

**DOWA METALTECH CO., LTD. Co-Develops  
Aluminum Integrated Substrate with Fine Shape Fins**

DOWA METALTECH CO., LTD. (headquarters: 14-1, Sotokanda 4-chome, Chiyoda-ku, Tokyo; capital: 1.0 billion yen; president: ONIOH Takashi; hereinafter "DOWA METALTECH"), a subsidiary of DOWA HOLDINGS CO., LTD. (headquarters: same as above; capital: 36.4 billion yen; president: SEKIGUCHI Akira; hereinafter "DOWA"), has developed an aluminum integrated substrate with fine shape fins for power module jointly with Nakamura mfg. Co., Ltd. (headquarters: 493-1 Mikkamachi, Minowa-machi, Kamiina-gun, Nagano Prefecture; capital: 75 million yen; president: MIYAHARA Tomoyasu; hereinafter "Nakamura mfg."). The product is lightweight and it features high cooling performance and low pressure loss.

Power modules are currently attracting attention for energy-saving applications. Traditionally, they were produced using solder or grease to bond or contact metal-ceramic substrates with heat sink base plates or cooling jackets. However, demand has been increasing for high heat dissipation from power semiconductors due to high integration and size reduction. The development of structures that do not use solders and greases with poor thermal conductivity (hereinafter "direct cooling structure") and the development of designs that use other methods is progressing (Figure 1).

DOWA METALTECH developed and commercialized an aluminum integrated substrate with cylindrical pin fins that is one of the best designs in the world for heat dissipation achieved by its original molten aluminum direct bonding technology aimed to achieve this direct cooling structure (Figure 2). Furthermore, in order to develop a substrate with excellent heat dissipation, it is necessary to densify the fins, use a highly heat conductive material, and increase the amount of cooling water. However, these have advantages and disadvantages in addition to the problems in the manufacturing method, considering the durability, corrosion resistance, cooling pump capacity, weight, installation area, cost, etc. comprehensively.

Based on such circumstances, DOWA METALTECH has newly developed an aluminum integrated substrate with fine shape fins (hereinafter "the developed product") (Figure 3). The developed product provides various fin form options, including curved or straight fins by adjustment of height, thickness and interval. Due to growing awareness of environmental issues, the developed product is expected to apply to a wide variety of applications, including next generation automotive applications such as electric vehicles (EVs) and hybrid electric vehicles (HEVs), new energy applications and other industrial applications.

DOWA METALTECH will continue to develop new products fulfilling ever-changing market needs by combining, applying, and developing its own original metal-ceramic substrates technology and Nakamura mfg.'s fin processing technology.

<<Features of the aluminum integrated substrate with fine shape fins>>

- Fine plate-shaped fins formed on a heat sink maintaining the original direct cooling structure  
(The fins are formed using Nakamura mfg.'s proprietary Aurora fin method.)
- Achieves a reduction in thermal resistance of approximately 15% and a reduction in pressure loss of approximately 60% compared to DOWA's aluminum integrated substrate with cylindrical pin fins that has world-class heat dissipation. (Figure 4)
- A massive weight reduction is possible comparing to the weight of products with a direct cooling structure using copper of the same size.
- The use of high-purity aluminum with high corrosion resistance eliminates the need for plating on the fins.
- With a simple shape design, it is possible to apply DOWA's original new manufacturing process, which has significantly reduced the manufacturing process, and overall cost reduction can be expected.

