

# **2007 Power Conversion Conference - Nagoya**

**Nagoya, Japan  
2-5 April 2007**

**Volume 1 of 3**



**IEEE Catalog Number:**  
**ISBN:**

**TH8935**  
**1-4244-0843-1**

## Table of Contents

<b>Cooling Concepts for High Power Density Magnetic Devices.....</b>	<b>1</b>
<i>J. Biela and J. W. Kolar</i>	
<b>Design and Implementation of Coaxial Winding Transformers for Isolated DC-DC Converters .....</b>	<b>9</b>
<i>Po-Tai Cheng, Siang-Yu Yang, Yeh Guan, and Shinn-Shyong Wang</i>	
<b>The Active Self-Controlled Free-Wheelin Management Principle Applied To Reverse Recovery Losses Reduction.....</b>	<b>16</b>
<i>Daniel Siemaszko, Philippe Barrade, Alfred C. Rufer</i>	
<b>Large-Signal Average Modeling and Simulation of DC-DC Converters with SIMULINK.....</b>	<b>22</b>
<i>P. Chrin and C. Bunlaksananusorn</i>	
<b>Output Impedance and Tolerance Analysis of POL with Peak Current Mode Control .....</b>	<b>28</b>
<i>S. Abe, and T. Ninomiya</i>	
<b>A Practical Model and a New Transient Performance Measurement of Capacitors for VR Applications.....</b>	<b>33</b>
<i>Takashi Nabeshima, Terukazu Sato, Susumu Ando, Hiroyuki Yajima, Hirokazu Ichihara, Kazuhiro Higuchi, Sakumi Aizawa and Kenji Hirano</i>	
<b>Analysis, Control And Comparison Of Hybrid Two-Stage Matrix Converters For Increased Voltage Transfer Ratio And Unity Power Factor .....</b>	<b>38</b>
<i>S. Mariethoz, T. Wijekoon, P. Wheeler</i>	
<b>CRA Based Robust Digital Current Controller for AC/DC PWM Converter.....</b>	<b>46</b>
<i>Jaeho Choi, Soo-Cheol Kim, Hyoung-Chul Kim, and Young-Chol Kim</i>	
<b>A Three-Phase Space-Vector Based PWM Rectifier with Power Factor Control .....</b>	<b>52</b>
<i>Mongkol Konghirun</i>	
<b>Space Vector Modulated and Vector Controlled Vienna I Rectifier with Active Filter Function.....</b>	<b>57</b>
<i>J. Alahuhtala, J. Virtakoivu, T. Viitanen, M. Routimo, and H. Tuusa</i>	
<b>A Method for Reducing Harmonics in Input Current of Double Connected Three-Phase Hybrid Rectifier without Input Transformers .....</b>	<b>64</b>
<i>Shigeo Masukawa, Shoji Iida</i>	
<b>Experiment on Instantaneous Value Voltage Control of a Single-Phase AC Chopper .....</b>	<b>69</b>
<i>S. Polmai, and E. Sugprajun</i>	
<b>Methods for Solving Problems in the Feedback System using the PWM (Pulse Width Modulation) Power Amplifier.....</b>	<b>75</b>
<i>Shigeaki Wachi Hirofumi Matsuo</i>	
<b>A New Current Balancer for Single-Phase Three-Wire Secondary Distribution Feeders Using the Correlation Coefficients .....</b>	<b>83</b>
<i>Toshihiko Tanaka, Hirokazu Fukui, and Eiji Hiraki</i>	
<b>A New Random Current Control Technique for a Single-Phase Inverter with Bipolar and Unipolar Modulations.....</b>	<b>89</b>
<i>Firuz Zare, Alireza Nami</i>	
<b>Switching Frequency Control based on Phase-locked Loop for a Current-fed Parallel Resonant Inverter .....</b>	<b>97</b>
<i>N. Ponwiangkum , S. Kittiratsatcha</i>	
<b>Inverter Circuit With The Regenerative Passive Snubber.....</b>	<b>102</b>
<i>Akihisa Matsushita, Hiromichi Tai, Ikuo Yasuoka, and Toshiaki Matsumoto</i>	
<b>Single-Phase Shunt Active Power Filter Using Frequency Limitation And Hysteresis Current Control.....</b>	<b>107</b>
<i>M. Antchev, M. Petkova, and M. Petkov</i>	
<b>Experimental Considerations on Adjustable Dead-Time Control Scheme for Resonant Snubber Inverter.....</b>	<b>113</b>
<i>Nobukazu Hoshi, Yuki Hachiga, and Hiroko Kurihara</i>	
<b>Output Voltage Distortion Analysis of PWM Inverter With LC Filter Caused by Device Voltage Drop .....</b>	<b>121</b>
<i>Yusuke Nakamura, Hirohito Funato and Satoshi Ogasawara</i>	

## Table of Contents

<b>A New Control Method of a Resonant Switched-Capacitor Converter and its Application to Balancing of the Split DC Voltages in a Multilevel Inverter</b> .....	127
<i>Kenichiro Sano, and Hideaki Fujita</i>	
<b>Virtual-Flux Direct Power Control for Mains Connected Three-Level NPC Inverter Systems</b> .....	135
<i>L. A. Serpa and J. W. Kolar</i>	
<b>A Control Method of Superposition Ratio in the Improvement of Voltage Utilization Factor in Three-Phase Multilevel Inverter Considering the DC Voltage Fluctuation</b> .....	142
<i>Kenji Amei, Youhei Tanizaki, Takahisa Ohji, Masaaki Sakui</i>	
<b>Hysteresis Band Current Control for a Single Phase Z-source Inverter with Symmetrical and Asymmetrical Z-network</b> .....	148
<i>Firuz Zare, Jafar Adabi Firouzjaee</i>	
<b>Theoretical Discussion on the Discrete-Time Feedback Error Learning for a Time Delay System with an Uncertainty Plant Model by using a PD Controller</b> .....	154
<i>B. Phokaphan, P. Guptabutra, T. Onwan, S. Wongsura and W. Kongprawechnon</i>	
<b>Characteristics of Power Series Type Wavelet Transform for Online Frequency Estimation</b> .....	159
<i>M. Tsuji, S. Hamasaki and M. Korogi</i>	
<b>A Three-Phase Frequency Adaptive Digital Phase Locked Loop for Measurement, Control, and Protection in Power Systems</b> .....	165
<i>H. Shokrollah Timorabadi and F. P. Dawson</i>	
<b>A New Frequency-Adaptive Phase-Estimation Method Based on a New PLL Structure for Single-Phase Signals</b> .....	173
<i>S. Shinnaka</i>	
<b>Output Maximization Control of Wind Generation System Applying Square-Wave Operation and Sensorless Control</b> .....	181
<i>I. Kawabe, S. Morimoto, and M. Sanada</i>	
<b>Suitable Configuration of Permanent Magnet Linear Synchronous Generator for Wave Power Generation</b> .....	188
<i>Akihiko Shibaike, Masayuki Sanada, and Shigeo Morimoto</i>	
<b>Intermittent Discharging for Lead-Acid Batteries</b> .....	194
<i>K. S. Ng, C. S. Moo, Y. C. Lin, Y. C. Hsieh, and Y. L. Tsai</i>	
<b>A Study of Output Terminal Voltage Modeling for Redox Flow Battery Based on Charge and Discharge Experiments</b> .....	199
<i>M. -H. Li, T. Funaki, and T. Hikiyara</i>	
<b>Uninterruptible Power Supply System Utilizing Electric Double-Layer Capacitors</b> .....	204
<i>Hiroshi Zaitzu, Hidetaka Nara, Hiroyuki Watanabe, Minoru Oobe, Shigeyuki Sugimoto, Ryouyuke Hatano, and Nobuyuki Yamamoto</i>	
<b>A Study on Electric Power Smoothing System for Lead-acid Battery of Stand-alone Natural Energy Power System Using EDLC</b> .....	210
<i>Yan Jia, Kenji Oti, Naoki Yamamura, Muneaki Ishida</i>	
<b>Method of Electric Power Compensation for Wind Power Generation Using Biomass Gas Turbine Generator and Flywheel</b> .....	217
<i>M. Hara, N. Yamamura, M. Ishida, Y. Kamada, T. Maeda, and M. Wakita</i>	
<b>A High Performance Position Control System of Switched Reluctance Motor</b> .....	223
<i>Min-Huei Kim, Won-Sik Baik, Dong-Hee Kim, Kyeong-Ho Choi</i>	
<b>An Adaptive FNN Control for Torque-Ripple Reduction of SR Motor Drive</b> .....	227
<i>Chih-Hong Lin</i>	
<b>Estimation of Rotor Position for Switched Reluctance Motor at Standstill</b> .....	233
<i>T. Bamba, A. Komatsuzaki, and I. Miki</i>	
<b>Position Estimation Technique of a Switched Reluctance Motor at Standstill</b> .....	238
<i>K. Trakrancharoungsook, S. Kittiratsatcha</i>	

