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Mitsubishi Electric Develops All-SiC Inverter with High Power Density

Tokyo, May 23, 2012 – Mitsubishi Electric Corporation (TOKYO: 6503) announced today it has developed a prototype forced-air-cooled three-phase 400V output inverter with all-silicon carbide (SiC) power modules that has a power density of 50kVA per liter. The inverter is expected to contribute to smaller and lighter power-electronics equipment in automotive and industrial applications, among others.

Full SiC inverter
with high power density



The module, which is rated at 1,200V/300A, incorporates a SiC MOSFET (metal oxide semiconductor field effect transistor) and SiC SBD (schottky barrier diode). To increase power density, electric current density must be increased by lower electric resistance, so Mitsubishi Electric developed low-resistance wiring by using direct lead bonding to connect power semiconductor chips directly to the main terminals, eliminating the use of conventional high-resistance aluminum lead wires.

To achieve high current density, low-loss (low-resistance) power chips also had to be used, but this required the application of high-speed protection circuits to prevent a large destructive current during short circuits. Mitsubishi Electric applied a SiC-MOSFET with a built-in current sensor function to its all-SiC power module and utilized a high-speed short-circuit-protection circuit, making it possible to use a low-resistance SiC-MOSFET even at a high current density. In so doing, the company successfully achieved a power density of 50kVA per liter by an inverter operation with an output of 156kVA.

While silicon (Si) has traditionally been used for power semiconductor devices, in recent years SiC has come to be widely considered as a promising next-generation material. Compared to Si, SiC has a critical electric field for breakdown that is about 10 times higher and enables the reduction of power loss, which contributes to fewer emissions of carbon dioxide. Furthermore, the reduction of power loss implies the reduction of cooling equipment, and contributes to overall downsizing and lightening of electronic components for automotive and industrial uses.

Mitsubishi Electric plans to further downsize inverters for commercial viability.

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About Mitsubishi Electric

With over 90 years of experience in providing reliable, high-quality products, Mitsubishi Electric Corporation (TOKYO: 6503) is a recognized world leader in the manufacture, marketing and sales of electrical and electronic equipment used in information processing and communications, space development and satellite communications, consumer electronics, industrial technology, energy, transportation and building equipment. Embracing the spirit of its corporate statement, Changes for the Better, and its environmental statement, Eco Changes, Mitsubishi Electric endeavors to be a global, leading green company, enriching society with technology. The company recorded consolidated group sales of 3,639.4 billion yen (US\$ 44.4 billion*) in the fiscal year ended March 31, 2012. For more information visit <http://www.MitsubishiElectric.com>

*At an exchange rate of 82 yen to the US dollar, the rate given by the Tokyo Foreign Exchange Market on March 31, 2012