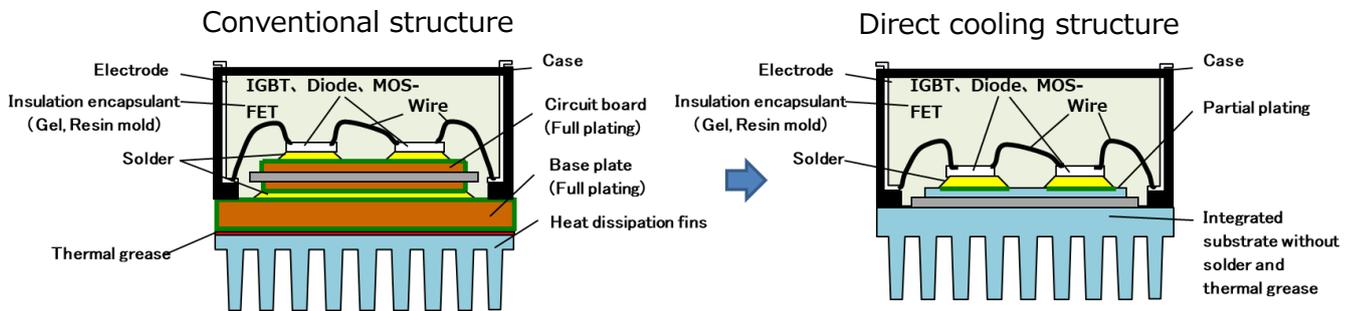


Figure 1: Difference in the structure of power modules



Figure 2: Aluminum integrated substrate with cylindrical pin fins

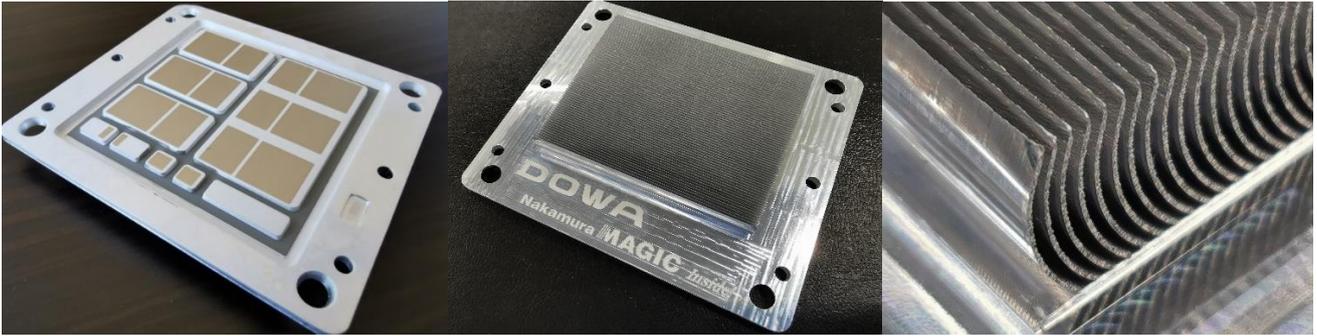


Figure 3: Aluminum integrated substrate with fine shape fins

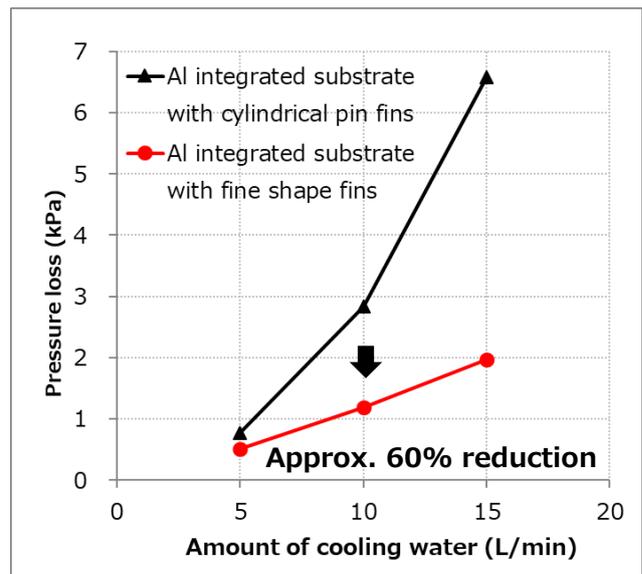
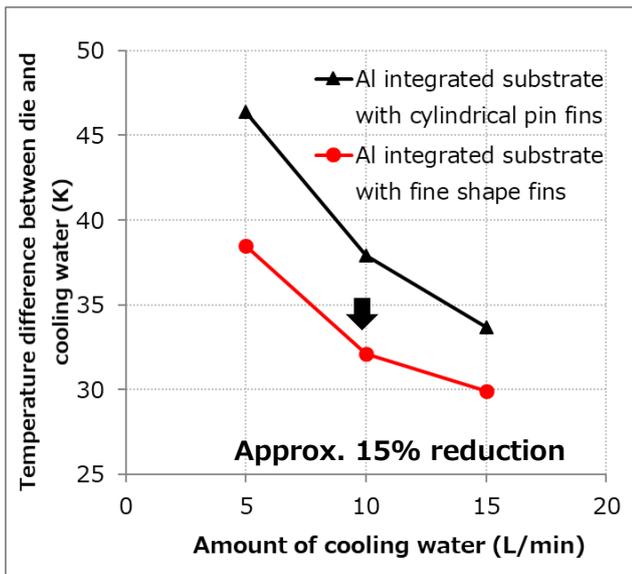


Figure 4: Changes in the temperature and pressure loss of power semiconductors mounted on substrates with an inflow of water cooled at 65 °C

**[Overview of DOWA METALTECH CO., LTD.]**

- Headquarters: 14-1 Sotokanda 4-chome, Chiyoda-ku, Tokyo
- Representative: ONIOH Takashi
- Founded: October 2006
- Capital: 1 billion yen
- Shareholder: DOWA HOLDINGS CO., LTD. 100.0%
- Business outline: Manufacturing and sales of copper rolled products such as copper/brass/copper alloy strips, plated strips, metal substrates, nickel alloy strips, electronic parts and brass rods & forgings.

**[Overview of Nakamura mfg. Co., Ltd.]**

- Location: 493-1 Mikkamachi, Minowa-machi, Kamiina-gun, Nagano Prefecture
- Representative: MIYAHARA Tomoyasu
- Founded: July 1962
- Capital: 75 million yen
- Business outline: Metal plasticity processing, assembling of precision products and design and manufacturing of labor-saving machinery



**[Contact for inquiries]**

<Inquiries about press releases>

DOWA HOLDINGS CO., LTD.

<https://ir.dowa.co.jp/en/ir/contact1.html>

<Inquiries about products and services>

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