

JPE **JOURNAL OF** **POWER ELECTRONICS**



Journal of Power Electronics

Editor-in-Chief

Jung-Ik Ha, Seoul National University, Seoul, Korea

Editors

Honnyong Cha, Kyungpook National University, Daegu, Korea

Sung-Jin Choi, *Publication Editor*, University of Ulsan, Ulsan, Korea

Kyo-Beum Lee, *Publication Editor*, Ajou University, Suwon, Korea

Young-Doo Yoon, Hanyang University, Seoul, Korea

Associate Editors

Dukju Ahn, Incheon National University, Incheon, Korea

Seon-Ju Ahn, Chonnam National University, Daejeon, Korea

Dianov Anton, Samsung Electronics, Suwon, Korea

Jong-Bok Baek, Korea Institute of Energy Research, Daejeon, Korea

Wu Chen, Southeast University, Nanjing, China

Chun-An Cheng, I-Shou University, Kaohsiung, Taiwan

Younghoon Cho, Konkuk University, Seoul, Korea

Pooya Davari, Aalborg University, Aalborg, Denmark

Xiaoqiang Guo, Yanshan University, Qinhuangdao, China

Zhiqiang Guo, Beijing Institute of Technology, Beijing, China

Yang Han, University of Electronic Science and Technology of China, Chengdu, China

Seon-Hwan Hwang, Kyungnam University, Changwon, Korea

Jee-Hoon Jung, UNIST, Ulsan, Korea

Byungtaek Kim, Kunsan National University, Gunsan, Korea

Jaehong Kim, Chosun University, Gwangju, Korea

Jonghoon Kim, Chungnam National University, Daejeon, Korea

Sangshin Kwak, Chung-ang University, Seoul, Korea

Byoung-Hee Lee, Hanbat National University, Daejeon, Korea

Dong-Hee Lee, Kyungsung University, Busan, Korea

June-Seok Lee, Dankook University, Cheonan, Korea

Kwang-Woon Lee, Mokpo National Maritime University, Mokpo, Korea

Seongjun Lee, Chosun University, Gwangju, Korea

Wook-Jin Lee, Chungnam National University, Daejeon, Korea

Zixin Li, University of Chinese Academy of Sciences, Beijing, China

Fuxin Liu, Nanjing University of Aeronautics and Astronautics, Nanjing, China

Jianxing Liu, Harbin Institute of Technology, Harbin, China

Hao Ma, Zhejiang University, Hangzhou, China

Saad Mekhilef, University of Malaya, Kuala Lumpur, Malaysia

Jinyeong Moon, Florida State University, Tallahassee, USA

Woonki Na, California State University, Fresno, USA

Minh-Khai Nguyen, Chosun University, Gwangju, Korea

Joung-Hu Park, Soongsil University, Seoul, Korea

N. Prabakaran, SASTRA Deemed University, Thanjavur, India

Mattia Ricco, Alma Mater Studiorum University of Bologna, Bologna, Italy

Gab-Su Seo, Power Systems Engineering Center, National Renewable Energy Laboratory, Golden, USA

Jongwon Shin, Chung-Ang University, Seoul, Korea

Kai Song, Harbin Institute of Technology, Harbin, China

Kai Sun, Tsinghua University, Beijing, China

Xiaodong Sun, Jiangsu University, Zhenjiang, China

Mahinda Vilathgamuwa, Queensland University of Technology, Brisbane, Australia

Gaolin Wang, Harbin Institute of Technology, Harbin, China

Wei Wang, Southeast University, Nanjing, China

Yijie Wang, Harbin Institute of Technology, Harbin, China

Zheng Wang, Southeast University, Nanjing, China

Huiqing Wen, Xi'an Jiaotong-Liverpool University, Suzhou, China

Hongfei Wu, Nanjing University of Aeronautics and Astronautics, Nanjing, China

Xuerong Ye, Harbin Institute of Technology, Harbin, China

Kang-Hyun Yi, Daegu University, Gyeongsan, Korea

Zhonggang Yin, Xi'an University of Technology, Xi'an, China

Sang-Won Yoon, Hanyang University, Seoul, Korea

Liqiang Yuan, Tsinghua University, Beijing, China

Guoqiang Zhang, Harbin Institute of Technology, Harbin, China

Li Zhang, Hohai University, Nanjing, China

Yongchang Zhang, North China University of Technology, Beijing, China

Xueguang Zhang, Harbin Institute of Technology, Harbin, China

Yun Zhang, Tianjin University, Tianjin, China

Advisory Board

Subhashish Bhattacharya, North Carolina State University, North Carolina, USA

Frede Blaabjerg, Aalborg University, Aalborg, Denmark

Dushan Boroyevich, Virginia Polytechnic Institute and State University, Blacksburg, USA

