Emerging Technologies in Converter Design

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ABSTRACT:

With the current push for electric vehicles and weapon systems, the need for high power density power converters is growing. Two technologies are examined that have the potential to increase power densities in converters.

The first technology is the hybrid Silicon (Si)/Silicon Carbide (SiC) IGBT module. The hybrid module consists of a standard Si IGBT with the Si diode replaced with a SiC diode. These devices are a direct replacement for the all Si IGBT modules. This paper compares the hybrid modules verses standard modules in a 100kW+, three-phase, PWM inverter, in both motoring and regeneration modes. Currently the inverter has been operated at 60kW with both types of modules. Further results are pending a rebuild on the interface circuit to prevent noise faults.

The second technology being examined is the use of embedded Rogowski coils as current sensors in an IGBT module. For a baseline of comparison, testing was done using Allegro A1374 programmable linear Hall Effect sensor. Currently the Rogowski coil is awaiting completion of the control circuitry, but test results for the Hall Effect sensor are discussed, along with their primary limiting factor, frequency response.

Key Words: Silicon Carbide, SiC, Rogowski, Hall Effect, power density, Hybrid IGBT

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