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CEMEP Topic: Industrial revolution until 2025: the culture of “new” for the 1st day

Perspectives of wide band-gap power devices: SiC and GaN versus its silicon counterparts

Abstract

Abstract: IGBTs have been the power device of choice for drive applications since at least more than two decades. Consequent improvement of the technology has lead to very favorable trade-offs between conduction losses and switching losses. Especially the introduction of the trench-stop concept in combination with thin wafer technology was a major technology breakthrough.

Recently, wide band gap devices based on SiC and GaN, are challenging the dominance of the IGBT. As majority carrier devices both concepts feature an ohmic forward characteristic and extremely low switching losses (nearly) without any bipolar charge contribution.

While classic converter architectures with limited switching speed bring advantages in efficiency driven applications, the full potential of the power devices is unleashed in high switching frequency applications allowing voltage gradients far beyond 5V/ns.

We will show system advantages for SiC both in classic converter architectures as well as for machines fed by sinusoidal currents. For low-power applications such as pump drives GaN with its integration potential is an interesting candidate for much simpler and more efficient systems.