

Call for Letters-Special Section on Fabrication and Design of High-Power-Density and High-Frequency Passive Components

Scheduled Publication Time: October 2025

Brief description

Power density holds significant importance in various critical applications of power electronics, such as data centers, electric vehicles, and electric aircraft. Recent advancements in wide band-gap devices have enabled power electronics systems to operate at higher frequencies, reaching hundreds of kHz or even MHz. Higher operating frequencies contribute to enhanced system power density. Consequently, passive components must also advance to manage high-frequency operation effectively and ensure reliability. Key strategies include material innovations, such as high-permeability and magnetic saturation materials for inductive components, as well as high dielectric constant and low dissipation factor materials for capacitive components. Additionally, material characterization, loss modeling, and isolation, alongside active thermal management techniques, play crucial roles, particularly in high-frequency applications. Furthermore, emerging artificial intelligence (AI) and machine learning (ML) methods are gaining significant traction in characterizing hysteresis phenomena and performing complex electromagnetic field calculations. Together, these innovations are driving the evolution of passive components towards higher power density and reliability, spanning frequencies from hundreds of kHz to tens of MHz, and reshaping the future landscape of power electronics systems.

Objective

This special issue aims to collect emerging research achievements within the scope of passive component and material. The outcome of this Special Section is not only to report the technological advancements, but also to raise the awareness of the importance of the research field.

Subtopics

Prospective authors are invited to submit their innovative ideas or latest developments for peer review for publication in the TPEL Letter. Topics of interest in this Special Issue include, but are not limited to, the following:

- Novel material and structure for high-power-density and high-frequency passive components
- Electro-thermal modeling and simulation of passive components for lifetime assessment
- High accuracy loss calculation and measurement techniques for passive components
- Hysteresis characterization and modeling of the soft magnetic material and dielectric material
- Electromagnetic field modeling for the passive components
- Design and optimization of the planar passive components
- AI and ML-assisted solutions for loss prediction and electromagnetic field calculation
- New fabrication methods for passive components
- Passive components for medium voltage / high voltage power electronics

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Proposed timeline

- November 1, 2024 – Open to Manuscript Submissions
- May 1, 2025 – Manuscript Submissions Deadline
- July 30, 2025 – Final Decision Notification
- August 15, 2025 – Manuscripts Forwarded to IEEE for Publication
- September 1, 2025 – Manuscripts Published Online as Early Access
- October 15, 2025 – Special Section Published in an IEEE TPEL Issue