

An experimental analysis of the behavior under short-circuit conditions of three different silicon-carbide (SiC) 1200-V power devices is presented. It is found that all devices take up a substantial voltage, which is favorable for detection of short circuits. A transient thermal device simulation was performed to determine the temperature stress on the die during a short-circuit event, for the SiC MOSFET. It was found that, for reliability reasons, the short-circuit time should be limited to values well below Si IGBT tolerances. Guidelines toward a rugged design for short-circuit protection (SCP) are presented with an emphasis on improving the reliability and availability of the overall system. A SiC device driver with an integrated SCP is presented for each device-type, respectively, where a short-circuit detection is added to a conventional driver design in a simple way. The SCP driver was experimentally evaluated with a detection time of 180 ns. For all devices, short-circuit times well below 1 μ s were achieved.