Liuchen Chang, University of New Brunswick, New Brunswick, Canada

Po-Tai Cheng, National Tsing Hua University, Hsinchu, Taiwan

Bo-Hyung Cho, Seoul National University, Seoul, Korea

Jaeho Choi, Chungbuk National University, Cheongju, Korea

Ilhami Colak, Nisantasi University, Istanbul, Turkey

Braham Ferreira, Delft University of Technology, Delft, Netherlands

Dong-Seok Hyun, Hanyang University, Seoul, Korea

Atsuo Kawamura, Yokohama National University, Yokohama, Japan

Marian P. Kazmierkowski, Warsaw University of Technology, Warsaw, Poland

Ralph Kennel, Technical University of Munchen, Munchen, Germany

Johan W. Kolar, Swiss Federal Institute of Tech., Zurich, Switzerland

Fujio Kurokawa, Nagasaki Institute of Applied Science, Nagasaki, Japan

Dong-Choon Lee, Yeungnam University, Gyeongsan, Korea

Tsorn-Juu Liang, National Cheng-Kung University, Tainan City, Taiwan

Jinjun Liu, Xi'an Jiaotong University, Xi'an, China

Sanjib Kumar Panda, National University of Singapore, Singapore

Fang Z. Peng, Michigan State University, East Lansing, USA

John Shen, Illinois Institute of Technology, Chicago, USA

Toshihisa Shimizu, Tokyo Metropolitan University, Tokyo, Japan

Seung-Ki Sul, Seoul National University, Seoul, Korea

Jian Sun, Rensselaer Polytechnic Institute, New York, USA

Pat Wheeler, University of Nottingham, Nottingham, UK

Dehong Xu, Zhejiang University, Hangzhou, China

Managing Editor

Sejin Jung, The Korean Institute of Power Electronics Administrative Office, Seoul, Korea

Journal of Power Electronics

Aims and Scope

The *Journal of Power Electronics (JPE)* publishes papers of a high technical standard with a suitable balance of practice and theory. It covers a wide range of applications and apparatus in the power electronics field. The scope of the JPE includes the following:

- Low Power Converter
- High Power Converters
- Motor Drives
- Grid and Power Quality
- Energy Management Systems
- Devices and Components
- Consumer Power Electronics
- Emerging Power Electronics

The official abbreviation is *J. Power Electron.*

Copyright Information

For Authors

As soon as an article is accepted for publication, authors will be requested to assign copyright of the article (or to grant exclusive publication and dissemination rights) to the publisher (respective the owner if other than Springer Nature). This will ensure the widest possible protection and dissemination of information under copyright laws.

More information about copyright regulations for this journal is available at www.springer.com/43236

For Readers

While the advice and information in this journal is believed to be true and accurate at the date of its publication, neither the authors, the editors, nor the publisher can accept any legal responsibility for any errors or omissions that may have been made. The publisher makes no warranty, express or implied, with respect to the material contained herein.

All articles published in this journal are protected by copyright, which covers the exclusive rights to reproduce and distribute the article (e.g., as offprints), as well as all translation rights. No

material published in this journal may be reproduced photographically or stored on microfilm, in electronic data bases, on video disks, etc., without first obtaining written permission from the publisher (respective the copyright owner if other than Springer Nature). The use of general descriptive names, trade names, trademarks, etc., in this publication, even if not specifically identified, does not imply that these names are not protected by the relevant laws and regulations.

Springer Nature has partnered with Copyright Clearance Center's RightsLink service to offer a variety of options for reusing Springer Nature content. For permission to reuse our content please locate the material that you wish to use on link.springer.com or on springerimages.com and click on the permissions link or go to copyright.com and enter the title of the publication that you wish to use. For assistance in placing a permission request, Copyright Clearance Center can be contacted directly via phone: +1-855-239-3415, fax: +1-978-646-8600, or e-mail: info@copyright.com

© The Korean Institute of Power Electronics 2020

Journal Website

www.jpels.org
www.springer.com/43236
Electronic edition:
link.springer.com/journal/43236
For the actual version of record please always check the online version of the publication.

