

ISSN 1598-2092  
eISSN 2093-4718

Volume 26 • Number 1 • January 2026

# JPE JOURNAL OF POWER ELECTRONICS



 THE KOREAN INSTITUTE OF  
POWER ELECTRONICS

 Springer

# Journal of Power Electronics

## Editor-in-Chief

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

## Editors

**Il-Oun Lee**, *Publication Editor*,

Myongji University, Yongin, Korea

**Young-Doo Yoon**, *Publication Editor*,

Hanyang University, Seoul, Korea

**Suyong Chae**, Pohang University of Science and Technology, Pohang, Korea

**Jonghoon Kim**, Chungnam National University, Daejeon, Korea

**Sungmin Kim**, Hanyang University, ERICA Campus, Ansan, Korea

## Associate Editors

**Dukju Ahn**, Incheon National University, Incheon, Korea

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

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

**Jun Cai**, Nanjing University of Information Science and Technology, Nanjing, China

**Wu Chen**, Southeast University, Nanjing, China

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

**Younghoon Cho**, Konkuk University, Seoul, Korea

**Uimin Choi**, Seoul National University of Science and Technology, Seoul, Korea

**Anton Dianov**, Samsung Electronics, Suwon, Korea

**Xiaoqiang Guo**, Yanshan University, Qinhuangdao, China

**Zhiqiang Guo**, Beijing Institute of Technology, Beijing, China

**Krishna Kumar Gupta**, Thapar Institute of Engineering and Technology, Patiala, India

**Yeonho Jeong**, University of Rhode Island, Kingston, RI, USA

**Libing Jing**, China Three Gorges University, Hubei, China

**Byungtaek Kim**, Kunsan National University, Gunsan, Korea

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

**Dong-Hee Lee**, Kyungsung University, Busan, Korea

**Jaebum Lee**, Korea National University of Transportation, Uiwang, Korea

**June-Seok Lee**, Dankook University, Cheonan, Korea

**Kibok Lee**, Korea University, Seoul, Korea

**Seongjun Lee**, Chosun University, Gwangju, Korea

**Cheon-Yong Lim**, Jeonbuk National University, Jeonju, Korea

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

**Jianxing Liu**, Harbin Institute of Technology, Harbin, China

**Saad Mekhilef**, Swinburne University of Technology, Hawthorn, VIC, Australia

**Jinyeong Moon**, Oregon State University, Corvallis, USA

**Minh-Khai Nguyen**, General Motors Company, Warren, MI, USA

**Joung-Hu Park**, Soongsil University, Seoul, Korea

**N. Prabaharan**, SASTRA Deemed University, Thanjavur, India

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

**Jongwon Shin**, Seoul National University, Seoul, Korea

**Kai Song**, Harbin Institute of Technology, Harbin, China

**Gaolin Wang**, Harbin Institute of Technology, Harbin, China

**Jiangfeng Wang**, Southeast University, Nanjing, China

**Kang-Hyun Yi**, Daegu University, Gyeongsan, Korea

**Sang-Won Yoon**, Seoul National 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

**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

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

**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

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

**Tsornng-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**, Florida State University, Tallahassee, FL, 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 Converters
- 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.*

## 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.

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](http://link.springer.com) or on [springerimages.com](http://springerimages.com) and click on the permissions link or go to [copyright.com](http://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](mailto:info@copyright.com)

© The Korean Institute of Power Electronics 2026

## Journal Website

[www.jpels.org](http://www.jpels.org)  
[www.springer.com/43236](http://www.springer.com/43236)

For the actual version of record please always check the online version of the publication.

## Subscription Information

*Journal of Power Electronics* is published every month (12 times per year). Volume 26 (12 issues) will be published in 2026.

