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High power, high repetition rate, fast capacitor charging circuit

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A high power, high repetition rate, fast capacitor charging circuit is presented. The circuit uses four SiC MOSFET switches in parallel in a modified boost converter configuration. Switching losses, already reduced due to the fast switching characteristics of the SiC devices are further mitigated by an auxiliary switch enforcing zero voltage turn-on of the main switches. The charging circuit is expected to enable a nanosecond range high-voltage pulse generator to operate at 100kHz repetition rate. The optimum number of main switches is determined by the available liquid cooling area of the SiC device packages and resulting power density for an acceptable junction temperature rise of approximately 85degC.

Keywords: SiC Mosfet losses, fast charging, nanosecond pulses.

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