## Table of Contents

<b>Direct Torque Control of ALA Synchronous Reluctance Machine Based on Modified Integrator</b> .....	245
<i>L.Q. Zhou</i>	
<b>Flux Position Estimation of Closed Slot Induction Machine with Three Phase Triangular Carrier Waves at Low Speeds</b> .....	249
<i>Eiichi Morooka, and Hisao Kubota</i>	
<b>Characteristic Comparison between Five-Leg Inverter and Nine-Switch Inverter</b> .....	253
<i>Kazuo Oka, Yusuke Nozawa, Ryuji Omata, Kanta Suzuki, Atsushi Furuya and Kouki Matsuse</i>	
<b>A Novel Position Sensorless Vector Control of Permanent-Magnet Synchronous Motors</b> .....	258
<i>Kenji Yamanaka, Tokuo Ohnishi, Masahide Hojo</i>	
<b>Steady State Characteristics of PWM Inverter with Voltage Boosters for Permanent Magnet Synchronous Motor Drives</b> .....	264
<i>Kichiro Yamamoto, Katsuji Shinohara and Akihiro Imakiire</i>	
<b>Initial Pole Position Estimation of IPMSM with DC Link Current Measurement Approach for Weak Saturation Effect Machines</b> .....	270
<i>Hisao Kubota, Yusuke Shibano</i>	
<b>Expansion of Operating Range of Sensorless PMSM Drive by Square-wave Operation at High-speed</b> .....	276
<i>T. Weng, Y. Inoue, S. Morimoto, and M. Sanada</i>	
<b>Performance Improvement of the IPMSM Position Sensor-less Vector Control System by the On-line Motor Parameter Error Compensation</b> .....	282
<i>Tetsuya Fukumoto, Hiroto Hamane and Yoich Hayashi</i>	
<b>A Method of Reducing Torque Ripple in Interior Permanent Magnet Synchronous Motor</b> .....	290
<i>A. Yamada, H. Kawano, I. Miki, and M. Nakamura</i>	
<b>Prototyping of IPMSMs for a Micro-mover and Their d-q Equivalent Model Based Comparative Evaluation</b> .....	294
<i>Mikihiko Matsui and Zhongqin Yang</i>	
<b>Numerical Optimization of Speed Profiles of Inverter Trains Considering DC Feeding Circuit</b> .....	300
<i>Masafumi Miyatake, and Hideyoshi Ko</i>	
<b>A Study of Energy Storage Systems for Railway Rolling Stocks Using Transformers Connected in Series to Motor Windings</b> .....	306
<i>M. Yano, T. Mizumura, and A. Kuramochi</i>	
<b>Synthesis and Integration of Future Electronic Power Distribution Systems</b> .....	312
<i>Dushan Boroyevich</i>	
<b>Recent Development of Halbach Permanent Magnet Machines and Applications</b> .....	320
<i>Z. Q. Zhu</i>	
<b>Progresses for a Last Decade and Perspectives in Applications Specific Electric Motors and Drives in Japan</b> .....	328
<i>Nobuyuki Matsui</i>	
<b>Power Semiconductor Devices- Development Trends and System Interactions</b> .....	333
<i>Leo Lorenz</i>	
<b>Recent and Future IGBT Evolution</b> .....	340
<i>Gourab Majumdar, and Tadaharu Minato</i>	
<b>Comparison of High Voltage Switches in Automotive DC-DC Converter</b> .....	345
<i>A. Gorerino, A. Guerra, D. Kinzer and J. Marcinkowski</i>	
<b>Vertical device operation of AlGaIn/GaN HEMTs on free-standing n-GaN substrates</b> .....	353
<i>Masahiro Sugimoto, Hiroyuki Ueda, Masakazu Kanechika, Narumasa Soejima, Tsutomu Uesugi, and Tetsu Kachi</i>	
<b>Novel SiC Power Devices utilizing a Si 4H-SiC Heterojunction</b> .....	358
<i>Masakatsu Hoshi, Testuya Hayashi, Hideaki Tanaka, Shigeharu Yamagami</i>	

