Wide Bandgap Devices in Power Electronics

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Abstract

The increasing demand for high-power applications has led us to investigate and develop resonant power converters with high power density. Thanks to state-of-the-art wide bandgap devices, such as enhancement mode gallium nitride (eGaN) transistors or Silicon Carbide (SiC) MOSFETs, we can extend the limit on size, switching frequency, and efficiency in the power converters while operating them under high-frequency, high-power conditions. However, the GaN FET has a relatively low breakdown voltage and a significant positive thermal coefficient in their conduction characteristics. A competing WBG semiconductor, a SiC MOSFET, exhibits excellent conduction characteristics and a particularly low positive thermal coefficient in on-resistance but is challenging to operate at very high frequencies efficiently. In this talk, I will present a performance comparison of eGaN FETs and SiC MOSFETs in MHz, KW resonant power converter. Also, I will demonstrate how to optimize the power converter design using eGaN FETs for high-frequency, high-power operation.