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

For information on subscription rates please contact Springer Nature Customer Service Center:  
[customerservice@springernature.com](mailto:customerservice@springernature.com)

The Americas (North, South, Central America and the Caribbean)  
Springer Nature Customer Service Center LLC, 200 Hudson Street, Suite 503, Jersey City, NJ 07311, USA  
Tel.: 800-SPRINGER (777-4643);  
212-460-1500 (outside North America)

Outside the Americas  
Springer Nature Customer Service Center GmbH, Europaplatz 3, 69115 Heidelberg, Germany  
Tel.: +49-6221-345-4303

## Advertisements

E-mail contact: [anzeigen@springer.com](mailto: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/Manufacturer

Springer Nature Singapore Pte Ltd. /  
Springer Singapore  
[ProductSafety@springernature.com](mailto:ProductSafety@springernature.com)

Springer is part of  
Springer Science+Business Media

## Product Safety

This product is imported into the EU by Springer Nature Customer Service Center GmbH, Europaplatz 3, 69115 Heidelberg, Germany who also acts as the Manufacturer's EU authorized representative under the EU General Product Safety Regulation.

In case of any concerns about this product, please contact  
[ProductSafety@springernature.com](mailto:ProductSafety@springernature.com)

## 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

**Hybrid charge control-based natural voltage sharing method for input series output parallel resonant converters**

L. Qu · H. Liu 1

**Critical mode boost power factor correction converter with high efficiency and reduced input current distortion using variable inductor**

C.-Y. Lim · Y. Jeong · H.-W. Jeong · G.-W. Moon 13

### HIGH POWER CONVERTERS

**Variables decoupling and multi-objective optimization of all-SiC interleaved boost converters for fuel cell electrical vehicles**

Z. Wang · X. Ma · Y. Wang · C. Zhang · R. Liu 26

**Topology derivation of a single-phase bridgeless three-level PFC converter based on graph theory**

K. Xiang · L. Fan · R. Shen · L. Yang · T. Zhu · G. Chen · H. Ma 38

**Quasi-resonant bridgeless power factor correction converter with simple control**

H.-S. Jang · J.-Y. Lee · M.-Y. Kim · J.-I. Kang · S.-K. Han 54

### MOTOR DRIVES

**Streamlined control set of MPCC for PMSMs**

Y. Li · G. Chong · W. Guo · Z. Xu · Z. Wang · Q. Wang · S. Gao · X. Zhang · R. Tong · Y. Deng 67

**SOGI based finite position set-phase locked loop for sensorless control of PMSMs**

X. Wu · B. Wu · J. Li · S. Lu · C. Li · J. Li · H. Yue · X. Zhang 77

**Implementation of an improved low-resolution encoder-based speed and rotor flux estimation strategy for induction motors in the wide-speed range**

H. Dan · Y. Ma · P. Zeng · Y. Sun · M. Rivera · P. Wheeler 88

**Fast terminal integral sliding mode disturbance observer-based sliding mode current control for SPMSM systems**

R. Zu · M. Li · Z. Huang · Y. Huang · D. Xu 101

### GRID AND POWER QUALITY

**Modeling and analysis of sensorless state feedback-based active damping for LCL filters using MRAS observer**

J.-S. Yu · H.-I. Kim · S.-M. Lee · H.-W. Kim 116

### ENERGY MANAGEMENT SYSTEMS

**Adaptive SOC-OCV mapping-based joint estimation of SOC and SOH in aging lithium-ion batteries using extended Kalman filtering**

Z. Li · H. Ni · W. Zhu · B. Ni · J. Chang · J. Cao 126

**Transient synchronization stability analysis of multi-parallel grid-following voltage source converters considering the coupling effects of phase-locked loop and current control**

Q. Tan · H. Zhuang · W. Liu 139

**Interval prediction strategy for the remaining useful life of lithium-ion battery pack considering cell inconsistency**

