Wide Band Gap Technology in Power Electronics Application

Wide bandgap (WBG) semiconductor materials, such as GaN and SiC, offer advancements over existing semiconductor technologies such as MOSFETs and IGBTs. The bandgap is the energy required to move electrons from a material's valence band to the conduction band. The bandgap of WBG materials is much higher than that of silicon. WBG semiconductors allow devices to operate at much higher voltages, frequencies and temperatures than silicon, with significantly lower switching and conduction losses. The materials used in WBG (Wide Bandgap) technology have conduction and switching properties that are approximately ten times better than those of traditional silicon. These peculiarities make WBG technology a natural application for power electronics, especially for EV applications. SiC components and GaN can simultaneously have smaller sizes and higher speeds and be more efficient.

Gate drivers for Wide bandgap power devices

Gate drivers are an essential component in power electronics. They are responsible for controlling the switching of power devices such as MOSFETs, IGBTs, and SiC devices. The main function of a gate driver is to provide the necessary voltage and current to the gate of the power device to turn it on and off. This is critical in applications such as motor drives, power supplies, and inverters. Gate drivers come in different configurations and can be either isolated or non-isolated. Isolated gate drivers provide electrical isolation between the input and output, which is important for safety and noise immunity. Non-isolated gate drivers, on the other hand, do not provide isolation but are simpler and less expensive. Gate drivers also have features such as overcurrent protection, undervoltage lockout, and thermal shutdown to protect the power device from damage. They can be designed to operate at different frequencies and voltages depending on the application requirements. Overall, gate drivers play a crucial role in power electronics by providing reliable and efficient control of power devices. Gate driver parameters in a SiC-Based DC-DC Converter for Electric Vehicles and GaN-Based Half-Bridge Converter will be discussed.

Short CV

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