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Analysis of Commercial off-the-shelf 1200 V Silicon Carbide MOSFETs Under Short Circuit Conditions

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Silicon carbide (SiC) power semiconductor devices are experiencing an increasingly widespread adoption in many power electronics and pulsed power applications such as high-power DC-DC converters and inverters, battery chargers, industrial motor drives, as well as high-power solid-state pulse generators such as a Marx generator or a linear transformer driver (LTD). The wide-bandgap (WBG) and thermal properties of SiC provide inherent advantages over silicon power devices especially in high power density applications. These advantages include higher blocking voltages, increased switching speeds, physically smaller implementations of power electronics and pulsed power circuits, improved system efficiencies, and higher operating temperatures. To improve the overall confidence in the ability of SiC devices to reliably replace equivalent silicon solutions, independent reliability testing and analysis must be conducted. In this research, a short circuit test board was developed to analyze the short circuit ruggedness of 1200 V MOSFETs. Using the test board, commercially available 1200 V / 10 A SiC MOSFETs from 3 different manufacturers were subjected to both single and repetitive short circuit events, and the short circuit ruggedness of each device was measured and analyzed. The purpose of this research is to independently measure and report on the short circuit capabilities of commercially off-the-shelf 1200 V SiC MOSFETs.

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