Jeff Kugener</i>	
PP344	DESIGN AND ANALYSIS OF GATE-DRIVER FOR SIC-BASED INVERTER FOR MEGAWATT SCALE ALL ELECTRIC AIRCRAFT .....	3318
	<i>Jeff Kugener</i>	

### **MEASUREMENT TECHNIQUES AND METHODS**

PP345	ADDRESSING TESTING CHALLENGES FOR POWER MODULES AND THREE-LEVEL INVERTERS .....	3328
	<i>Oleg Fotteler</i>	
PP346	CHARACTERIZATION OF THE BONDING QUALITY OF SILVER SINTERED COMPOUNDS BY MEANS OF LASER-INDUCED BREAKDOWN SPECTROSCOPY .....	3334
	<i>Yannick Bockholt</i>	
PP347	INVERTER-INTEGRATED MEASUREMENT OF THE FREQUENCY-DEPENDENT WINDING IMPEDANCE OF ELECTRIC MACHINES .....	3340
	<i>Christian Mühlfeld</i>	
PP348	COMPENSATION TECHNIQUES FOR BANDWIDTH-DISTORTED MEASUREMENTS OF FAST TRANSIENTS IN DOUBLE PULSE TESTS .....	3347
	<i>Christian Lottis</i>	
PP349	AN AERODYNAMIC LOAD MEASUREMENT TECHNIQUE FOR AUTONOMOUS AERIAL VEHICLES .....	3353
	<i>Mehmet Oguz Girgin</i>	
	COMPENSATION TECHNIQUES FOR BANDWIDTH-DISTORTED MEASUREMENTS OF FAST TRANSIENTS IN DOUBLE PULSE TESTS .....	3358
	<i>Christian Lottis</i>	
PP350	A HIGH-BANDWIDTH MULTILEVEL COUNTER CIRCUIT FOR BEARING CURRENT EVALUATION .....	3364
	<i>Felix Schulte</i>	

### **TRANSFORMERS**

PP351	CORE LOSS MODEL FOR CONSIDERING ANISOTROPY AND TEMPERATURE EFFECTS ON ELECTRICAL STEEL UNDER POWER ELECTRONIC CONDITIONS .....	3371
	<i>Michael Owzareck</i>	

PP353 CIRCULAR ECONOMY ORIENTED AND RECONFIGURABLE PLANAR  
TRANSFORMER DESIGN FOR ISOLATED DC-DC CONVERTERS ..... 3380  
*Fabian Groon*

PP354 CONTROLLABLE MAGNETICS: VARIABLE TRANSFORMERS AND VARIABLE  
INDUCTORS, THEORY – PRODUCTION – APPLICATION..... 3390  
*Florian Fenske*

PP355 A THREE-PHASE INTERLEAVED LLC INTEGRATED TRANSFORMER USING  
PCB WINDINGS FOR FUEL CELL DCDC CONVERTERS ..... 3395  
*Jiajia Guan*

PP356 TESTING THE PRIMARY-SECONDARY COIL COUPLING OF HIGH-FREQUENCY  
TRANSFORMER IMPLEMENTED ON ETD AND TOROIDAL CORES ..... 3400  
*Alexis Gioda*

**Author Index**