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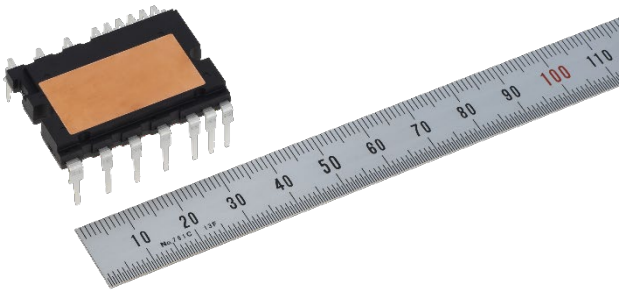
Mitsubishi Electric to Ship Compact DIPIPM Series of Semiconductor Modules Samples

Footprint has been reduced to approximately 53% of that of conventional products, will enable more compact inverter substrates



PSS30SF1F6 module, Compact DIPIPM series

TOKYO, September 11, 2025 – Mitsubishi Electric Corporation (TOKYO: 6503) announced today that it has developed a new compact version of its DIPIPM power semiconductor modules specifically for use in consumer and industrial equipment such as packaged air conditioners and heat pump heating and hot water systems. The new Compact DIPIPM series of products comprises the PSS30SF1F6 (rated current 30A / rated voltage 600V) and the PSS50SF1F6 (rated current 50A / rated voltage 600V), and samples will begin shipping on September 22.

By utilizing reverse-conducting insulated-gate bipolar transistors (RC-IGBTs),* the module's footprint has been reduced to almost 53% of that of the company's conventional Mini DIPIPM Ver.7 series of products, enabling more compact inverter substrates in packaged air conditioners and other applications. The new products will be exhibited at Power Conversion and Intelligent Motion (PCIM) Asia Shanghai 2025 in Shanghai, China, from September 24 to 26.

Power semiconductors are key devices that efficiently convert electricity from DC to AC, and demand for

* A single chip integrating an IGBT and a diode.

them has accordingly been rising in recent years. Power semiconductor modules for packaged air conditioners and heat pump heating and hot water systems are used in the power conversion equipment of inverters that control outdoor unit compressors and fans. Globally, the shift to inverters is gathering pace in order to achieve energy savings in air conditioning systems, contributing to the realization of a decarbonized society. In this context, there is a growing need for more compact outdoor packaged air conditioner and heat pump components, not only to improve performance but also to reduce their footprint, leading to demand for smaller components such as inverter substrates.

In 1997 Mitsubishi Electric commercialized the DIPIPM intelligent power semiconductor module with a transfer mold structure; this integrated switching elements and the control ICs that drove and protected them. These have since been widely adopted in inverters for air conditioners, washing machines, heating and hot water systems, and industrial motors, helping to achieve a more compact inverter design and improved energy efficiency. The footprint of the company's new Compact DIPIPM series of power semiconductor modules for consumer and industrial equipment has been reduced by approximately 47% compared to conventional products.

Through the adoption of RC-IGBTs, Mitsubishi Electric has achieved a smaller module size, contributing to the compact design of inverter substrates. Additionally, the new interlock function for arm short-circuit protection simplifies its design. The insulation distance from the terminals to the heat sink** is equivalent to that of conventional products, making replacement easy. Furthermore, in response to the growing demand for heat pump air conditioning systems in regions with cold winters such as North America and Northern Europe, Mitsubishi Electric has developed a power semiconductor module that operates stably at low temperatures, achieving a continuous operating temperature lower limit of -40°C. This is boosting widespread adoption of inverter-equipped air conditioning systems in cooler regions and helping to achieve carbon neutrality.

Product Features

1) ***47% reduction in footprint compared to conventional products, contributing to the compact design of inverter substrates***
   - By adopting RC-IGBTs, Mitsubishi Electric has achieved a smaller module size, reducing the footprint to approximately 53% compared to conventional products when mounted on inverter substrates, thus helping to achieve a more compact design.
   - Despite the smaller product size, the use of high-heat dissipation insulating sheet material suppresses temperature rise at the junction, achieving a current rating of 50A, equivalent to that achieved by conventional larger products.

2) ***Newly equipped with an interlock function, contributing to the simplification of inverter substrate design***
   - In addition to the conventional short-circuit protection function using an external shunt resistor method that detects and controls overcurrent, the newly added interlock function for arm short-circuit protection simplifies the short-circuit protection design of inverter substrates.

** The distance from the terminal of the DIPIPM to the heatsink that contacts the copper foil surface.

- By maintaining the same insulation distance between terminals and the heat sink as that of conventional products, replacement of those products is facilitated, helping to simplify inverter substrate design.

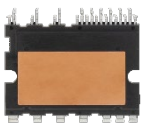
3) Expands the lower limit of continuous operating temperature to -40°C, contributing to the expansion of the operating temperature range for consumer and industrial equipment

- By expanding the lower limit of continuous operating temperature to -40°C, it is possible to extend the operating temperature range of consumer and industrial equipment such as packaged air conditioners. This helps drive the wider adoption of inverter-equipped air conditioning systems, including in regions with cold winters.

Main Specifications

Type	PSS30SF1F6	PSS50SF1F6
Rating current	30A	50A
Rating voltage	600V	
Built-in power chips	RC-IGBT	
Connection	6 in 1	
Isolation voltage	2500Vrms	
Package size	35.6 x 24.4 x 5.4mm	
Price	Based on individual quotations	
Sample shipments	September 22, 2025	
Environmental impact	Compliance with the Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment (RoHS) directive 2011/65/EU and (EU) 2015/863.	

Comparison with conventional products

Series	New product Compact DIPIPM	Conventional product Mini DIPIPM Ver.7
Rating current / voltage	30A, 50A / 600V	20A, 30A, 50A / 600V
Built-in power chips	RC-IGBT	IGBT＋FWD
T_{jop}: Operation junction temperature	-40 ~ 150°C	-30 ~ 150°C
T_c: Module case operating temperature	-40 ~ 125°C	-30 ~ 125°C
Top view of packages		
Package size (WxDxH)	35.6 x 24.4 x 5.4mm	52.5 x 31 x 5.6mm

Website

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

"DIPIPM" is a trademarks of Mitsubishi Electric Corporation.

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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 5,521.7 billion yen (U.S.$ 36.8 billion*) in the fiscal year ended March 31, 2025. For more information, please visit www.MitsubishiElectric.com

*U.S. dollar amounts are translated from yen at the rate of ¥150=U.S.$1, the approximate rate on the Tokyo Foreign Exchange Market on March 31, 2025