Subscription Information

Journal of Power Electronics is published six times a year. Volume 20 (6 issues) will be published in 2020.

ISSN: 1598-2092 print
ISSN: 2093-4718 electronic

For information on subscription rates please contact Springer Nature Customer Service Center:
customerservice@springernature.com

The Americas (North, South, Central America and the Caribbean)
Springer Nature Journal Fulfillment
Harborside Plaza II, 200 Hudson Street,
Jersey City, NJ 07302, USA
Tel.: 800-SPRINGER (777-4643);
212-460-1500 (outside North America)

Outside the Americas
Springer Nature Customer Service Center
GmbH, Tiergartenstraße 15,
69121 Heidelberg, Germany
Tel.: +49-6221-345-4303

Advertisements

E-mail contact: anzeigen@springer.com

Disclaimer

Springer Nature publishes advertisements in this journal in reliance upon the responsibility of the advertiser to comply with all legal requirements relating to the marketing and sale of products or services advertised. Springer Nature and the editors are not responsible for claims made in the advertisements published in the journal. The appearance of advertisements in Springer Nature publications does not constitute endorsement, implied or intended, of the product advertised or the claims made for it by the advertiser.

Office of Publication

Springer Nature Singapore Pte Ltd. /
Springer Singapore

Springer is part of
Springer Science+Business Media

Funding

This work was supported by the Korean Federation of Science and Technology Societies Grant funded by the Korean Government (Ministry of Education)

Co-Publisher

The Korean Institute of Power Electronics

LOW POWER CONVERTERS

Novel switched-coupled-inductor quasi-Z-source network with enhanced boost capability

M. Moslehi Bajestan · M.A. Shamsinejad 1343

Power decoupling method with robust voltage control strategy for electric vehicle applications

D.-H. Kim · S.-M. Park 1352

Improved model predictive control scheme for AC/DC matrix converters by considering input filter power ripple under imbalanced grid voltage conditions

T.-L. Nguyen · H.-H. Lee 1364

Single-switch boost converter with extremely high step-up voltage gain

Y. Hao · H. Li · K. Li · C. Fang · X. Ding 1375

HIGH POWER CONVERTERS

Research on simplified SVPWM strategy for nine-switch converter

J. Guo 1386

Research and implementation of new-type supercapacitor and battery hybrid energy storage system

J. Liu · Y. Wang · Y. Wu · Y. Li · X. Wang 1395

Simplified methods of the 3D-SVPWM for four-wire three-leg inverter

F.H. Awad · A.A. Mansour · M.I. Marei · A.A. El-Sattar 1405

3-Bridge LLC resonant converter for achieving wide output voltage control range based on topology morphing

S.-J. Yoo · M.-J. Kim · E.-S. Kim · Y.-S. Jeon 1420

4-kW 3-phase rectifier with high efficiency and wide operational range via 3-mode SVPWM

J. Lin · Z. Li · B. Zhang · G. Zhang · W. Qiu 1433

Power quality improvements of arc welding power supplies by modified bridgeless SEPIC PFC converter

A. Bouafassa · L.M. Fernández-Ramírez · B. Babes 1445

MOTOR DRIVES

Model predictive current control method for PMSM drives based on an improved prediction model

S. Fan · C. Tong 1456

Predictive DTC-PWM of PMSM based on zero voltage and 12 voltage vectors

S. Kim · O.-K. Choi · D.-H. Lee 1467

Identification of mechanical parameters for position-controlled servo systems using sinusoidal commands

M.-S. Yoo · S.-C. Choi · S.-W. Park · Y.-D. Yoon 1478

Constant and variable switching frequency random PWM strategies for open-end winding induction motor drive

N.L. Sadhu · B.R. Teegala · V.K. Marapu 1488

Optimal control strategy for excitation parameters of SRGs

Y. Dou · D. Chen 1496

Signal injection method without torque ripple for stator winding temperature estimation of surface-mounted PMSM drive systems

J. Fang · S. Ding · Y. Sun · J. Hang 1504

GRID AND POWER QUALITY

An accurate and robust adaptive notch filter-based phase-locked loop

J. Li · Q. Wang · L. Xiao · Z. Liu · Q. Wu 1514

ENERGY MANAGEMENT SYSTEMS

Review of state-of-the-art battery state estimation technologies for battery management systems of stationary energy storage systems

S. Park · J. Ahn · T. Kang · S. Park · Y. Kim · I. Cho · J. Kim 1526

Novel reduced-order modeling method combined with three-particle nonlinear transform unscented Kalman filtering for the battery state-of-charge estimation