## Table of Contents

<b>High Efficiency Low Noise SMPS System - Single Phase PFC Rectifier Side</b> .....	362
<i>Kouhei Imai, Takahiro Kawashima, Shigeyuki Funabiki, Masayoshi Yamamoto and Mamoru Tsuruya</i>	
<b>Distributed Active Filters for Harmonic Resonance Suppression in Industrial Facilities</b> .....	369
<i>Shen-Yuan Kuo, Tzung-Lin Lee, Chien-An Chen, Po-Tai Cheng, and Ching-Tsai Pan</i>	
<b>Design of a State Feedback Controller for Series Voltage Sag Compensators</b> .....	376
<i>Po-Tai Cheng, Chia-Long Ni, and Jhao-Ming Chen</i>	
<b>A New Method of Compensating Harmonic Currents for Wind Power Generation Systems with the Soft Starter Using A Hybrid Active Filter</b> .....	382
<i>Hiroaki Yamada, Miho Enami, Eiji Hiraki, and Toshihiko Tanaka</i>	
<b>Analysis of Common-Mode Noise Generation in Single-Switch Converter Comparison With Four-Switch Converter Using Unbalanced Circuit Model</b> .....	388
<i>A. Srisawang, N. Boonpirom, Y. Prempraneerach and S. Nitta</i>	
<b>Design Procedure of Common-mode Filter for Induction Motor Drive using Butterworth Function</b> .....	395
<i>C. Khun, V. Tarateeraseth, W. Khan-ngern, Masaaki Kando</i>	
<b>Discussion of Internal Noise Currents in a Control Circuit on a 200-kHz Switching PWM Inverter</b> .....	401
<i>Keiji Wada, Kazuhiro Shirakawa, Toshihisa Shimizu</i>	
<b>A Study on Common-Mode Noise Generation in Switching Circuit due to Unbalanced Characteristic</b> .....	407
<i>T. Intachot, W. Klungwijit, Y. Prempraneerach and S. Nitta</i>	
<b>The Comparison of EMI and Electrical Performances of High Frequency Transformer Windings for SMPS Applications</b> .....	413
<i>V. Tarateeraseth, T. Maneenopphon, and W. Khan-ngern</i>	
<b>An Analytical, Control-Oriented State Space Model for a PEM Fuel Cell System</b> .....	419
<i>Felix Grasser and Alfred C. Rufer</i>	
<b>A 1kW Grid-Connected Converter System for PEFC</b> .....	426
<i>Ryuji Yamada, Nobuyuki Kobayashi, Kazuaki Mino</i>	
<b>Power Conditioner Consisting of Utility Interactive Inverter and Soft-Switching DC-DC Converter for Fuel-Cell Cogeneration System</b> .....	433
<i>Shinichiro Sumiyoshi, Hideki Omori and Yasuyuki Nishida</i>	
<b>A High-Efficiency 5-kW Soft-Switched Power Conditioning System for Low-Voltage Solid Oxide Fuel Cells</b> .....	441
<i>Jih-Sheng Lai, Sung-Yeul Park, Seungryul Moon, and Chien Liang Chen</i>	
<b>Study of a Control Method of Fuel Cell Inverters Connected in Parallel and Verification Test Result of an Isolated Micro Grid</b> .....	449
<i>Noriko Kawakami, Jiro Sumita, Kojiro Nishioka, Yasuhiro Noro, Hirofumi Shinohara, Yozo Ito, and Masanori Yabuki</i>	
<b>Practical Modeling and Simulation of a Power Electronic System</b> .....	455
<i>Toshiji Kato, Kaoru Inoue, Tomoaki Hashimoto</i>	
<b>Discretization Method Suitable for Real-Time Simulators on Power Electronic Systems Error Reduction for Arbitrary Waveforms</b> .....	463
<i>Masashi Hirasawa, Satoshi Ogasawara and Hirohito Funato</i>	
<b>Simulation Based Power Electronics Education in Korea</b> .....	469
<i>Jaeho Choi, Hyungsoo Mok</i>	
<b>Utilization of Spreadsheet Software as Engineering Education Tool</b> .....	474
<i>Fumio Sakuma and Mikihiko Matsui</i>	
<b>Virtual Power Electronics: Novel Software Tools for Design, Modeling and Education</b> .....	480
<i>J. Hamar, I. Nagy, H. Funato, S. Ogasawara, O. Dranga and Y. Nishida</i>	
<b>Bi-Directional Isolated DC-DC Converter for Next-Generation Power Distribution - Comparison of Converters using Si and SiC Devices</b> .....	488
<i>D. Aggeler, J. Biela, S. Inoue, H. Akagi, J. W. Kolar</i>	

## Table of Contents

<b>DC Voltage Control of the DC Micro-grid for Super High Quality Distribution .....</b>	<b>496</b>
<i>H. Kakigano, Y. Miura, T. Ise, and R. Uchida</i>	
<b>Development of Active Filters with Spiral Vector Theory .....</b>	<b>504</b>
<i>Kempei Seki</i>	
<b>Efficiency Improvement of a Gas Engine Cogeneration System by Power Factor Control with an IGBT Rectifier .....</b>	<b>512</b>
<i>Y. Miura, S. Kokubo, D. Maekawa, and T. Ise</i>	
<b>Four-Wire Current Source Active Power Filter with an Open-Loop Current Control .....</b>	<b>520</b>
<i>S. Pettersson, M. Salo and H. Tuusa</i>	
<b>Computationally Efficient Integration of Complex Thermal Multi-Chip Power Module Models into Circuit Simulators.....</b>	<b>528</b>
<i>Uwe Drofenik, Didier Cottet, Andreas Musing, Jean-Marc Meyer and Johann W. Kolar</i>	
<b>Thermal Stress Simulation for HV Inverter Module.....</b>	<b>536</b>
<i>Y. Nishibe, Y. Yagi, K. Nishiyama, H. Ohmo, K. Akamatus, and N. Ohmo</i>	
<b>Reliability of High Temperature Inverters for HEV .....</b>	<b>541</b>
<i>F. Renken, G. Ehbauer, V. Karrer, R. Knorr, S. Ramminger, N. Seliger and E. Wolfgang</i>	
<b>High Power Density Design Methodology .....</b>	<b>547</b>
<i>Y. Hayashi, K. Takao, T. Shimizu and H. Ohashi</i>	
<b>High Power Density Converter using SiC-SBD.....</b>	<b>553</b>
<i>I. Omura, M. Tsukuda, W. Saito and T. Domon</i>	
<b>Novel Approach in Stability Analysis Presented in Controlled Boost Converter .....</b>	<b>559</b>
<i>B. Buti, I. Nagy, H. Ohsaki and E. Masada</i>	
<b>A Comparison of Soft-Switched DC-DC Converters for Fuel Cell to Utility Interface Application .....</b>	<b>566</b>
<i>Akshay K. Rathore, Ashoka K. S. Bhat, and Ramesh Oruganti</i>	
<b>Operation Analysis of a Novel High Frequency-Link Asymmetrical Half-Bridge ZCS...PWM DC-DC Converter.....</b>	<b>573</b>
<i>Tomokazu Mishima, Eiji Hiraki, Toshihiko Tanaka, Khairy Fathy, and Mutsuo Nakaoka</i>	
<b>A New Quadratic, Three-Level, DC/DC Converter Suitable for Fuel Cell Applications .....</b>	<b>579</b>
<i>Y. R. de Novaes, A. Rufer, and I. Barbi</i>	
<b>Performance Characteristics of One Novel Switched Reluctance Bearingless Motor Drive .....</b>	<b>586</b>
<i>L. Chen, W. Hofmann</i>	
<b>Fundamental Characteristics Of A Small Actuator With A Magnetically Levitated Mover.....</b>	<b>592</b>
<i>Y. Ueda and H. Ohsaki</i>	
<b>Microgrids and Heterogeneous Security, Quality, Reliability, and Availability .....</b>	<b>600</b>
<i>C. Marnay</i>	
<b>Micro-grid Demonstration Projects in Japan .....</b>	<b>606</b>
<i>Satoshi Morozumi</i>	
<b>Long Term European Field Tests for Microgrids.....</b>	<b>614</b>
<i>B. Buchholz, T. Erge, N. Hatzigryriou</i>	
<b>Protection Issues in Microgrids with Multiple Distributed Generation Units .....</b>	<b>617</b>
<i>Johan Driesen, Pieter Vermeyen, Ronnie Belmans</i>	
<b>Economic Analysis of Microgrids.....</b>	<b>625</b>
<i>H. Asano, S. Bando</i>	
<b>Comparison of Five-Level Voltage-Source Inverter Based STATCOMs .....</b>	<b>630</b>
<i>P. Luttamus and H. Tuusa</i>	
<b>A Transformerless Hybrid Active Filter Using a Three-Level Diode-Clamped PWM Converter .....</b>	<b>638</b>
<i>Wiroj Tangtheerajaronwong, Takaaki Hatada, and Hirofumi Akagi</i>	

