Bio

Dr. Victor Veliadis is Executive Director and CTO of PowerAmerica, which is a U.S. Department of Energy wide bandgap power electronics Manufacturing Innovation Institute. Dr. Veliadis manages a budget in excess of $30 million per year that he strategically allocates to over 35 industrial, University, and National-Laboratory projects, to enable U.S. leadership in WBG power electronics manufacturing, work force development, job creation, and energy savings.

Dr. Veliadis has given over 60 invited presentations/tutorials, and keynotes at major conferences in India, Korea, China, Europe and the U.S.  He is an IEEE Fellow and an IEEE EDS Distinguished Lecturer. Dr. Veliadis has 25 issued U.S. patents, 6 book chapters, and over 120 peer-reviewed technical publications to his credit. He is also Professor in Electrical and Computer Engineering at North Carolina State University. Dr. Veliadis received the Ph.D. degree in Electrical and Computer Engineering from Johns Hopkins University in 1995. Prior to taking an executive position at Power America in 2016, Dr. Veliadis spent 21 years in the semiconductor industry where his work included design, fabrication, and testing of 1-12 kV SiC SITs, JFETs, MOSFETs, Thyristors, and JBS and PiN diodes, as well as financial and operations management of a commercial foundry.

  Abstract

Silicon (Si) power devices have dominated power electronics due to their low cost volume production, excellent starting material quality, ease of processing, and proven reliability. Although Si power devices continue to make progress, they are approaching their operational limits primarily due to their relatively low bandgap and critical electric field that result in high conduction and switching losses, and poor high temperature performance.

In this presentation, the favorable material properties of Silicon Carbide (SiC) devices, which allow for highly efficient power electronic systems with reduced form factor and reduced cooling requirements, will be highlighted. Emphasis will be placed on high impact application opportunities where SiC devices are expected to displace their incumbent Si counterparts. These include “more electric aerospace” with weight, volume, and cooling system reductions contributing to energy savings and low emissions; automotive power electronics with reduced losses and relaxed cooling requirements; more efficient, flexible, and reliable grid applications with reduced system footprint; variable frequency drives for efficient high power electric motors at reduced overall system cost; and novel data center topologies with reduced cooling loads and higher efficiencies. Foundry considerations and design of SiC MOSFETs, currently being inserted in the majority of SiC based power electronic systems, will be discussed. Cost reduction strategies will be outlined elucidating the path to the projected $1.5B SiC device market by 2023. The efforts of the PowerAmerica manufacturing Institute to bridge gaps in wide bandgap power technology to enable manufacturing job creation and energy savings will also be presented.