

Tuesday February 28, 2017 12:00pm—1:00pm

III-Nitride Power Electronics

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Abstract: The III-Nitride (III-N) materials have enabled several important technology breakthroughs in recent years, most notably as the building semiconductors for the solid-state lighting technology and next-generation detecting deep ultraviolet (DUV) photon emitters and detectors for applications in water sanitation, bio-detection, and astrophysics studies. The wide bandgap properties and high electron saturation velocity in III-N materials also attracted extensive R&D efforts in high-power millimeter-wave and radio-frequency electronic circuits. Today, III-N HFETs are highly sought in energy-efficient DC-DC converters from 12V up to 1.2-kV. As a complementary device technology, III-N heterojunction bipolar transistors (HBTs) and related bipolar switches offer new opportunities for ultra-high-power operation because of their normally off and vertical current conduction capabilities. This talk will present a summary of III-N electronic device development for power applications. We have demonstrated state-of-the-art InGaN HBTs at Georgia Tech and high-performance GaN PIN rectifiers with device characteristics approaching the theoretical limit for GaN materials. With significant progress in the development of III-N transistors and vertical bipolar switches, GaN-based power electronic devices could offer a disruptive technology basis for the future high-temperature, high-power electronic components in applications such as electric vehicles, HVAC systems, and future power grids.

Bio: Shyh-Chiang Shen received his Ph.D. at the University of Illinois at Urbana-Champaign in 2001. His expertise and background have been in advanced semiconductor device research and high-speed integrated circuits. He was involved in the research of low-voltage RF MEMS switches and ion-implanted GaAs MESFET, and developed a proprietary InP SHBT technology that led to the first demonstration of monolithically integrated 40Gb/s differential-output optical receivers. Shen joined Georgia Tech in 2005 and is conducting focused research on III-N device technologies, including deep-ultraviolet (DUV) high-sensitivity avalanche photodiodes, III-N lasers in blue-green, UVA and DUV bands, high-voltage III-N HFETs, and InGaN HBTs. Shen is a senior member of the IEEE and OSA. He holds 8 awarded U.S. patents and is an author or a co-author of more than 150 technical papers in refereed journals and conferences. He is a recipient of the 2000 Gregory E. Stillman fellowship in ECE at UIUC, the 2010 Richard M. Bass/Eta Kappa Nu Outstanding Teacher Award in the School of ECE at Georgia Tech, the 2011 Outstanding Junior Faculty Member Award in the School of ECE at Georgia Tech, and the 2012 Outstanding Undergraduate Research Mentor Award at Georgia Tech.

Nano@Tech is held at noon in room **1116-1118 of the Marcus Nanotechnology Building**. The event is free and lunch is provided. For information on future events contact: nanotech@ien.gatech.edu

Pizza lunch will be provided, however we ask that you limit yourself to two slices so that all attendees are accommodated.