## Table of Contents

<b>Analysis and Comparison of Phase Locked Loop Techniques for Grid Utility Applications</b> .....	645
<i>L. R. Limongi, R. Bojoi, C. Pica, F. Profumo and A. Tenconi</i>	
<b>Experimental Evaluation of Dynamic Force Distribution Method for EV Motion Control</b> .....	653
<i>Peng He and Yoichi Hori</i>	
<b>Traction Control based on Slip Ratio Estimation Without Detecting Vehicle Speed for Electric Vehicle</b> .....	659
<i>Kiyoshi Fujii and Hiroshi Fujimoto</i>	
<b>Analysis on Current Regulation for Torque Control for a Very Distorted CEMF Type IPMSM</b> .....	665
<i>Yukou Kawno and Atsuo Kawamura</i>	
<b>A Study of Novel Traction Control Method for Electric Motor Driven Vehicle</b> .....	670
<i>Toru Akiba, Ryota Shirato, Takeshi Fujita and Jun Tamura</i>	
<b>Electric Vehicle Yaw Rate Control using Independent In-Wheel Motor</b> .....	676
<i>Jeongmin Kim, Hyunsoo Kim</i>	
<b>Starting Transient Characteristics of Metal Halide Lamps</b> .....	682
<i>Sheng Y. Tang, Jia H. Chen, Ching R. Lee, Hung L. Cheng</i>	
<b>High Efficiency Inverter Systems for Driving Mercury-free Flat Fluorescent Lamps</b> .....	688
<i>J. H. Park, I. K. Lee, B. H. Cho, Ju Kwang Lee, and Ki-Woong Whang</i>	
<b>Electronic Ballast with Constant Instantaneous Power Output for Fluorescent Lamps without Light Fluctuation</b> .....	692
<i>Yong N. Chang, Chung C. Hung</i>	
<b>Single-Stage Voltage Source Charge Pump Electronic Ballast with Switched-Capacitor Dimmer for Multiple Fluorescent Lamps</b> .....	698
<i>M. H. Tseng, H. T. Yang, H. J. Chiu, S. C. Mou</i>	
<b>Analysis of a Fuel Starvation Phenomenon of a PEM Fuel Cell</b> .....	702
<i>P. Thounthong and P. Sethakul</i>	
<b>Research on Dynamic Response of Hybrid Power Source Systems with PEMFCs and Lead-Acid Batteries</b> .....	710
<i>Chih-Chiang Hua, Chi-Lun Huang, and Hsien-Chang Chiu</i>	
<b>Investigation on Operating Characteristics of Individual Cells in a Lead-Acid Battery Pack</b> .....	716
<i>Yao C. Hsieh, Wen C. Chen, Kong S. Ng, Chin S. Moo</i>	
<b>A Transformerless Energy Storage System Based on a Cascade PWM Converter with Star-Configuration</b> .....	722
<i>Laxman Maharjan, Tsurugi Yoshii, Shigenori Inoue, and Hirofumi Akagi</i>	
<b>State-of-Charge Estimation with Open-Circuit- Voltage for Lead-Acid Batteries</b> .....	729
<i>C. S. Moo, K. S. Ng, Y. P. Chen, Y. C. Hsieh</i>	
<b>Improvement of Input Current Waveforms for a Matrix Converter Using a Novel Hybrid Commutation Method</b> .....	734
<i>Koji Kato, Jun-ichi Itoh</i>	
<b>PWM Control of Matrix Converter for Reducing a Number of Commutations and Output Voltage Harmonics</b> .....	740
<i>Andou Yusuke, Takaharu Takeshita</i>	
<b>A New Modulation Method for the Three- Level-Output-Stage Matrix Converter</b> .....	747
<i>Meng Yeong Lee, Patrick Wheeler, Christian Klumpner</i>	
<b>An Ultra Sparse Matrix Converter with a Novel Active Clamp Circuit</b> .....	755
<i>J. Schonberger, T. Friedli, S. D. Round, and J. W. Kolar</i>	
<b>Bi-directional Switch Commutation for a Resonant Matrix Converter supplying a Contactless Energy Transmission System</b> .....	763
<i>A. Ecklebe and A. Lindemann</i>	
<b>Output Waveform Improvement of High Switching Frequency PWM Inverters Introducing Digital Signal Processing</b> .....	771
<i>Y. Sato, M. Jiang</i>	

