

Hitachi and Hitachi Astemo Awarded the Prime Minister Prize of the National Commendation for Invention

for the Insulation Structure of the 800V EV Inverter Power Module

Contributing to the widespread adoption of EVs and realization of carbon-neutral society through innovative technologies that enable greater acceleration and shorter charging times



Fig. 1. 800V inverter developed for EVs (left); Double-sided cooled power module (right)

Tokyo, May 31, 2022 – Hitachi, Ltd. (TSE: 6501, “Hitachi”) and Hitachi Astemo, Ltd. (“Hitachi Astemo”) have received the Prime Minister Prize of the National Commendation for Invention FY2022 for the patent (patent registration no. JP6200871) pertaining to the insulation structure for power modules used in 800V electric vehicle (EV) inverters. The invention was recognized for being an outstanding technological advancement and demonstrating remarkable effectiveness in its implementation.

The “National Commendation for Invention” was established in 1919 by the Japan Institute of Invention and Innovation to contribute to advances in science and technology and the development of industry in Japan by recognizing creators of outstanding inventions, ideas, and designs, as well as researchers and scientists with notable achievements in these areas.

A higher voltage inverter for EV is effective in improving an EV’s acceleration performance and achieving a shorter charging time. This newly developed insulation structure for the inverter power module realizes both high insulation resistance and high thermal dissipation. As a result, a more compact size and higher output is realized by increasing the voltage rating of the inverter, from the conventional 400V to 800V, making it possible to improve the acceleration performance and achieve a shorter charging time.

Hitachi and Hitachi Astemo will continue to promote the widespread adoption of EVs, through the technological innovation of key components such as inverters, and contribute to realizing a carbon-neutral society.

The awards ceremony will be held at The Okura Tokyo on Thursday, June 30.

Insulation resin structure with a built-in intermediate conductor

The resin insulation sheet used in the power module is attached to a thermal dissipation fin and conductor plate, on which the power semiconductor (the heat source) is mounted. Hence, the resin insulation sheet is required to have insulating and thermal dissipating properties, as well as strong adhesive properties capable of withstanding thermal stress caused by thermal expansion differences. However, if the insulation sheet is made thicker to improve insulating

properties, the thermal dissipating properties decrease. Therefore, it has been difficult to achieve these three functions concurrently with a conventional approach.

By incorporating a floating, intermediate conductor into the middle of the conventional resin insulation sheet, this invention divides the voltage applied to the insulation layer and reduces the voltage, thereby making it possible to increase insulation resistance without changing the composition of the insulation layer or using a thicker insulation sheet. Consequently, adhesive properties can be maintained without compromising insulating properties or thermal dissipating properties (Fig. 2).

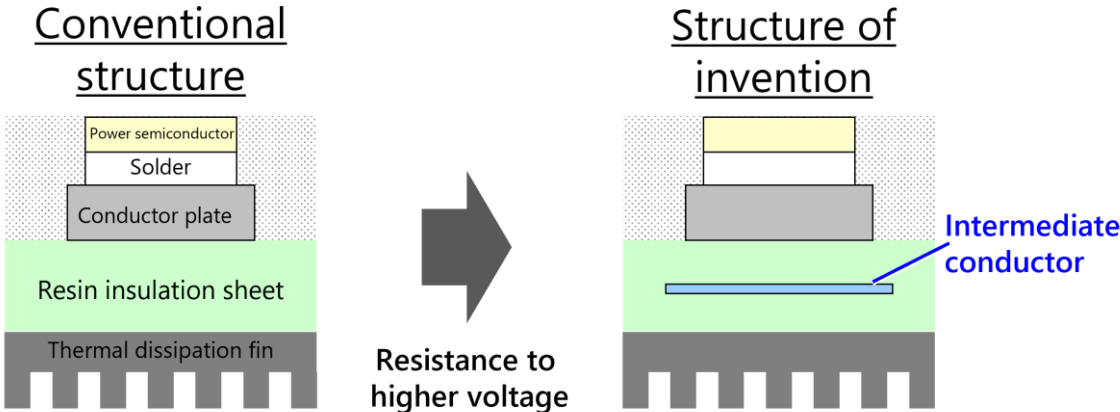


Fig. 2. Comparison of insulation structures of power modules

Summary of Award

Title of patent	Insulation Resin Structure for Inverter for 800V Electric Vehicles Enabling Rapid Charging (patent registration no. JP6200871)	
Inventors	Hitachi, Ltd.	Nobutake Tsuyuno, Junpei Kusakawa, Takeshi Tokuyama
	Hitachi Astemo, Ltd.	Tokihito Suwa

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About Hitachi, Ltd.

Hitachi drives Social Innovation Business, creating a sustainable society with data and technology. We will solve customers' and society's challenges with Lumada solutions leveraging IT, OT (Operational Technology) and products, under the business structure of Digital Systems & Services, Green Energy & Mobility, Connective Industries and Automotive Systems. Driven by green, digital, and innovation, we aim for growth through collaboration with our customers. The company's consolidated revenues for fiscal year 2021 (ended March 31, 2022) totaled 10,264.6 billion yen (\$84,136 million USD), with 853 consolidated subsidiaries and approximately 370,000 employees worldwide. For more information on Hitachi, please visit the company's website at <https://www.hitachi.com>.

About Hitachi Astemo, Ltd.

Hitachi Astemo is pursuing business enhancement and technological innovation through a strategic business portfolio consisting of the Powertrain & Safety Systems business, Chassis business, Motorcycle business, Software business and Aftermarket business. Hitachi Astemo is committed to creating social, environmental, and economic value by providing advanced mobility solutions that contribute to improving safety and comfort, and to environmental conservation to create a more sustainable society. By doing so, we contribute to improving quality of life and creating value for our OEM customers.

For more information, use the enquiry form below to contact the Research & Development Group, Hitachi, Ltd. or Hitachi Astemo, Ltd. Please make sure to include the title of the article.

<https://www8.hitachi.co.jp/inquiry/hqrd/news/en/form.jsp>

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