



School of Interdisciplinary Research (SIRe) Indian Institute of Technology Delhi, New Delhi

Invites you all to a seminar on

SiC Power Devices Enabling next-generation power infrastructure



Dr. Ranbir Singh
GeneSiC Semiconductor Inc., USA

Date: November 01 (Friday), 2019

Time: 12:00

**Venue: CARE Committee Room (III-101)
IIT Delhi**

Abstract

Recently, many power electronics systems have emerged that require direct tie-in to grid level voltages – 480 V AC, 4160 VAC, 12.47 kVAC and higher. These include Extra fast electric vehicle chargers, grid-tied battery energy storage, high power data servers, and utility-scale solar plants. These applications are providing a strong pull towards the utilization of emerging Silicon Carbide switches, because of the promise of increased conversion efficiencies, compact/simpler circuits, and higher reliability. Applications traditionally requiring high voltage devices, such as rail traction, utility grid, pulsed power are already being fielded with SiC MOSFETs that have proven their mettle by delivering significant size, weight, volume and cost savings.

SiC MOSFETs offer simplified gate drive requirements and very fast switching speeds. They also offer the possibility of the use of third quadrant operation of its I-V characteristics to enable synchronous rectification for very low power losses in multi-kV devices. These characteristics offers an opportunity for SiC MOSFETs to be applied flexibly to a wide range of high voltage circuits. Switching characterization of 4500 V SiC MOSFETs at GeneSiC have demonstrated a turn ON and OFF times within 30 nano-seconds. These capabilities poses new challenges towards designing optimized packaging, controlling the EMI, optimizing gate driving conditions, as well as designing high power circuits that fully utilize these cutting-edge devices. Circuits that allow series connection of high voltage MOSFETs to achieve grid-scale voltages will also be presented.

Brief CV

Dr. Ranbir Singh, received a **Ph.D.** and MS degrees in Electrical and Computer Engineering, **North Carolina State University**, Raleigh, NC, and B. Tech from Indian Institute of Technology, Delhi. He founded GeneSiC Semiconductor Inc. in 2004. Prior to that he conducted research on SiC power devices first at Cree Inc, and then at the NIST, Gaithersburg, MD. In 2012, EE Times named Dr. Singh as among "Forty Innovators building the foundations of next generation electronics industry." In 2011, he won the R&D100 award towards his efforts in commercializing 6.5kV SiC Thyristors. He has published over 200 journal and conference papers, is an author on 28 issued US patents, and has authored a book.