

Lectures on Power Electronics and Mechatronics

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Link	https://ethz.zoom.us/j/68912471127



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SiC power device commercialization: status and barriers to overcome

Silicon (Si) power devices have dominated power electronics due to their low cost volume production, excellent starting material quality, ease of fabrication, and proven reliability. Although Si power devices continue to make significant 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), which allow for highly efficient power devices with reduced form-factor and simplified thermal management, will be outlined. High impact application opportunities, where SiC devices are displacing their incumbent Si counterparts, will be reported. Material and device fabrication aspects will be highlighted with an emphasis on the processes that do not carry over from the mature Si manufacturing world and are thus specific to SiC. Fab models will be analyzed, and the vibrant U.S. SiC manufacturing infrastructure (that mirrors that of Si) will be presented. Barriers to SiC mass commercialization will be identified and discussed. These include the higher than silicon device cost, reliability and ruggedness concerns, defects that degrade device performance, and the need for a trained workforce to skillfully insert SiC into power electronics systems.

Biography

Dr. Victor Veliadis is Executive Director and CTO of PowerAmerica, a WBG semiconductor power electronics consortium. At PowerAmerica, he has managed a budget of \$146 million that he strategically allocated to 200 industrial and University projects to accelerate WBG semiconductor clean energy manufacturing, workforce development, and job creation. His PowerAmerica educational activities have trained 410 University students in applied WBG projects, and engaged over 3700 attendees in tutorials, short courses, and webinars.

Dr. Veliadis is an ECE Professor at NCSU and an IEEE Fellow and EDS Distinguished Lecturer. He has 27 issued U.S. patents, 6 book chapters, and over 120 peer-reviewed publications. Prior to entering academia and 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 SiC devices, GaN devices for military radar amplifiers, and financial and operations management of a commercial semiconductor fab. He has a Ph.D. degree in Electrical Engineering from John Hopkins University (1995).