## Table of Contents

<b>Variable Sampling Quasi Multirate Deadbeat Control Method for Single Phase PWM Inverter in Low Carrier Frequency Modeling</b> .....	775
<i>Suguru Tahara, Takahiro Fujii, Tomoki Yokoyama</i>	
<b>Multirate Perfect Tracking Control of Single-phase Inverter with Inter Sampling for Arbitrary Waveform</b> .....	781
<i>Hironori Abe and Hiroshi Fujimoto</i>	
<b>Modulation Concepts for the Control of a Two-Phase Bearingless Slice Motor Utilizing Three-Phase Power Modules</b> .....	787
<i>M.T. Barholet, T. Nussbaumer, D. Krähenbühl, F. Zürcher, J.W. Kolar</i>	
<b>Analysis of a Three-Phase Buck-Boost AC Chopper Controlled in Two Phases</b> .....	795
<i>Shinichiro Fujikura, Akiteru Ueda, Akihiro Torii, and Nariaki Kobayashi</i>	
<b>Semiconductor Power Loss Comparison of Space-Vector Modulated Direct and Indirect Matrix Converter</b> .....	802
<i>M. Jussila and H. Tuusa</i>	
<b>A Speed Sensorless Induction Motor Control Method using Adaptive Flux Observer Improving Stability Around Zero Frequency</b> .....	810
<i>Toshie Kikuchi, Yasushi Matsumoto, Hidehiko Sugimoto</i>	
<b>A New Detection Method of Slot Harmonics for Speed Sensorless Vector Control of Induction Motors</b> .....	816
<i>Hirofumi Kiyotake, Katsuji Shinohara, and Daisuke Katoh</i>	
<b>Influence of Inverter Output Filter on Maximum Torque and Speed of PMSM Drives</b> .....	823
<i>Janne Salomäki, Marko Hinkkanen, and Jorma Luomi</i>	
<b>Accuracy Improvement of IPMSM Sensorless Drives with On-line Parameter Identification</b> .....	831
<i>Yukinori Inoue, Koji Yamada, Shigeo Morimoto, Masayuki Sanada</i>	
<b>A Position Sensorless Control for Switched Reluctance Motor</b> .....	838
<i>A. Komatsuzaki, T. Bamba, and I. Miki</i>	
<b>Current Compensation Signal in Suppression Control for frame vibration of PMSM by Sensorless Control</b> .....	845
<i>Airinori Shimada, Tadanao Zanma, Shinji Doki, Muneaki Ishida</i>	
<b>Computer Aided Analysis and Design of Power Electronic Systems - Simulator Based Approach</b> .....	850
<i>Yasuaki Kuroe</i>	
<b>A Novel Multi-Phase Buck Converter for Lap-top PC</b> .....	856
<i>K. Abe, K. Nishijima, K. Harada, T. Nakano, T. Nabeshima and T. Sato</i>	
<b>Three-Level ZVZCS and ZVS Half-Bridge Converters: A Comparative Evaluation</b> .....	863
<i>A. Medury, J. Carr., J. Balda, H. Mantooth, T. Funaki</i>	
<b>Output Voltage Control of Resonant Boost Switched Capacitor Converter</b> .....	870
<i>Masahito Shoyama, and Tamotsu Ninomiya</i>	
<b>9000 kW-1500Hz Frequency Converter for Hot Bar Heater</b> .....	875
<i>Katsuro Itoh, Yasutomo Moriura, Tsuguo Satoh, Koji Arimatsu, Noriyuki Nakayama, Kenichi Kimoto, Tetsuji Doizaki and Koji Dojoh</i>	
<b>Application of the Power Devices for the Accelerator Magnet Power Supply</b> .....	882
<i>H. Sato, S. Igarashi, K. Koseki, T. Kubo, S. Matsumoto, K. Okamura, T. Shintomi and T. Sueno</i>	
<b>Improved Performance of Induction Motor Using Magnetic Energy Recovery Switch</b> .....	890
<i>Takanori Isobe, Jan A. Wiik, F. Danang Wijaya, Kouta Inoue, Kazuhiro Usuki, Tadayuki Kitahara and Ryuichi Shimada</i>	
<b>High-Efficient Linear Oscillatory Actuator Drive Systems Optimized Current Waveform</b> .....	896
<i>T. Izumi, Y. Ibuki, M. Yamashita, H. Shimizu, S. Nakayama, and H. Abe</i>	
<b>The Design and Experiment of Ion Generator Power Supply for Vacuum Sputtering</b> .....	902
<i>Wen-Guang Chen, Yi-Hua Rao, Chang-Hong Shan, Goro Fujita and Takemoto Yasutoshi</i>	

## Table of Contents

<b>An Interface Converter with Reduced VA Ratings for Battery-Supercapacitor Mixed Systems.....</b>	<b>907</b>
<i>Giuseppe Guidi, Tore M. Undeland, Yoichi Hori</i>	
<b>Synchronous Control of Six-Phase Traction Drive with Two DC Links .....</b>	<b>913</b>
<i>V. Oleschuk, R. Bojoi, V. Ermuratski, and F. Profumo</i>	
<b>Motor Control for Power Variator in a Hybrid Electric Vehicle .....</b>	<b>920</b>
<i>Namdoo Kim, Jeongmin Kim, Hyunsoo Kim</i>	
<b>A Torque Distribution Method Using CCD Cameras That Is Suitable for Electric Vehicles Driven by Front and Rear Wheels Independently.....</b>	<b>926</b>
<i>Nobuyoshi Mutoh, Kyohei Yokota</i>	
<b>A Novel Control Method of Wheel Slip Phenomena in Electric Vehicles Based on the Number of Equilibrium Points.....</b>	<b>934</b>
<i>Kaoru Inoue, Keiichi Fukui, Akira Shiogai and Toshiji Kato</i>	
<b>Coordinated Voltage Control and Continuous Operation of the 80MVA STATCOM under Commercial Operation.....</b>	<b>940</b>
<i>T. Fujii, H. Chisyaki, H. Teramoto, T. Sato, Y. Matsushita, Y. Shinki, S. Funahashi, and N. Morishima</i>	
<b>STATCOM Operation with Saturable Transformer Under Single Line to Ground Power System Faults .....</b>	<b>946</b>
<i>Subhashish Bhattacharya and Zhengping Xi</i>	
<b>Series Connected Power Flow Control using Magnetic Energy Recovery Switch (MERS).....</b>	<b>954</b>
<i>Jan A. Wiik, F. Danang Widjaya, Takanori Isobe, Tadayuki Kitahara, and Ryuichi Shimada</i>	
<b>Line Loss Minimum Control of Loop Distribution Systems Using UPFC.....</b>	<b>962</b>
<i>Mahmoud A. Sayed, Nobuyuki Inayoshi, Takaharu Takeshita and Fukashi Ueda</i>	
<b>Application of Series Type BTB Converter for Minimizing Circulating Current and Balancing Power Transformers in Loop Distribution Lines .....</b>	<b>968</b>
<i>Rejeki Simanjorang, Yushi Miura, Toshifumi Ise, Shigeyuki Sugimoto, Hideki Fujita</i>	
<b>AC Power Transmission Even when One Phase is Lost.....</b>	<b>976</b>
<i>J. M. Miguel, E. H. Watanabe, and M. Aredes</i>	
<b>Floating Island and Thick Bottom Oxide Trench Gate MOSFET (FITMOS) Ultra-Low On-Resistance Power MOSFET for Automotive Applications.....</b>	<b>982</b>
<i>Kyosuke Miyagi, Hidefumi Takaya, Hirokazu Saito, and Kimimori Hamada</i>	
<b>Fast Inverter Loss Simulation and Silicon Carbide Device Evaluation for Hybrid Electric Vehicle Drives.....</b>	<b>988</b>
<i>A.T. Bryant, G.J. Roberts, A. Walker and P.A. Mawby</i>	
<b>Novel RC Compact Thermal Model of HV Inverter Module for Electro-Thermal Coupling Simulation.....</b>	<b>996</b>
<i>T. Kojima, Y. Yamada, Y. Nishibe and K. Torii</i>	
<b>Study on High Frequency Limitation of SJMOSFET/ SiC-SBD pair in Comparison with Normal MOSFET/SiC-SBD pair.....</b>	<b>1001</b>
<i>K. Takao, Y. Hayashi, and H. Ohashi</i>	
<b>Considerations for Developing a Highly Efficient, High-power Shortwave AM Transmitter.....</b>	<b>1006</b>
<i>Masahiko Yamazoe, Kazuhisa Haeiwa, Shoji Hirose, Kazuaki Wakai</i>	
<b>A Compact Calculation Method for Dynamic Electro-thermal Behavior of IGBTs in PWM Inverters .....</b>	<b>1014</b>
<i>M. Ishiko, T. Kondo, M. Usui and H. Tadano</i>	
<b>A Novel Control Strategy for Matrix Converters in Over-modulation Range.....</b>	<b>1020</b>
<i>Yasuhiro Tamai, Hideki Ohguchi, Ikuya Sato, Akihiro Odaka, Hironori Mine, Jun-ichi Itoh</i>	
<b>Various Control Methods by conduction ratio to a Middle Phase in Matrix Converter Based on Direct AC/AC Conversion .....</b>	<b>1027</b>
<i>Motoki Sato, Yoichi Ohmori</i>	
<b>Direct Space Vector PWM Strategies for Three-Phase to Three-Phase Matrix Converter.....</b>	<b>1035</b>
<i>Yugo Tadano, Shota Urushibata, Masakatsu Nomura, Yukihiko Sato, and Muneaki Ishida</i>	
<b>Analysis of Control Performance of Matrix Converter in a High-speed Region using Circuit Simulator .....</b>	<b>1043</b>
<i>Hidenori Hara, Eiji Yamamoto, Tatsuya Yamada</i>	

