Design of Traction Inverter With SiC Semiconductors

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In recent years, the purchase price of fossil fuels has risen significantly, bringing alternative energy sources to the fore. The problem has affected not only fossil fuels but also electricity, resulting in substantial losses for public railways and transport companies. In September 2022, the Budapest Transport Company (BKV) did not receive any valid bids for the procurement of traction energy. The company's annual traction costs, which amounted to approximately 20 billion HUF, could potentially increase by a factor of 10 or 15. For Hungarian State Railways (MÁV), the cost of 1 kWh of traction energy was 34 HUF in 2021. However, by 2022, this cost had already risen to 170 HUF, and in 2023, it further increased to 180 HUF. To address the aforementioned issues, an inverter optimized for railway traction will be developed, consisting of SiC MOSFETs. The inverter is a compactly designed, high energy density electrical device. Despite its small size, it is capable of delivering a power of 2.5 kW. For demonstration purposes, it can also be operated from a 230 V mains voltage. It is perfectly suitable as a general-purpose variable frequency drive. The device is pioneering in terms of general-purpose VFDs, as it offers outstanding performance compared to traditional IGBT-based VFDs, while maintaining low manufacturing costs. Thanks to the modular system, the power module of the device is interchangeable, allowing for a huge power density and higher input voltages.

Awards Won:
Fourth Award of $500