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2200-V GaN Technology Promises Improvements In High-Voltage Power Supplies

Power Integrations has extended the rating of PowiGaN technology from the 1700-V available in existing PowiGaN ICs up to 2200 V. This far exceeds the voltage capabilities of all other commercially available GaN technologies, according to the vendor.

Unlike past PowiGaN announcements from Power Integrations, which were for production-ready power supply ICs incorporating variously rated PowiGaN switches, this news comes in the form of a technology announcement with product commercializtion still to come. According to Roland St Pierre, vice president of product development, the first products using this technology are expected next year.

The introduction of power supply ICs with 2200-V PowiGaN technology is expected to simplify development of low-power, power supplies that can operate from high-voltage buses, enabling smaller, more efficient designs. It avoids having to stack devices to achieve higher voltage ratings with all the design complexity that brings.

Applications may include the 800-V buses in data centers and EVs, 1200-V buses in light EV trucks and buses, and even higher voltages in renewable energy and HVDC infrastructure. For example BESSs can operate at 1500 V. Note that the devices based on this technology will target the lower-power applications such as auxiliary or bias supplies, not the higher-power stages processing hundreds of kilowatts. These are typically employing SiC MOSFETs or IGBTs.

As with the existing PowiGaN devices, this technology employs a d-mode HEMT on Sapphire paired with a low-voltage silicon MOSFET in cascode configuration (Fig 1). The cascode operation is easier to drive and said to offer more efficient third-quadrant operation than e-mode devices. But in any case, the company typically embeds its PowiGaN devices in its power supply ICs, which offloads the details of driving the switch from the power supply designer. Test results obtained for the 2200-V PowiGaN cascode switch suggest it has ample margin on breakdown voltage, and exhibits stable operation in the face of high switching votages (Figs. 2-4).

"Our 2200-V PowiGaN technology provides substantial voltage margin for emerging high-voltage power systems while enabling the high switching frequencies required to maximize power density," said Jennifer Lloyd, president and CEO at Power Integrations. "Emerging applications include next-generation AI data centers, where industry roadmaps point toward 1500-V distribution architectures, as well as future EV battery and auxiliary power systems operating at increasingly higher output voltages (48 V). This milestone breakthrough extends the reach of GaN into voltage ranges traditionally served by SiC, enabling a compelling high-frequency alternative for applications such as solar, HVDC and advanced industrial power conversion."

For further information, see the White Paper or visit the company's PowiGaN page.

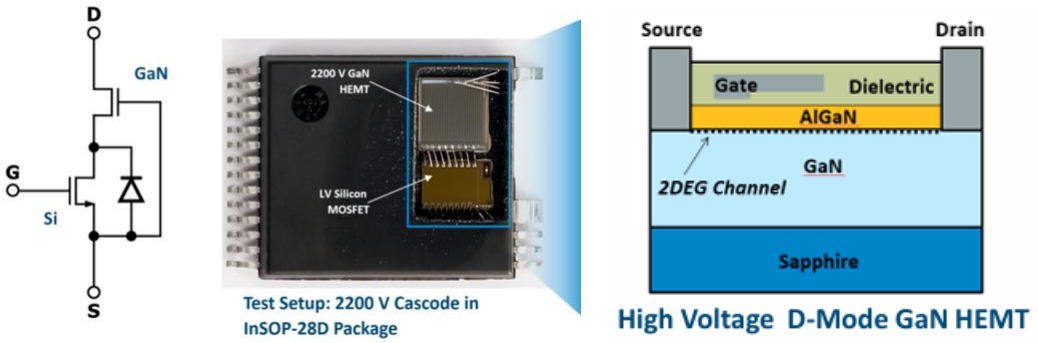

Fig. 1. Power Integrations has announced its development of a 2200-V version of its PowiGaN power switch. According to Roland St. Pierre, the use of a sapphire substrate has enabled this transition to higher voltage. However, getting to 2200 V still required developments in areas such as epitaxial engineering and field plate management.

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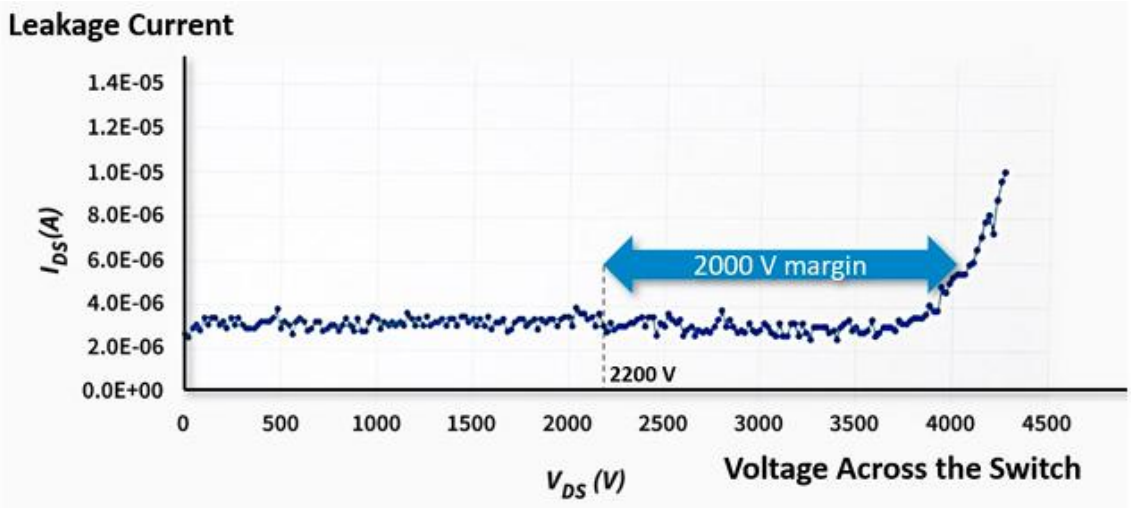