W. Xu · S. Wang · C. Fernandez · C. Yu · Y. Fan · W. Cao 1541

Integrated control scheme for dynamic power management with improved voltage regulation in DC microgrid

R.R. Deshmukh · M.S. Ballal 1550

Contents continued on inside back cover

DEVICE, MODELING AND CONTROL

Electrical variable capacitor using symmetrical switch configuration for reducing switch voltage in RF plasma systems

J. Min · B. Chae · Y. Suh · J. Kim · H. Kim 1562

Observer-based adaptive threshold diagnosis method for open-switch faults of voltage source inverters

H. Yin · Y. Chen · Z. Chen 1573

Novel driver circuit for switching performance improvements in SiC MOSFETs

X. Li · Y. Lu · X. Ni · S. Wang · Y. Zhang · X. Tang 1583

Modeling and controller optimization for current-fed isolated bidirectional DC–DC converters

Z. Zhang · S. Xie · X. Shang · Q. Qian · J. Xu 1592

CONSUMER POWER ELECTRONICS

Design and research of deep slot universal motor for electric power tools

H. Qi · L. Ling · C. Jichao · X. Wei 1604

LCL-T resonant network-based modular multi-channel constant-current LED driver analysis and design

Q. He · Q. Luo · J. Huang · C. Cao · P. Sun · X. Du 1616

Input voltage selection method of half-bridge series resonant inverters for all-metal induction heating applications using high turn-numbered coils

J. Jin · M. Kim · J. Han · K. Kang · J.-H. Jung 1629

EMERGING POWER ELECTRONICS

Capacitor voltage feedforward decoupling control based on third harmonic injection modulation for five-level active neutral point clamped converter

Z. Nie · W. Ye · J. Zhu · J. Xu 1638

Averaged current mode control for maximum power point tracking in high-gain photovoltaic applications

D. de la Rosa Romo · R. Loera-Palomo · M. Rivero ·

F.S. Sellschopp-Sánchez 1650

Selection of high transfer stability and optimal power-efficiency tradeoff with respect to distance region for underground wireless power transfer systems

Y. Xu · Q. Chen · D. Tian · Y. Zhang · B. Li · H. Tang 1662

Further articles can be found at link.springer.com

Indexed in *Astrophysics Data System (ADS)*, *EBSCO Discovery Service*, *El Compendex*, *Google Scholar*, *Institute of Scientific and Technical Information of China*, *Journal Citation Reports/Science Edition*, *Naver*, *OCLC WorldCat Discovery Service*, *ProQuest-ExLibris Primo*, *ProQuest-ExLibris Summon*, *SCImago*, *SCOPUS*, *Science Citation Index Expanded (SciSearch)*, *TD Net Discovery Service*, *UGC-CARE List (India)*

Instructions for Authors for *J. Power Electron.* are available at www.springer.com/43236

Table of Contents

Journal of Power Electronics Vol. 20, No. 6 November 2020

Low Power Converters

Novel switched-coupled-inductor quasi-Z-source network with enhanced boost capability	
..... Mehran Moslehi Bajestan, Mohammad Ali Shamsinejad	1343
Power decoupling method with robust voltage control strategy for electric vehicle applications	
..... Dong-Hee Kim, Sung-Min Park	1352
Improved model predictive control scheme for AC/DC matrix converters by considering input filter power ripple under imbalanced grid voltage conditions	
..... Thanh-Luan Nguyen, Hong-Hee Lee	1364
Single-switch boost converter with extremely high step-up voltage gain	
..... Yangyang Hao, Haibin Li, Kai Li, Chengqun Fang, Xinping Ding	1375

High Power Converters

Research on simplified SVPWM strategy for nine-switch converter	
..... Jia Guo	1386
Research and implementation of new-type supercapacitor and battery hybrid energy storage system	
..... Jian Liu, Yang Wang, Yangjie Wu, Yang Li, Xiangsheng Wang	1395
Simplified methods of the 3D-SVPWM for four-wire three-leg inverter	
..... Fathy H. Awad, Ahmed A. Mansour, Mostafa I. Marei, Ahmed A. El-Sattar	1405
3-Bridge LLC resonant converter for achieving wide output voltage control range based on topology morphing	
..... Sang-Jae Yoo, Min-Ji Kim, Eun-Soo Kim, Yong-Seog Jeon	1420
4-kW 3-phase rectifier with high efficiency and wide operational range via 3-mode SVPWM	
..... Jiaqing Lin, Zhizhong Li, Bo Zhang, Guidong Zhang, Wei Qiu	1433
Power quality improvements of arc welding power supplies by modified bridgeless SEPIC PFC converter	
..... Amar Bouafassa, Luis M. Fernandez-Ramirez, Badreddine Babes	1445

