

Energy and Power Group

WEEKLY SEMINAR SERIES – FALL 2018

Special Time, Monday, October 29th, 2018, 1:30 p.m. – 2:30 p.m., ZACH 304

Applications of SiC MOSFETs – An Industry Perspective



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Abstract

This seminar will review the state of art silicon carbide (SiC) devices and converters and their application in various industries. While the opportunities in performance improvements with SiC devices are clear, there are also significant design challenges related to high speed, high voltage and high temperature operation. These challenges will be analyzed and several solutions aiming to fully exploit the superior characteristics of SiC devices will be given. Several design examples such as high-density power converters based on SiC MOSFETS will be given to demonstrate the opportunities, design challenges and proposed solutions. In particular, we will review:

- Photo-voltaic (PV) inverter applications, where the SiC-MOSFET-based PV inverters face challenges dictated by the grid code mandates related to the reactive power support to the grid. This seminar will cover an application of dynamic gate resistance modulation technique to keep the SiC device within its safe operating limits while maintaining a low switching loss with minimum voltage and current overshoots. The proposed implementation also works equally well at high junction temperatures (up to $T_j = 150^\circ\text{C}$), which further increases the operating range of the PV inverter.
- Three-phase, two-level inverter for commercial power block applications designed with the latest generation high performance 1.7 kV/ 450 A SiC-MOSFET module from GE. This power block is expected to replace the commercially available standardized 1.7 kV/ 450 A Silicon (Si) IGBT based three phase power block.

Biography

Maja Harfman Todorovic is a Principal Engineer at the GE Global Research, Niskayuna, NY, where she leads R&D programs focusing on power electronics applications in various industries ranging from aviation and energy supply to healthcare and O&G. She holds a Dipl. Ing. degree from the Faculty of Electrical Engineering, University of Belgrade, Belgrade, Serbia, in 2001, and the M.S. and Ph.D. degrees from Texas A&M University, College Station, TX in 2004 and 2008, all in electrical engineering. Her research interests include converters for PV applications, subsea oil and gas applications, switching-mode power supply design, uninterruptible power supply systems, energy storage devices, and digital control of power converters. She holds 14 U.S. patents with 25 others pending and has over 100 published technical papers in refereed journals and conferences. Dr. Harfman Todorovic is a Senior Member of IEEE. She serves as an Associate Editor for the IEEE Transactions on Power Electronics, and as a Reviewer for the IEEE Transactions on Education, IEEE Transactions on Industry Applications, IEEE Transactions on Industrial Electronics, and several IEEE conferences.