X. Pang · X. Li · J. Kim · M. Lee · Z. Zhao · J. Wen · J. Zeng 153

**Intelligent multiport DC/AC inverter for distributed energy storage integration in low-voltage electrical networks**

M. Dakanalis · I. Kalaitzakis · I. Roditis · E. Koutroulis · F. Kanellos 166

### DEVICES AND COMPONENTS

**Improved device characteristics in 4H-SiC UMOFETs with high-κ HfO<sub>2</sub>/SiO<sub>2</sub> stacking gates**

W. Wu · B. Zhang · Y. Zhang · Y. Wang · J. Hu · X. Luo · X. Deng · H. Chen · Y. Zheng 181

**Fault diagnosis of static eccentricity in motors using FFT analysis of resolver signals**

D.-H. Cho · D. Kim · H.-G. Choi 190

### EMERGING POWER ELECTRONICS

**Enhanced photovoltaic water pumping system employing Kalman filter-based MPPT coupled with multilevel inverter-driven DTC-IM**

R. Kumar · M.V. Naik 201

**Topology design and manufacturing of enhanced current-attenuating solid-state characteristic DC circuit breaker based on cascade structure**

C. Ding · Y. Ji · Z. Yuan · Y. Shi 214

**Analysis and reduction of common-mode ground leakage current in transformerless PV inverters with rectified sine wave DC-link voltage**

G.I. Orfanoudakis · E. Koutroulis · G. Foteinopoulos · W. Wu 227

**PWM SRC with variable input structure to implement wide output voltage for fast chargers**

C.-G. Jung · M.-K. Jung · B.-G. Lee · E.-H. Chung · J.-Y. Lee 242

### CORRECTION

**Correction: Investigations on size and composition effects on ideality factor models of In<sub>x</sub>Ga<sub>1-x</sub>N/GaN solar cells**

Y. Che · D. Wang · L. Zhang · T. Yuan · M. Zhang 253

Further articles can be found at [link.springer.com](http://link.springer.com)

Indexed in *Astrophysics Data System (ADS)*, *BFI List*, *Baidu*, *CLOCKSS*, *CNKI*, *CNPIEC*, *Dimensions*, *EBSCO Academic Search*, *EBSCO Discovery Service*, *El Compendex*, *Google Scholar*, *Journal Citation Reports/Science Edition*, *Korea Citation Index (KCI)*, *Naver*, *Norwegian Register for Scientific Journals and Series*, *OCLC WorldCat Discovery Service*, *Portico*, *ProQuest-ExLibris Primo*, *ProQuest-ExLibris Summon*, *SCImago*, *SCOPUS*, *Science Citation Index Expanded (SCIE)*, *TD Net Discovery Service*, *UGC-CARE List (India)*, *WTI AG*, *Wanfang*

Instructions for Authors for *J. Power Electron.* are available at [www.springer.com/43236](http://www.springer.com/43236)

# Table of Contents

## Journal of Power Electronics Vol. 26, No. 1 January 2026

### Low Power Converters

---

Hybrid charge control-based natural voltage sharing method for input series output parallel resonant converters .....	Lu Qu, He Liu	1
Critical Mode Boost Power Factor Correction Converter with High Efficiency and Reduced Input Current Distortion using Variable Inductor .....	Cheon-Yong Lim, Yeonho Jeong, Hyeon-Woo Jeong, Gun-Woo Moon	13

### High Power Converters

---

Variables decoupling and multi-objective optimization of all-SiC interleaved boost converters for fuel cell electrical vehicles .....	Zhongda Wang, Xiaoyong Ma, Yifeng Wang, Chuang Zhang, Ruihuang Liu	26
Topology derivation of a single-phase bridgeless three-level PFC converter based on graph theory .....	Kun Xiang, Liping Fan, Ran Shen, Lingxi Yang, Tianan Zhu, Guofang Chen, Hui Ma	38
Quasi-resonant bridgeless power factor correction converter with simple control .....	Hyo-Seo Jang, Ju-Young Lee, Moon-Young Kim, Jeong-Il Kang, Sang-kyoo Han	54