Motor Drives

Model predictive current control method for PMSM drives based on an improved prediction model	
..... Shengwen Fan, Chaonan Tong	1456
Predictive DTC-PWM of PMSM based on zero voltage and 12 voltage vectors	
..... Seung Jun Kim, Oh-Kyu Choi, Dong-Hee Lee	1467
Identification of mechanical parameters for position-controlled servo systems using sinusoidal commands	
..... Min-Sik Yoo, Seung-Cheol Choi, Sang-Woo Park, Young-Doo Yoon	1478
Constant and variable switching frequency random PWM strategies for open-end winding induction motor drive	
..... Nithya Lavanya Sadhu, Bramhananda Reddy Teegala, Vijay Kumar Marapu	1488
Optimal control strategy for excitation parameters of SRGs	
..... Yuyu Dou, Dong Chen	1496

Signal injection method without torque ripple for stator winding temperature estimation of surface-mounted PMSM drive systems

..... Jie Fang, Shichuan Ding, Yining Sun, Jun Hang 1504

Grid and Power Quality

An accurate and robust adaptive notch filter-based phase-locked loop

..... Jinbo Li, Qin Wang, Lan Xiao, Zehao Liu, Qunfang Wu 1514

Energy Management Systems

Review of state-of-the-art battery state estimation technologies for battery management systems of stationary energy storage systems

..... Seongyun Park, Jeongho Ahn, Taewoo Kang, Sungbeak Park, Youngmi Kim, Inho Cho, Jonghoon Kim 1526

Novel reduced-order modeling method combined with three-particle nonlinear transform unscented Kalman filtering for the battery state-of-charge estimation

..... Wenhua Xu, Shunli Wang, Carlos Fernandez, Chunmei Yu, Yongcun Fan, Wen Cao 1541

Integrated control scheme for dynamic power management with improved voltage regulation in DC microgrid

..... Rohit R. Deshmukh, Makarand S. Ballal 1550

Device, Modeling, and Control

Electrical variable capacitor using symmetrical switch configuration for reducing switch voltage in RF plasma systems

..... Juhwa Min, Beomseok Chae, Yongsug Suh, Jinho Kim, Hyunbae Kim 1562

Observer-based adaptive threshold diagnosis method for open-switch faults of voltage source inverters

..... Haoran Yin, Yong Chen, Zhangyong Chen 1573

Novel driver circuit for switching performance improvements in SiC MOSFETs

..... Xianyun Li, Yi Lu, Xijun Ni, Shuzheng Wang, Yu Zhang, Xinjie Tang 1583

Modeling and controller optimization for current-fed isolated bidirectional DC–DC converters

..... Zhao Zhang, Shaojun Xie, Xiaofeng Shang, Qiang Qian, Jinming Xu 1592

Consumer Power Electronics

Design and research of deep slot universal motor for electric power tools

..... Huang Qi, Luo Ling, Cao Jicao, Xi Wei 1604

LCL-T resonant network-based modular multi-channel constant-current LED driver analysis and design

..... Qingqing He, Quanming Luo, Jian Huang, Chi Cao, Pengju Sun, Xiong Du 1616

Input voltage selection method of half-bridge series resonant inverters for all-metal induction heating applications using high turn-numbered coils

..... Juil Jin, Mina Kim, Jinwook Han, Kyelyong Kang, Jee-Hoon Jung 1629

Emerging Power Electronics

Capacitor voltage feedforward decoupling control based on third harmonic injection modulation for five-level active neutral point clamped converter

.....	Ziling Nie, Weiwei Ye, Junjie Zhu, Jie Xu	1638
Averaged current mode control for maximum power point tracking in high-gain photovoltaic applications		
.....	David de la Rosa Romo, Rodrigo Loera-Palomo, Michel Rivero, Fransisco S. Sellschopp Sanchez	1650
Selection of high transfer stability and optimal power-efficiency tradeoff with respect to distance region for underground wireless power transfer systems		
.....	Yu Xu, Qili Chen, Detian Tian, Yongquan Zhang, Bo Li, Huiming Tang	1662