## Table of Contents

<b>Improvement Effect of Input Current Waveform of a Soft Switching Boost Type Three-Phase Diode Rectifier</b> .....	1049
<i>Eijun Yamashita, Akiteru Ueda, Akihiro Torii and Kae Doki</i>	
<b>A Multi-functional Four-leg Grid Connected Compensator</b> .....	1056
<i>R. R. Sawant and M. C. Chandorkar</i>	
<b>A High DC voltage Generator by LC Resonance in Commercial Frequency</b> .....	1064
<i>Keiju Matsui, Isamu Yamamoto, Erdong Guan, Masaru Hasegawa , Kenji Ando, Fukashi Ueda, Hideki Mori</i>	
<b>A New Control Method to Reduce Low-Frequency Output Current Ripples of Polyphase Rectifiers</b> .....	1070
<i>Pekik Argo Dahono</i>	
<b>Signal Injection in Sensorless PMSM Drives Equipped With Inverter Output Filter</b> .....	1076
<i>Antti Piippo, Janne Salomaki, and Jorma Luomi</i>	
<b>A Unified Speed Estimation Design Framework for Sensorless AC Motor Drives Based on Positive-Real Property</b> .....	1082
<i>Somboon Sangwongwanich, Surapong Suwankawin, Sakorn Po-ngam, Suratsavadee Koonlaboon</i>	
<b>Position Sensorless Vector Control of Permanent Magnet Synchronous Motors for Electrical Household Appliances</b> .....	1090
<i>Kiyoshi Sakamoto, Yoshitaka Iwaji, Tsunehiro Endo, Tsukasa Taniguchi, Toru Niki, Mitsuhsa Kawamata, and Atsuo Kawamura</i>	
<b>Saliency-based Sensorless Drive of Adequate Designed IPM Motor for Robot Vehicle Application</b> .....	1097
<i>Kozo Ide, Mamoru Takaki, Shinya Morimoto, Yosuke Kawazoe, Akihiko Maemura, and Motomichi Ohto</i>	
<b>Multi-Phase Converter Controlled by Hysteretic PWM Method</b> .....	1105
<i>T. Sato, T. Nabeshima, K. Nishijima, and T. Nakano</i>	
<b>Latest Developments of Soft-Switching Pulse Modulated High Frequency Conversion Systems for Consumer Induction Heating Power Appliances</b> .....	1110
<i>K. Yasui, M. Mihara, H. Omori and M. Nakaoka</i>	
<b>Improvement of Dynamic Characteristics of Digitally Controlled Switching Power Converter</b> .....	1118
<i>Fujio Kurokawa and Wataru Okamoto</i>	
<b>High Power Factor Converter Control by Instantaneous Single-Phase Current for a Maglev System Linear Generator</b> .....	1125
<i>T. Murai, Y. Sakamoto, and H. Hasegawa</i>	
<b>Development of a Hybrid Inverter and a Hybrid Converter for an electric railway</b> .....	1131
<i>Junichi Nomura, Akihisa Kataoka, Katsuhisa Inagaki</i>	
<b>Development of Power Unit for the Train Drive System using Low Loss IGBT</b> .....	1137
<i>M. Takeda, K. Miura, I. Yasuoka, S. Teramae and K. Kotake</i>	
<b>Development of a 40kV Series-connected IGBT Switch</b> .....	1142
<i>T. Ohkami, M. Souda, T. Saito, C. Yamazaki, S. Asano, Y. Suzuki, A. Hayakawa, M. Osakabe, K. Nagaoka, Y. Takeiri, and O. Kaneko</i>	
<b>Steps Towards Prediction of Conducted Emission Levels of an RB-IGBT Indirect Matrix Converter</b> .....	1148
<i>A. Müsing, M. L. Heldwein, T. Friedli and J. W. Kolar</i>	
<b>Sub-Optimum Design of a Forced Air Cooled Heat Sink for Simple Manufacturing</b> .....	1156
<i>Uwe Drogenik and Johann W. Kolar</i>	
<b>Dynamic Behavior of DFIG-Based Wind Turbines during Grid Faults</b> .....	1162
<i>I. Erlich, H. Wrede, and C. Feltes</i>	
<b>Impact and Control of Energy Storage Systems in Wind Power Generation</b> .....	1168
<i>C. Abbey, K. Strunz, J. Chahwan, and G. Joos</i>	
<b>Power and Heat Interchange System using Fuel Cells in Collective Housing</b> .....	1174
<i>Y. Hayashi, S. Kawasaki, T. Funabashi, and Y. Okuno</i>	
<b>Practical Study on 5.2MW PV System in Sharp's Kameyama Plant</b> .....	1179
<i>K. Odagaki</i>	

