

Research Activities of Silicon Carbide Power Semiconductor Devices in KERI (Korea Electrotechnology Research Institute)

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Abstract

Power semiconductor devices are very important component in electric energy conversion system. Over the 60% of electric energy was used to motor control and heating system. Electric vehicles are already commercialized in many country. Therefore, energy conversion efficiency is very important in power system such as electric vehicle, renewable energy and industrial purpose.

However, performance of silicon based power switching devices are restricted by their material properties. With conventional silicon based conversion technologies, up to 20% of the generated electrical power is lost during the various conversion stages. For overcome this material restriction of silicon based power conversion system, wide band-gap materials such as Silicon Carbide and Gallium Nitride based conversion system were proposed in renewable energy and environment friendly systems. Wide band-gap semiconductors based on Silicon Carbide are most attractive for power conversion systems due to low losses, superior capability of high temperature operation and high thermal conductivity. A significant effort has been devoted to characterizing the numerous Silicon Carbide power devices.

Korea is one of the global top player in memory devices. However, Korea is still backward in power semiconductor industry. Power Semiconductor Research Center (PSRC) of KERI is one of the technical leading-edge group in Korea. Last two decade, PSRC has developed various kind of Silicon Carbide power devices such as MOSFET, JFET, schottky diode, and PN junction diode. This presentation will give an overview of design, process and characterization of high voltage 4H-SiC MOSFET devices fabricated in KERI, and brief introduction of power semiconductor R&D project in Korea.

Keywords: *Silicon Carbide, Power Semiconductor, MOSFET, Wide Band-gap*

Biography

Sangcheol Kim was born in Seoul, Korea. He studied in Hanyang University and Pusan National University for B.Ss, M.Sc degree and Ph.D. He has been working for Korea Electrotechnology Research Institute (KERI) since 1992. He is currently a Principal Researcher in Power Semiconductor Research Center and a Technical Leader of device design group. His research interests include numerical simulation and design of power semiconductor devices, especially SiC devices.