### Motor Drives

---

Streamlined control set of MPCC for PMSMs ...	Yaohua Li, Guochen Chong, Weichao Guo, Zhixiong Xu, Zichen Wang, Qinzhen Wang, Sai Gao, Xinquan Zhang, Ruiqi Tong, Yizhi Deng	67
SOGI based finite position set-phase locked loop for sensorless control of PMSMs .....	Xiang Wu, Boliang Wu, Jieguang Li, Shanjun Lu, Chao Li, Jia Li, Haifeng Yue, Xiao Zhang	77
Implementation of an improved low-resolution encoder-based speed and rotor flux estimation strategy for induction motors in the wide-speed range .....	Hanbing Dan, Yongjian Ma, Peng Zeng, Yao Sun, Marco Rivera, Patrick Wheeler	88
Fast terminal integral sliding mode disturbance observer-based sliding mode current control for SPMSM systems .....	Ran Zu, Min Li, Zijun Huang, Yanhui Huang, Dong Xu	101

### Grid and Power Quality

---

Modeling and analysis of sensorless state feedback-based active damping for LCL filters using MRAS observer .....	Jeong-Seon Yu, Hae-In Kim, Sang-Min Lee, Hag-Wone Kim	116
--	---	-----

### Energy Management Systems

---

Adaptive SOC-OCV mapping-based joint estimation of SOC and SOH in aging lithium-ion batteries using extended Kalman filtering .....	Zhuo Li, Haibin Ni, Wenbing Zhu, Bo Ni, Jianhua Chang, Ji Cao	126
Transient synchronization stability analysis of multi-parallel grid-following voltage source converters considering the coupling effects of phase-locked loop and current control .....	Qiuting Tan, Hongling Zhuang, Weiqing Liu	139
Interval prediction strategy for the remaining useful life of lithium-ion battery pack considering cell inconsistency .....	Xiaoqiong Pang, Xiao Li, Jonghoon Kim, Miyoung Lee, Zhen Zhao, Jie Wen, Jianchao Zeng	153
Intelligent multiport DC/AC inverter for distributed energy storage integration in low-voltage electrical networks .....	Michail Dakanalis, Iason Kalaitzakis, Ioannis Roditis, Eftichios Koutroulis, Fotios Kanellos	166

## ***Devices and Components***

---

Improved device characteristics in 4H-SiC UMOSFETs with high- $\kappa$ HfO <sub>2</sub> /SiO <sub>2</sub> stacking gates .....	Weijie Wu, Bangmin Zhang, Yuyang Zhang, Yu Wang, Jiahao Hu, Xin Luo, Xiaochuan Deng, Hongbo Chen, Yue Zheng	181
Fault diagnosis of static eccentricity in motors using FFT analysis of resolver signals .....	Dong-Hyun Cho, Dogyun Kim, Hyeon-Gyu Choi	190

## ***Emerging Power Electronics***

---

Enhanced photovoltaic water pumping system employing Kalman filter-based MPPT coupled with multilevel inverter-driven DTC-IM .....	Rahul Kumar, M. Venkatesh Naik	201
Topology design and manufacturing of enhanced current-attenuating solid-state characteristic DC circuit breaker based on cascade structure .....	Can Ding, Yinbo Ji, Zhao Yuan, Yiji Shi	214
Analysis and reduction of common-mode ground leakage current in transformerless PV inverters with rectified sine wave DC-link voltage .....	Georgios I. Orfanoudakis, Eftichios Koutroulis, Georgios Foteinopoulos, Weimin Wu	227
PWM SRC with variable input structure to implement wide output voltage for fast chargers .....	Chang-Gyeo Jung, Min-Kyo Jung, Bo-Gyeong Lee, Eui-Hoon Chung, Jun-Young Lee	242

## ***Correction***

---

Correction: Investigations on size and composition effects on ideality factor models of In <sub>x</sub> Ga <sub>1-x</sub> N/GaN solar cells .....	Yu'ang Che, Danghui Wang, Lingkun Zhang, Tianhao Yuan, Mengfan Zhang	253
--	--	-----