## Table of Contents

<b>Utility AC Frequency to High Frequency AC Power Converter with Boost-Half Bridge Single Stage Circuit Topology</b> .....	1184
<i>Bishwajit Saha, Kenji Yasui, Takaaki Okude, Hideki Omori, Hidekazu Muraoka, Soon Kurl Kwon, Mutsuo Nakaoka</i>	
<b>Automatic Fault Diagnosis Method of Electrical Machinery and Apparatus by Using Kohonen's Self-Organizing Map</b> .....	1191
<i>Toshiji Kato, Kaoru Inoue, Tomohiro Takahashi, Yuto Kono</i>	
<b>High Efficiency Low Noise SMPS System - DC-DC Converter Side -</b> .....	1197
<i>Akira Hashizaka, Hiroyuki Oka, Mantaro Nakamura, Shigeyuki Funabiki, Masayoshi Yamamoto, Shinichiro Nagai and Mamoru Tsuruya</i>	
<b>High Density Approaches of AC to DC Converter of Distributed Power Systems (DPS) for Telecom and Computers</b> .....	1203
<i>Fred C. Lee, Ming Xu, and Shuo Wang</i>	
<b>Voltage Control of a Bi-Directional Isolated DC/DC Converter for Medium-Voltage Motor Drives</b> .....	1211
<i>Shigenori Inoue and Hirofumi Akagi</i>	
<b>Towards a 30 kW/liter, Three-Phase Unity Power Factor Rectifier</b> .....	1218
<i>S. D. Round, P. Karutz, M. L. Heldwein and J. W. Kolar</i>	
<b>QRAS and SAZZ Chopper for HEV Drive Application</b> .....	1227
<i>Y. Tsuruta and A. Kawamura</i>	
<b>High Efficiency Flyback Converter Technology</b> .....	1235
<i>U. Boeke</i>	
<b>Improving the Power Density of the ZVS-SVM Controlled Three-Phase Boost PFC Converter</b> .....	1241
<i>Rui Li, Dehong Xu, Min Chen, Bo Feng, Kazuaki Mino, Hidetoshi Umida</i>	
<b>PWM Technique for Non-Isolated Three-phase Soft-Switching Buck-boost PFC Converter</b> .....	1247
<i>Toshimitsu Morizane, Wataru Shimomori, Katsunori Taniguchi, Noriyuki Kimura, and Masanori Ogawa</i>	
<b>Analysis and Experimental Evaluation of Symmetric and Asymmetric 18-Pulse Autotransformer Rectifier Topologies</b> .....	1253
<i>R. Burgos, A. Uan-Zo-li, F. Lacaux, F. Wang, and D. Boroyevich</i>	
<b>A Simple Passive PFC Scheme for Three-Phase Diode Rectifier</b> .....	1261
<i>Yasuyuki Nishida and Kazuaki Mino</i>	
<b>A Novel Three-PA Novel Three-Phase PFC Rectifier Using a Harmonic Current Injection Method</b> .....	1269
<i>I. Ashida, J. Itoh</i>	
<b>Design of a Current Regulator with Extended Bandwidth for Servo Motor Drive</b> .....	1275
<i>Anno Yoo, Young-Doo Yoon, Seung-Ki Sul, Masaki Hisatune, Shinya Morimoto and Kozo Ide</i>	
<b>A Novel Current Control System of IPMSM Operating at High Speed based on Model Predictive Control</b> .....	1282
<i>Mitsuhiro Kadota, Smith Lerdudomsak, Shinji Doki, Shigeru Okuma</i>	
<b>Harmonic Currents Estimation and Compensation Method for Current Control System of IPMSM in Overmodulation Range</b> .....	1287
<i>Smith Lerdudomsak, Mitsuhiro Kadota, Shinji Doki and Shigeru Okuma</i>	
<b>Power Consumption and Conversion of EPS Systems</b> .....	1294
<i>Hirozumi Eki, Tatsuo Teratani, and Takashi Iwasaki</i>	
<b>EPS System Analysis using Multi Domain Simulation for Power Network Design in a Vehicle</b> .....	1301
<i>Kimitoshi Tsuji, Kenji Kataoka, Yasushi Kusaka, Tatsuo Teratani, Takashi Abe</i>	
<b>Trend Of High Voltage Harness Technology That Supports Hybrid-Electric-Vehicles</b> .....	1307
<i>H.Miyaki, Y.Mizutani</i>	
<b>Lead Acid Battery for Idling Stop System</b> .....	1313
<i>S. Horie, K. Shimoda, K. Sugie and H. Jimbo</i>	
<b>The Environmental Impact Of Using Different Supply Voltages For HEVs And FCEVs</b> .....	1318
<i>P.Miller</i>	

## Table of Contents

<b>Power Electronics Technologies for Locomotives</b> .....	1323
<i>M.M. Bakran, H.-G. Eckel</i>	
<b>Power Electronics Technologies For A Lithium Ion Battery Tram</b> .....	1330
<i>M. Ogasa, Y. Taguchi</i>	
<b>Anti-slip/skid Re-adhesion Control Based on Disturbance Observer Considering Bogie Vibration</b> .....	1337
<i>Yosuke Shimizu, Kiyoshi Ohishi, Takashi Sano, Shinobu Yasukawa, and Takafumi Koseki</i>	
<b>Performance of IGBTs Series Connection Technologies for Auxiliary Power Supply System</b> .....	1343
<i>Yasushi Abe, Kouji Maruyama, Yasushi Matsumoto, Kiyooki Sasagawa, and Kouki Matsuse</i>	
<b>Power Electronics Technologies for Railway Vehicles</b> .....	1349
<i>J. Taufiq</i>	
<b>New Technique to Improve the Efficiency of Uninterruptible Power Supply</b> .....	1355
<i>Yukio Kandatsu, Hiroshi Masunaga, Yushin Yamamoto</i>	
<b>System Variation of Electrical GEN-SET with Energy Buffer</b> .....	1362
<i>J. Leuchter, P. Bauer, and V. Steklý</i>	
<b>Improvement Method of Input-Impedance Characteristics in Electronic Choke for Wire Communication System - Effective Use of Electric and Magnetic Couplings in Inductor -</b> .....	1368
<i>Akihiko Katsuki, Masahiro Matsushima, Kazunori Matsunaga, and Keisuke Morisaki</i>	
<b>Development of a High-Speed Static Switch for Distributed Energy and Microgrid Applications</b> .....	1374
<i>B. Kroposki, C. Pink, J. Lynch, V. John, S. Meor Daniel, E. Benedict, and I. Vihinen</i>	
<b>Maximum Peak Power Tracking-Based Control Algorithms with Stall Regulation for Optimal Wind Energy Capture</b> .....	1380
<i>B. Neammanee, K. Krajangpan, S. Sirisumrannukul and S. Chatrattana</i>	
<b>SVR-based Wind Speed Estimation for Powe Control of Wind Energy Generation System</b> .....	1387
<i>Ahmed G. Abo-Khalil and Dong-Choon Lee</i>	
<b>Development of Doubly-fed Wind Energy System Model for DG embedded Power System Studies</b> .....	1393
<i>F. Yamada, S.C. Verma, S. Sugimoto, Y. Kono, and S. Fujiwara</i>	
<b>A Unified Architecture for Doubly Fed Induction Generator Wind Turbines using a Parallel Grid Side Rectifier and Series Grid Side Converter</b> .....	1398
<i>P. Flannery and G. Venkataramanan</i>	
<b>Practical Implementation of V-connection Power Conditioner For 10kW Wind Power Generation</b> .....	1406
<i>Makoto Kimura, Shinichiro Nagai, Yoichi Ito, Takaya Sakurai</i>	
<b>Back-to-Back Connected Five-Level Diode-Clamped PWM Converters for Motor Drives</b> .....	1412
<i>Hatti Natchpong, Yosuke Kondo, and Hirofumi Akagi</i>	
<b>Unified Space-Vector Modulation Scheme for Multilevel Inverters</b> .....	1420
<i>P. Luttamus and H. Tuusa</i>	
<b>A Hybrid Multi Converter System Having Full Adjustable Output Voltage Range</b> .....	1428
<i>S. Fukuda, T. Yoshida, and S. Ueda</i>	
<b>A Multilevel Power Converter With Integrated Storage For Particle Accelerators</b> .....	1436
<i>C. Farhni, A. Rufer, F. Bordry, JP. Burnet</i>	
<b>Design and Implementation of A Hybrid Output EMI Filter for High Frequency Common-Mode Voltage Compensation in PWM Inverters</b> .....	1440
<i>Pennapa Pairodamonchai Surapong Suwankawin Somboon Sangwongwanich</i>	
<b>Low Reverse Recovery Stress in High Power Converters achieved by Self-Resetting Saturable Reactors</b> .....	1448
<i>H. Gruening, K. Koyanagi, and M. Mukunoki</i>	
<b>Zone Controlled Induction Heating (ZCIH) A New Concept in Induction Heating</b> .....	1454
<i>Hideaki Fujita, Naoki Uchida and Kazuhiro Ozaki</i>	

