

News Release

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Save energy, increase power and efficiency: high-performance PPA by BASF for next-generation IGBT semi-conductors

- **Tailored Ultramid® Advanced N3U41 G6 enhances robustness, long-term performance and reliability of IGBTs**
- **Semikron Danfoss uses BASF PPA as housing of its Semitrans 10 IGBT for inverters in photovoltaic and wind energy systems**
- **Showcased at BASF booth, Fakuma 2024: hall B4, booth 4303**

For next-generation power electronics, BASF has developed a polyphthalamide (PPA) that is especially suited for manufacturing housings of IGBT (insulated-gate bipolar transistor) semi-conductors. Ultramid® Advanced N3U41 G6 addresses the growing demand for high-performance, reliable electronic components for e.g., electric vehicles, high-speed trains, smart manufacturing and the generation of renewable energy. Semikron Danfoss, a global technology leader in power electronics, now uses the BASF PPA as housing in its Semitrans 10 IGBT which can be installed in inverters of photovoltaic and wind energy systems. Due to its outstanding chemical resistance and dimensional stability, the Ultramid® Advanced N grade enhances the robustness, long-term performance and reliability of these IGBTs, thus meeting growing needs for energy saving, higher power density and increased efficiency. IGBTs enable efficient switching and control of electrical circuits in power electronics.

"IGBTs are a key element of modern electronics, particularly in the renewable energy sector," explains Jörn Grossmann from research and predevelopment at

Semikron Danfoss. “IGBTs must operate at higher temperatures while maintaining long-term stability and performance. The Semitrans 10 has set a new benchmark for performance and efficiency benefiting from the unique properties of BASF’s PPA. We chose this material because of its extraordinary electrical isolation even in harsh environments and because of its excellent robustness against short-term temperature peaks in the assembly process.” The combination of high-performance material and smart design allows for faster switching speeds, lower conduction losses, and improved thermal management, thus addressing key needs in power electronics.

In today’s IGBTs, BASF’s proven Ultradur® (PBT: polybutylene terephthalate) is widely used. The new PPA is designed to meet the stringent requirements of next-generation IGBTs for rapidly evolving power electronics. They demand materials that can withstand higher temperatures, provide sustained electrical insulation, and maintain dimensional stability under challenging environmental conditions like humidity, dust and dirt. The laser-sensitive Ultramid® Advanced N3U41G6 with non-halogenated flame retardant combines high thermal stability with low water uptake and excellent electrical properties. It is characterized by a high CTI (Comparative Tracking Index) of 600 (acc. to IEC 60112): This supports miniaturization of IGBTs by lower creepage and better insulation than materials so far used for power switches. The UL-certified grade shows an excellent electrical RTI (Relative Temperature Index) value of 150°C.

“BASF’s PPA compound is globally available and ready for sampling”, says Jochen Seubert, senior application expert for power electronics at BASF. “Backed by our customer-focused technical support in part development, we expect this innovative material to significantly contribute to the advancement of power electronics, supporting the global transition to renewable energies.” For manufacturing of IGBTs, the BASF PPA is compatible with potting materials used to assemble the semi-conductors with metal pins and clamps after injection molding.

About Ultramid® Advanced

BASF’s polyphthalamide portfolio is based on the six polymers Ultramid® Advanced N (PA9T), Ultramid® Advanced T1000 (PA6T/6I), Ultramid® Advanced T2000 (PA6T/66), Ultramid® T KR (PA6T/6), Ultramid® T6000 (PA66/6T) and Ultramid® T7000 (PA/PPA). They open the door to the next generation of lightweight, high-

performance plastic components in many different sectors including the automotive industry, electronics and electric devices, mechanical engineering and consumer goods. The PPA portfolio is available globally and complemented by BASF's Ultrasil® simulation tool and extensive experience in application development. It includes more than 50 compounded grades for injection molding and extrusion, products with or without flame retardants. The compounds are available in different colors, from colorless to laser-markable black, with short-glass, long-glass or mineral fiber reinforcement, and with various heat stabilizers.

Further information: www.ppa.basf.com

About BASF's Performance Materials division

BASF's Performance Materials division is at the forefront of the much-needed sustainability transformation in plastics. Our products are co-created with customers around the globe to bring innovations to major industry sectors such as transportation, consumer goods, industrial applications, and construction. Our R&D focuses on all stages of the plastics journey: Make, Use and Recycle. The MAKE phase is about improving how plastics are made, from product design to the choice of raw materials and the manufacturing process itself. The USE phase enhances plastics' strengths such as light weight, robustness, and thermal resistance. At the end of the product lifecycle, the RECYCLE phase looks at how to close the loop to achieve a circular economy. In 2023, the Performance Materials division achieved global sales of €7.2 billion. Join #ourplasticsjourney at: <https://www.performance-materials.basf.com>

About BASF

At BASF, we create chemistry for a sustainable future. We combine economic success with environmental protection and social responsibility. Around 112,000 employees in the BASF Group contribute to the success of our customers in nearly all sectors and almost every country in the world. Our portfolio comprises six segments: Chemicals, Materials, Industrial Solutions, Surface Technologies, Nutrition & Care and Agricultural Solutions. BASF generated sales of €68.9 billion in 2023. BASF shares are traded on the stock exchange in Frankfurt (BAS) and as American Depositary Receipts (BASFY) in the United States. Further information at www.basf.com.