

Overview



Author: *Yukio Yasuda**

Latest Technology Trends and Prospects for Power Modules

The increasing consumption of energy and the emission of massive quantities of CO₂ are global issues that must be urgently addressed.

Currently, approximately 40% of the primary energy consumed around the world is used to generate electricity, and the ratio is estimated to exceed 50% within the next 25 years. Power electronics are crucial for solving such problems, and power devices are key components that need to be progressed.

The structure of IGBTs that use Si as a semiconductor material has advanced, from the planar gate structure to the trench gate structure and our proprietary CSTBT structure. In addition, the characteristics have been improved by using ultrathin wafer processing and back patterning technologies.

The performance of power devices is not determined only by the chips; packaging technologies that make the most of the characteristics of the chips are also important. In addition to conventional technologies, we have various new technologies such as resin insulation, molding, and low inductance wiring technologies. Moreover, various other technologies, such as on-chip sensing technologies to detect chip temperature and protection technologies (e.g., intelligent power modules (IPM)), can be combined at the user's request.

These technologies allow us to provide small, light-weight, high-efficiency (low-loss), high-robustness, and high-reliability devices for a wide variety of sectors such as home appliances, industry, automobiles, electric railway, and power transmission.

In the power electronics sector, SiC as WBG semiconductors in particular has been gaining attention as a material that may replace Si due to its excellent physical properties. Mitsubishi Electric Corporation started developing SiC semiconductors ahead of other companies and succeeded in commercializing cutting-edge SiC power modules for various applications as a pioneer in the industry, and has been improved them further.

Mitsubishi Electric provides power modules with capacities ranging from 100 W to several MW for various applications. These modules incorporate leading-edge technologies to help reduce the global consumption of energy.