

SiC Devices for Power Electronic Systems: Status, Challenges, and Prospects

Abstract

In this tutorial, the favorable material properties of Silicon Carbide (SiC), which allow for highly-efficient power devices with reduced form factor and reduced cooling requirements, will be presented. High impact application opportunities, where SiC devices are expected to displace their incumbent Si counterparts, will be discussed. SiC fab models will be analyzed and the vibrant U.S. SiC device manufacturing infrastructure will be summarized. Fab considerations and cost reduction strategies will be highlighted elucidating the path to the projected \$1B SiC device market by 2022. Device fabrication aspects will be outlined with an emphasis on the processes that do not carry over from the mature Si manufacturing world and are thus specific to SiC. In particular, the presentation will stress the design and fabrication of SiC MOSFETs that are presently being inserted in the majority of SiC based power electronic systems. Barriers to SiC mass commercialization will be identified and detailed.

Instructor Bio



Victor Veliadis received the B.S. degree from the National Technical University of Athens Greece in 1990, and the M.S. and Ph.D. degrees in electrical and computer engineering from Johns Hopkins University, Baltimore, MD, USA, in 1992 and 1995, respectively. He is the Chief Executive and CTO of PowerAmerica, which is a U.S Department of Energy WBG power electronics Manufacturing Institute. In this role, he manages an annual budget in excess of \$30 million that he strategically allocates to over 35 industrial and University projects to accelerate WBG manufacturing, workforce development, job creation, and clean energy. He is also an ECE Professor at NCSU and an IEEE Fellow and IEEE EDS Distinguished Lecturer. He has given over 70 invited presentations/tutorials, and keynotes at major conferences in India, Korea, China, Europe and the U.S. He has 27 issued U.S. patents, 6 book chapters, and over 120 peer-reviewed technical publications. Prior to entering academia and taking an executive position at Power America in 2016, he 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 semiconductor fab.

