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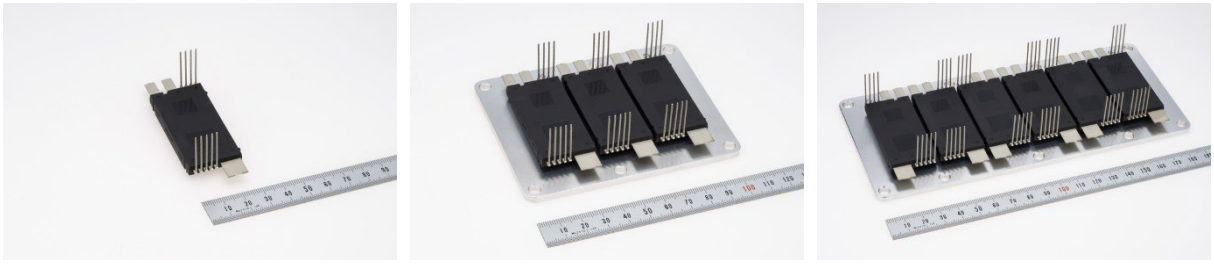
Mitsubishi Electric to Release J3-Series SiC and Si Power Module Samples

Six-model lineup of compact T-PMs and other modules will lead to smaller, more efficient inverters for xEVs



(from left) J3-T-PM, J3-HEXA-S and J3-HEXA-L

TOKYO, January 23, 2024 – Mitsubishi Electric Corporation (TOKYO: 6503) announced today the coming release of six new J3-Series power semiconductor modules for various electric vehicles (xEVs), featuring either a silicon carbide metal-oxide semiconductor field-effect transistor (SiC-MOSFET) or a RC-IGBT (Si),[1] with compact designs and scalability for use in the inverters of electric vehicles (EVs) and plug-in hybrid electric vehicles (PHEVs). All six J3-Series products will be available for sample shipments from March 25.

The new power modules will be exhibited at the 38th Electronics R&D, Manufacturing and Packaging Technology Expo (NEPCON JAPAN 2024) from January 24 to 26 at Tokyo Big Sight, Japan, as well as other exhibitions in North America, Europe, China and additional locations.

As power semiconductors capable of efficiently converting electricity expand and diversify in response to decarbonization initiatives, the demand is increasing for SiC power semiconductors offering significantly reduced power loss. In the xEV sector, power semiconductor modules are used widely in power conversion devices such as inverters for xEV drive motors. In addition to extending the cruising range of xEVs, compact, high-power, high-efficiency modules are needed to further downsize batteries and inverters. But due to the high safety standards set for xEVs, power semiconductors used in drive motors must be more reliable than those used in general industrial applications.

Development of these SiC products was partially supported by Japan's New Energy and Industrial Technology Development Organization (NEDO).

[1] Reverse conducting IGBT with one IGBT and one diode on a single chip

Product Features

1) About 60% smaller modules compared to existing products

- The J3 transfer molded power module (J3-T-PM) can be soldered to a heat sink, resulting in about 30% lower thermal resistance and a size that is about 60% smaller than a comparable existing power module,[2] which will contribute to smaller xEV inverters.
- Thanks to downsizing, the inductance of the J3-T-PM is about 30% less than that of the existing module,[2] supporting high-speed switching. Using multiple J3-T-PMs in parallel further reduces the inductance.

2) SiC-MOSFETs for EVs and PHEVs offering extended range and lower electricity costs

- Two types of semiconductor elements are used: SiC-MOSFETs and RC-IGBTs (Si).
- The trench SiC-MOSFET combines low loss and high-speed drive, enabling smaller inverters with less power loss, resulting in EVs and PHEVs offering extended range and lower electricity costs.
- The RC-IGBT (Si) uses a new structure that combines an IGBT and a freewheeling diode (FWD) on a single chip for smaller modules with improved heat dissipation, contributing to smaller xEV inverters.

3) Comprehensive lineup with various J3-T-PM combinations for scalable xEV inverter designs

- The J3-HEXA-S has three J3-T-PMs and the J3-HEXA-L has six J3-T-PMs, both fitted with proprietary new pin-type aluminum fins to suit various designs for xEV inverters.
- The J3-HEXA-L reduces thermal resistance by about 20% versus a comparable existing power module[3] and is about 65% smaller than another comparable existing power module,[4] while the J3-HEXA-S is about 60% smaller than a comparable existing module.[5]

Main Specifications

Product Name	J3-T-PM	
Element	SiC MOSFET	RC-IGBT (Si)
Model	CTF350DJ3A130	CT400DJ3A075
Rated voltage	1300V	750V
Rated current	350A	400A
Connection	2in1	
Sample price	By quotation	
Shipment	March 25	June 25
Environmental awareness	The J3-T-PM is compliant with the Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment (RoHS) directive 2011/65/EU, (EU)2015/863.	

Product Name	J3-HEXA-S		J3-HEXA-L	
Element	SiC-MOSFET	RC-IGBT (Si)	SiC-MOSFET	RC-IGBT (Si)
Model	CTF350CJ3A130	CT400CJ3A075	CTF700CJ3B130	CT800CJ3B075
Rated voltage	1300V	750V	1300V	750V
Rated current	350A	400A	700A	800A
Connection	6in1			
Sample price	By quotation			
Shipment	Sequentially from July	Sequentially from July	March 25	June 25
Environmental awareness	J3-HEXA-S and J3-HEXA-L are compliant with the Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment (RoHS) directive 2011/65/EU, (EU)2015/863.			

[2] 2in1 J-Series T-PM(CT300DJH120)
[3] 6in1 J1-Series power module with insulated substrate integrated Al fin (CT700CJ1A060-A)
[4] Six 2in1 J-Series T-PMs (CT300DJH120; 64.0x84.0mm [LxW]) mounted 2mm apart
[5] Three 2in1 J-Series T-PMs (CT300DJH120; 64.0x84.0mm [LxW]) mounted 2mm apart

Mitsubishi Electric, which became the first company to mass produce xEV power semiconductor modules in 1997, has introduced numerous power modules that have contributed to improved reliability, including greater heat-cycle resistance, and smaller inverters for various EVs and hybrid electric vehicles (HEVs). The company's latest generation of widely used T-PMs will now introduce the J3-Series of compact modules equipped with either SiC-MOSFETs or RC-IGBTs (Si), both using the same package to enable xEV drive motor inverters to be further downsized. Mitsubishi Electric, with its comprehensive lineup of power modules covering a wide range of capacity bands for inverters, is committed to extending the driving range and reducing the electricity costs of increasingly popular EVs and PHEVs.

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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 5,003.6 billion yen (U.S.$ 37.3 billion*) in the fiscal year ended March 31, 2023. For more information, please visit www.MitsubishiElectric.com

*U.S. dollar amounts are translated from yen at the rate of ¥134=U.S.$1, the approximate rate on the Tokyo Foreign Exchange Market on March 31, 2023