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Level-Shifting Circuit for Gate-Charge-Scaled SiC MOS-Based Power Devices

This new technology uses a level shifting circuit with series capacitors and a resistor divider to enhance the performance, stability, and reliability of thin oxide silicon carbide (SiC) power devices, making them suitable for high voltage and current applications like electric vehicles and renewable energy systems.

Researchers at Purdue have developed a new technology based on a level shifting circuit for a thin oxide silicon carbide (SiC) power device. The circuit comprises one or more capacitors connected in series with the gate capacitance of the SiC power device, forming a voltage divider. Additionally, two or more resistors form a resistor divider, which is configured to divide voltage at the external drive node of the SiC power device according to the ratio of the resistors.

The SiC power devices offer significant advantages over traditional methods, including improved noise reduction, enhanced reliability, scalability, and integration. By incorporating the resistors and capacitors in a compact and efficient design, the circuit ensures stable operation, even in the presence of contamination, while minimizing current draw and energy consumption. Furthermore, this adaptable and robust solution can be employed in various applications and operating conditions, making it particularly suitable for electric vehicles, renewable energy systems, and other demanding environments where high voltage and current capabilities are essential.

Technology Validation:

SiC power devices were fabricated to withstand various voltage applications as well as shown to have the required thickness to support the claims

Advantages:

- Enhanced performance in situations involving short-circuit extreme device heating.

- Appropriate gate level shifting is ensured while maintaining proper voltage at the gate terminal for improved device operation.

Technology ID
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Category
Automotive & Mobility
Tech/Battery Management & Charging Technologies
Semiconductors/Devices & Components
Energy & Power Systems/Power Generation

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- Reduces noise, preventing unintended activation or deactivation of the device.

- Improves circuit design considerations compared to bipolar devices that require continuous electrical current.

- Mitigates the effects of contamination buildup over the device's lifetime.

- Prevents gate voltage decay, ensuring stable and consistent device operation.

Applications:

- Electric vehicles

- Renewable energy systems

- Power supplies

- Motor drives

- Consumer electronics

TRL: 3

Intellectual Property:

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