



Call for Papers

IEEE Transactions on Power Electronics (TPEL)

Special Section on Power Semiconductor Devices: From Modeling & Characterization to Gate Driving and AI-Enabled Technologies

With the industry's ever-increasing demands for converter system metrics such as power density and efficiency, the market penetration of wide-bandgap (WBG) devices is rising rapidly. While their inherent attributes—including high switching speeds—effectively reduce switching losses, they also pose significant challenges to existing theories and technologies. Owing to differences in intrinsic material properties, WBG devices show distinct characteristics compared to traditional silicon devices, creating an urgent need for the development of novel device modeling methodologies and simulation technologies. Additionally, their high switching slew rate interacts with parasitics, triggering switching oscillations. Against these downsides, the power semiconductor industry is calling for advanced dynamic characterization technologies to support effective device prescreening and application.

Employing emerging gate drivers as well as AI technology to enhance the application performance of power devices has become a focal point of industry attention. Acting as a bridge between the controller and power devices, gate drivers isolate and amplify the power to regulate the switching transient. Moreover, they provide protection in the event of faults, playing a crucial role in ensuring the safe operation of power devices. The emerging gate driver technologies, featuring multiple degrees of freedom and intelligent state sensing, can further enhance device characteristics and help address the reliability issues.

This research topic aims to bring together the efforts in power semiconductor device characteristics optimization with emerging gate driving. The topics of interest include, but are not limited to:

- Modeling of the power device behavior
- Analysis, modeling, and solutions for power device short-circuit
- Simulation technologies of power devices
- Temperature sensing methodologies of power devices
- Testing and characterization technologies of power devices
- Emerging gate driver circuitry for power devices
- Active switching characteristics control for power devices
- Gate driver chip and power supply design and fabrication
- Electromagnetic interference noise immunity augmentation of power converter using improved gate drivers
- Power device state of health monitoring
- Intelligent power module technologies
- Application of artificial intelligence in power device modeling and driving

All manuscripts must be submitted through ScholarOne at <https://mc.manuscriptcentral.com/tpel-ieee>. Submissions must clearly be marked "Special Section on Power Semiconductor Device Characteristics Optimization with Emerging Gate Driving Technologies" on the cover page. Hardware based experimental results are desired to support proposed ideas. When uploading your paper, please select your manuscript type "Special Section". Refer to <https://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.

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***Proposed Timeline:**

- March 31, 2026 – Manuscripts Submission Deadline
- May 15, 2026 – Revised Manuscripts Submission Deadline
- June 30, 2026 – Final Acceptance Notification
- July 31, 2026 – Manuscripts Forwarded to IEEE for Publication
- October 2026 – Special Section Appears in IEEE TPEL

*Please note that these dates are subject to change.