## Table of Contents

<b>A New Phase Shifted ZVS-PWM Controlled Full Bridge Series Resonant High Frequency Inverter with Auxiliary Active Quasi-Resonant Commutation Circuit .....</b>	<b>1461</b>
<i>Hisayuki Sugimura, Soon-Kurl Kwon, Hiroyuki Ogiwara, Eiji Hiraki, Mutsuo Nakaoka</i>	
<b>Analysis of Transition Mode from Phase Shift to Zero-Phase Shift Under ZVS and NON-ZVS Operation for Induction Heating Inverter .....</b>	<b>1468</b>
<i>P. Viriya, N. Yongyuth and K. Matsuse</i>	
<b>Recent Developments in Single-Phase Power Factor Correction .....</b>	<b>1476</b>
<i>Zhonghui Bing, Min Chen, Stephanie K.T. Miller, Yasuyuki Nishida, and Jian Sun</i>	
<b>Digital Controller for High-Frequency Rectifiers with Power Factor Correction Suitable for On-Chip Implementation .....</b>	<b>1483</b>
<i>Aleksandar Prodi</i>	
<b>Evaluation of a D-Q-0 Frame Average Model for Multiple Single-Phase PFC Converters Program.....</b>	<b>1488</b>
<i>R. Burgos, S. Rosado, B. Huang, F. Wang, and D. Boroyevich</i>	
<b>Single-phase Buck-boost PFC Converter for V-connected Three-phase Inverter.....</b>	<b>1496</b>
<i>Katsunori Taniguchi, Satoru Saegusa, Toshimitsu Morizane, Noriyuki Kimura</i>	
<b>A Low DC voltage Generator Using Novel Rectifier Topology Without High Frequency Switching Devices .....</b>	<b>1503</b>
<i>Keiju Matsui, Guan Erdong, Isamu Yamamoto, Masaru Hasegawa and Kenji Ando</i>	
<b>Trends in Integration for Magnetically Levitated Pump Systems.....</b>	<b>1507</b>
<i>T. Nussbaumer, K. Raggl, P. Boesch, J.W. Kolar</i>	
<b>Synchronous Reluctance Type Bearingless Motors with Multi-flux Barriers.....</b>	<b>1515</b>
<i>M. Takemoto, K. Yoshida, N. Itasaka, Y. Tanaka, A. Chiba, and T. Fukao</i>	
<b>Basic Characteristic of the Multi-Consequent- Pole Bearingless Motor.....</b>	<b>1521</b>
<i>Natsuki Watanabe, Hiroya Sugimoto, Akira Chiba, Tadashi Fukao, and Masatsugu Takemoto</i>	
<b>The Development of Small Size Ultra-High Speed Drive System.....</b>	<b>1527</b>
<i>J. Oyama, T. Higuchi, T. Abe, K. Shigematsu and R. Moriguchi</i>	
<b>An Ultra-High-Speed, 500000 rpm, 1 kW Electrical Drive System.....</b>	<b>1533</b>
<i>C. Zwyssig, M. Duerr, D. Hassler, J.W. Kolar</i>	
<b>High Performance Motor Drive Technologies for Hybrid Vehicles.....</b>	<b>1540</b>
<i>K. Asano, Y. Inaguma, H. Ohtani, E. Sato, M. Okamura, S. Sasaki</i>	
<b>Development of Inverter Simulation System and its Applications for Hybrid Vehicles.....</b>	<b>1546</b>
<i>Kaoru Torii, Takashi Kojima, Shoichi Sasaki, Kimimori Hamada</i>	
<b>Development of Inverter for 2006 Model Year CIVIC Hybrid .....</b>	<b>1552</b>
<i>Hiroshi Ohtsuka, Fumio Anraku</i>	
<b>Valeo StARS Technology: A Competitive Solution for Hybridization .....</b>	<b>1557</b>
<i>Daniel Richard, Yannick Dubel</i>	
<b>Development of Fuel Cell Hybrid Vehicles in TOYOTA .....</b>	<b>1562</b>
<i>Shinji Aso, Mikio Kizaki, and Yasuhiro Nonobe</i>	
<b>Perfect Tracking Control of Servo Motor Based on Precise Model with PWM Hold and Current Loop.....</b>	<b>1568</b>
<i>Koichi Sakata and Hiroshi Fujimoto</i>	
<b>Vibration Suppression Motor Drive Control for Industrial Robot Using Notch Filter with Little Phase Error .....</b>	<b>1574</b>
<i>Toshimasa Miyazaki, Hisashi Kataoka, Somsawas Tungpataratanawong, Kiyoshi Ohishi, Seiichiro Katsura</i>	
<b>Robust Current Controller for IPMSM High Speed Sensorless Drives.....</b>	<b>1580</b>
<i>Masaru Hasegawa, Yasuhiro Mizuno, Keiju Matsui</i>	
<b>Design of a Two-Stage AC/DC Converter with Standby Power Losses Less than 1 W.....</b>	<b>1586</b>
<i>Bo-Teng Huan, g Ko-Yen Lee, Yen-Shin Lai</i>	

## Table of Contents

<b>Nearly Unity Power-Factor of Modular Three-Phase AC to DC Converter with Minimized DC Bus Capacitor</b> .....	1592
<i>U. Kamnarn, and V. Chunkag</i>	
<b>Novel Self-Commissioning Digital Power Converter Control using Low Sampling Frequency A/D Converter</b> .....	1600
<i>Yen-Shin Lai, Chia-AnYeh, Ko-Yen Lee</i>	
<b>Implementation and Design of CPLD-Based Switched-Capacitor Step-Down DC-DC Converter with Multiple Output Choice</b> .....	1607
<i>Yuen-Haw Chang</i>	
<b>A Practical Approach to Eliminating DC Magnetic Flux from the Series Transformer of a Dynamic Voltage Restorer</b> .....	1615
<i>Takushi Jimichi, Hideaki Fujita, and Hirofumi Akagi</i>	
<b>Semiconductor Power Converterless Voltage Sag Compensator and UPS Using a Flywheel Induction Motor and an Engine Generator</b> .....	1622
<i>Shuhei Kato, Miao-miao Cheng, Hideo Sumitani and Ryuichi Shimada</i>	
<b>Series Connection of Snubberless IGBTs for 6.6 kV Transformerless Converters</b> .....	1628
<i>N. Okada, M. Takasaki, J. Narushima, R. Miyagawa and S. Katoh</i>	
<b>Compensating Characteristics of a Series-Shunt Active Power Filter Considering Unbalanced Source Voltage and Unbalanced Load</b> .....	1634
<i>Kiyotake Nohara, Akiteru Ueda, Akihiro Torii, Kae Doki</i>	
<b>An In-rush Current Suppression Technique for the Solid-State Transfer Switch System</b> .....	1640
<i>Po-Tai Cheng, Yu-Hsing Chen</i>	
<b>Power Modules As Key Component Group For Power Electronics</b> .....	1648
<i>Gourab Majumdar</i>	
<b>PWM Converter Power Density Barriers</b> .....	1656
<i>J. W. Kolar, U. Drofenik, J. Biela, M. L. Heldwein, H. Ertl, T. Friedli and S. D. Round</i>	