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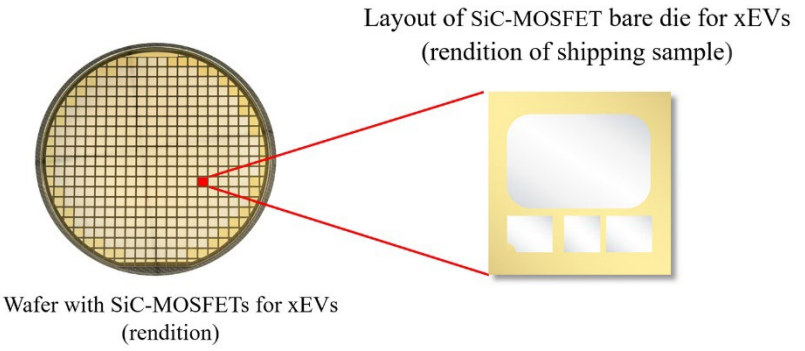
Mitsubishi Electric to Ship Samples of SiC-MOSFET Bare Die for xEVs

Standardized power-semiconductor chip will extend driving range and lower power costs for xEVs



(left) Wafer with SiC-MOSFETs for xEVs (rendition)
(right) Layout of SiC-MOSFET bare die for xEVs (rendition of shipping sample)

TOKYO, November 12, 2024 – Mitsubishi Electric Corporation (TOKYO: 6503) announced today that it will begin shipping samples of a silicon carbide (SiC) metal-oxide-semiconductor field-effect transistor (MOSFET) bare die for use in drive-motor inverters of electric vehicles (EVs), plug-in hybrid vehicles (PHEVs) and other electric vehicles (xEVs) on November 14. Mitsubishi Electric's first standard-specification SiC-MOSFET power semiconductor chip will enable the company to respond to the diversification of inverters for xEVs and contribute to the growing popularity of these vehicles. The new SiC-MOSFET bare die for xEVs combines a proprietary chip structure and manufacturing technologies to contribute to decarbonization by enhancing inverter performance, extending driving range and improving energy efficiency in xEVs.

Mitsubishi Electric's new power semiconductor chip is a proprietary trench* SiC-MOSFET that reduces power loss by about 50% compared to conventional planar** SiC-MOSFETs. Thanks to proprietary manufacturing technologies, such as a gate oxide film process that suppresses fluctuations in power loss and on-resistance, the new chip achieves long-term stability to contribute to inverter durability and xEV performance.

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* Groove (trench) is dug from the surface of the wafer and the gate electrode is embedded.
** Gate electrode is placed on the surface of the wafer.

Product Features

1) Proprietary trench SiC-MOSFET extends driving range and lowers power costs for xEVs

- Advanced miniaturization technology, cultivated in Mitsubishi Electric's manufacture of Si power semiconductor chips, helps reduce on-resistance compared to conventional planar SiC-MOSFETs.
- Oblique ion implantation instead of conventional vertical ion implantation reduces switching loss.
- Power loss is reduced by about 50% compared to conventional planar SiC-MOSFETs, resulting in improved inverter performance, extended driving range and reduced power costs for xEVs.

2) Proprietary manufacturing technologies contribute to xEV performance

- Unique SiC manufacturing technologies, cultivated by the company during more than 20 years of researching and manufacturing planar SiC-MOSFETs and SiC Schottky barrier diodes (SBDs), are used to produce this trench SiC-MOSFET. For example, Mitsubishi Electric's proprietary gate oxide film process suppresses fluctuations in power loss and on-resistance caused by repeated on/off switching, resulting in more durable inverters to stabilize xEV performance over the long term.

Main Specifications

Model	WF0009Q-1200AA	WF0008Q-0750AA
Application	xEVs	
Rated voltage	1200V	750V
On-resistance	9.0mΩ	7.8mΩ
Front side electrode	Compatible with solder bonding	
Back side electrode	Compatible with solder bonding and Ag sintering bonding	
Sample price	By quotation	
Shipment	November 14, 2024	
Environmental awareness	This product is compliant with the Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment (RoHS) directive 2011/65/EU and (EU) 2015/863.	

Power semiconductors capable of efficiently converting electricity have attracted growing demand as key devices contributing to global decarbonization. Particularly in the automotive sector, vehicle electrification to reduce greenhouse gas emissions is driving demand for diversified power semiconductors used in motor-drive inverters and other power-conversion equipment. Expectations are especially high for SiC power semiconductors due to their ability to significantly reduce power loss. Mitsubishi Electric, which became the first company to mass produce xEV power semiconductor modules in 1997, has introduced numerous power modules that contribute to improved reliability, including higher heat-cycle resistance and smaller inverters for various EVs and hybrid electric vehicles (HEVs). In March 2024, the company began shipping samples of its J3 Series power semiconductor for xEVs, which features a downsized design made possible by using the latest transfer-molded power module (T-PM), which is widely used in the automotive market.

Going forward, Mitsubishi Electric will remain committed to providing high-quality SiC-MOSFET bare dies with reduced power-loss to help popularize high-performance xEVs and thereby contribute to a more decarbonized world.

Website

https://www.MitsubishiElectric.com/semiconductors/powerdevices/

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About Mitsubishi Electric Corporation

With more than 100 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. Mitsubishi Electric enriches society with technology in the spirit of its "Changes for the Better." The company recorded a revenue of 5,257.9 billion yen (U.S.$ 34.8 billion*) in the fiscal year ended March 31, 2024. For more information, please visit www.MitsubishiElectric.com

*U.S. dollar amounts are translated from yen at the rate of ¥151=U.S.$1, the approximate rate on the Tokyo Foreign Exchange Market on March 31, 2024