

IEEE Transactions on Power Electronics (TPEL)

Special Section on Ultrawide/Wide Bandgap Device, Packaging, Control, EMI, and Applications for Power Electronics

Scheduled Publication Time: October 2024

A brief description of the topic:

Power electronics (PE) is a key enabling technology for fast-growing and emerging applications including electric vehicles (EVs), on- and off-shore renewable energy (RE), distributed energy resources (DERs), and smart grid (SG), solid-state transformers (SSTs), switched-capacitor converters (SCCs), wireless power transfer (WPT), aviation and space (A&S), information technology (IT), internet of things (IoTs), and high-performance, cognitive, and edge computation (HPCEC), and ultrafast protection (UP) to name a few. This necessitates advancements in PE-application-specific semiconductor devices based on new material bases, packaging, control and switching technologies that define new performance boundaries beyond silicon-based technologies. Fast emerging ultra/wide-bandgap (UWBG/WBG) PE devices owing to their superior properties are deemed to be game-changing technologies that are creating and propelling new/prospective applications aside from advancing the existing applications. To do so, UWBG/WBG semiconductors need new (e.g., vertical, optical, heterostructure) device structures, novel (e.g., ultra-low parasitic inductance, heterogeneous integration, SoC/SiP/SoM) packaging methodologies, and novel control, switching, and triggering techniques (e.g., to yield optimal tradeoff among current/voltage slew rate, electromagnetic interference (EMI), and switching loss). Additional open questions remain on the dynamic characteristics, power losses, stability, reliability, robustness, and conditional monitoring of advanced UWBG/WBG power devices, and their application spaces and new capabilities that can be brought to PE. Finally, to mitigate the detrimental impacts of PE-related radiative and conductive EMI effects associated with rapid-switching UWBG/WBG devices, advanced EMI theories, EMI measurement and diagnostic approaches, and various EMI suppression techniques needs further exploration and practical solutions.

The objective of the special section:

The objective of this special section in TPEL is to provide a collection of breakthroughs, informative, and tutorial publications encompassing the areas of UWBG/WBG device, packaging, control, EMI, and applications for PE. To be considered for review in TPEL, the review manuscripts must demonstrate the utility of the work for PE and its applications. Manuscript with sole focus on materials, device structures, physics of semiconductors, control, EMI, and characterization without utility for PE metrics and/or PE systems, may/will be returned/rejected without review.

A list of subtopics of interest, including emerging topics and topics related to recently-developed technologies

- Novel and advancements in UWBG/WBG unipolar/bipolar device structures including medium/high voltage devices, high/ultra-high frequency devices, high ambient/junction temperature devices, vertical devices, heterostructure devices, optical and photoconductive devices that demonstrate the practical utility for PE
- Ultra-low-inductance and robust thermal packaging, multi-die integration, heterogeneous two and three dimensional integration, optoelectronic packaging, waveguides, system of chip/package/module (SoC/SiP/SoM)
- Device-level electrical and/or optical control, modulation, and gate drive for loss mitigation, EMI mitigation, high current, long-term reliability, and voltage slew rates, integrated circuit and system on chip level realization, ultrafast and robust device dynamics, and electrical/thermal parameter sensing
- UWBG/WBG stability, reliability and robustness, device and module switching characteristics and power loss studies, circuit- and system-level modeling, lifetime assessment and evaluation, condition monitoring and prognosis
- EMI (conductive, near-field, radiative) modeling, measurement, diagnosis, passive and active filtering and suppression, and printed-circuit-board and integrated-circuit layout
- Radically new PE applications, SOA applications including but not limited to EVs, RE, DERs, and SG, SSTs, SCCs, WPT, A&S, IT, IoTs, HPCEC, and UP showing improvements in performance, robustness, resilience, and reliability, medium- and high-voltage applications, ultrafast applications
- Review or survey on recent advances in areas encompassing the above-mentioned research area(s)

All manuscripts must be submitted through ScholarOne at <https://mc.manuscriptcentral.com/tpel-ieee>. Submissions must be clearly marked "Ultrawide/Wide Bandgap Device, Packaging, Control, EMI, and Applications for Power Electronics" on the cover page. When uploading your paper, please select your manuscript type "Special Section." Refer to <https://www.ieee-pels.org/> for general information about electronic submission through ScholarOne. Manuscripts submitted for the special section will be reviewed separately and will be handled by the guest editorial board noted below. **Timeline:**

- March 31st, 2024 – Manuscripts Submission Deadline
- May 15th, 2024 – Revised Manuscripts Submission Deadline
- June 30th, 2024 – Final Acceptance Notification
- July 31st, 2024 – Manuscripts Forwarded to IEEE for Publication
- October 31st, 2024 – Special Section Appears in IEEE TPEL

Deadline for Submission of Manuscript: March 31, 2024

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