A High Power Boost Converter for PV Systems Operating up to 300 kHz using SiC Devices.

In this paper, a 3kW boost converter for PV applications using SiC devices is introduced. Main focus is to operate the converter over a wide range of switching frequency and to analyze the main loss distributors as well as the efficiency. The switching element is a recently introduced normally-on SiC JFET and a SiC diode is used. The SiC JFET has been evaluated on an optimized double pulse test circuit showing switching energies four times lower than its Si IGBT competitor. Measurements show a maximum efficiency of 98.6% at 50 kHz. Thermal investigations show that the boost converter can be operated at full power for a switching frequency of 100 kHz using natural cooling. At 200 kHz the boost converter is capable of operating at full power when forced air cooling is applied having a JFET case temperature of less than 90°C. The case temperature of the JFET increases up to 110°C at a switching frequency of 300 kHz where a maximum efficiency of 97.5% is achieved.