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# Evaluation of High Frequency Solid State Switches for Pulsed Power Applications Using a 12 kW Variable Voltage Testbed

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Field Effect Transistor (FET) controlled devices, such as MOSFETs and IGBTs, exhibit some desirable characteristics over other solid-state devices; benefits include high frequency switching, voltage control, and compact control circuitry. This paper details a testbed for evaluation of FET controlled devices used in inductive pulsed power systems as well as the diagnostics used to characterize the devices under test (DUT). The testbed operates in two modes: (1) High energy pulsed mode, with charge voltages up to 300 V, pulse width of 3 seconds and up to 18 kJ total stored energy (2) Continuous pulse-train mode, with charge voltage up to 300 V, up to 18 kJ total stored energy and average current output up to 40 A. Both of these modes utilize a 396 mF capacitor bank to store energy. A fast, custom, gigabyte-memory-depth data acquisition oscilloscope records voltage and current waveforms at a 60 Mega-Sample/second rate. Due to the frequency regime (3-30 kHz), high current levels (up to 100 A peak) and wide voltage range of these experiments, making these measurements, reliably, is a non-trivial effort. Several methods of making each measurement were examined. Calibrated voltage, current, energy, and power waveforms quantify the DUT's turn-on / conduction / turn-off characteristics. Measurements of interest in these experiments are device current and device voltage; energy dissipated in the DUT is extrapolated from these measurements.

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