Fig. 2. The 2200-V PowiGaN device has demonstrated an off-state breakdown voltage of >4 kV, enabling significant margin for a 2200-V BV rating.

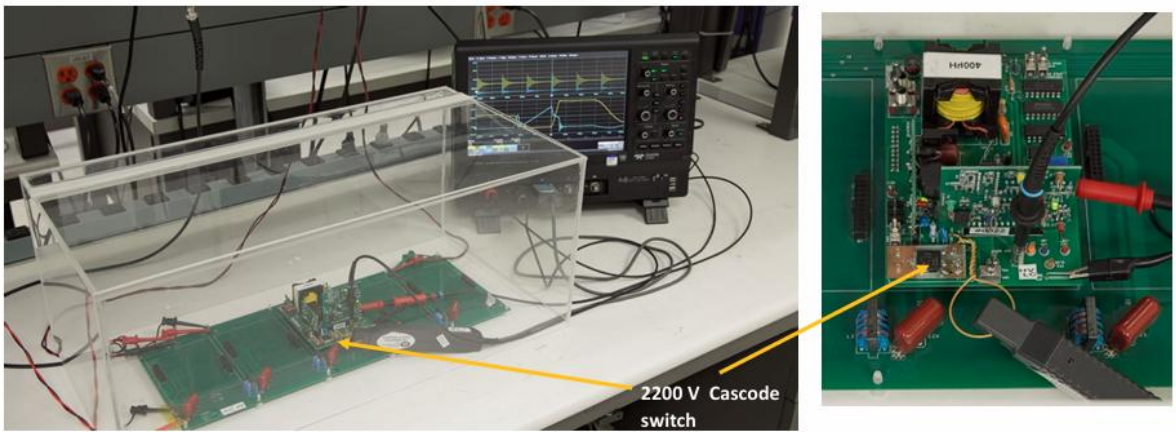

Fig. 3.The 2200-V PowiGaN switch has also demonstrated 20 hours of continuous operation in a flyback circuit.

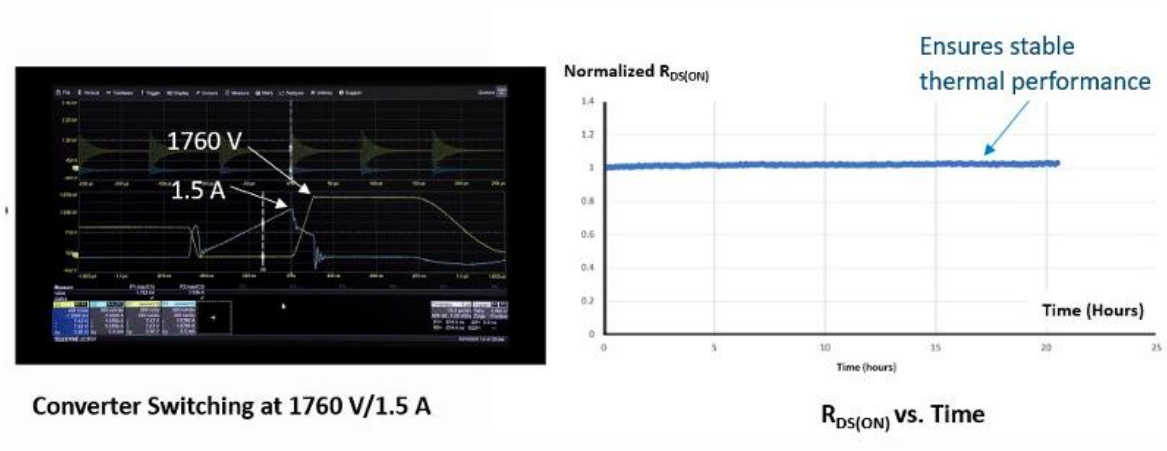

Fig. 4. Another measurement showed stable $R_{DS(ON)}$ when switching at a 1760-V peak. According to the company, this is the first demonstration of continuous switching at >1500 Vpk for a GaN device.

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