

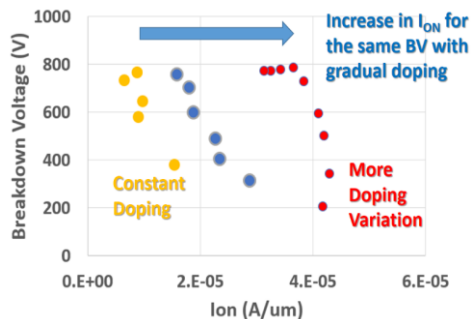
## Technology Overview:

The variable channel doping in vertical transistors, such as in a gradual channel doping SiC MOSFET, reduces  $R_{on}$  and increases BV of the transistors at the same time. The high BV is desired for reliability/safety and the lower on-state current is for reducing the conduction energy loss. The variation in doping is achieved using multiple implantations or in-situ doping during epitaxial growth.

**Potential Applications:** The primary focus of variable channel doping in a vertical transistor is to make the critical power circuits, in particular the power converter, more energy efficient with enhanced performance.

**Key Features & Benefits:** Doping in the channel can be used to optimize threshold voltage, on-state current and off state BV at the same time. The simulation result shows that 2X-4X improvement of on-state current is possible for the same BV.

- Variable doping in channel can be achieved by solely adjusting the dopant precursor gas flow during epitaxial growth. Hence, no additional cost.
- Minimal modification is required to existing manufacturing process. It is compatible with commercially available technologies for transistor manufacture.



**Computer simulations show that using gradual channel doping SiC MOSFET/FinFET, the transistor current can increase by 2-4 times for the same BV.**

**Case ID:** ID2020-010

**IP Position:** US patent application: Variable Channel Doping in Vertical Transistor

**Development Status:** TRL 3: Concept demonstrated on lab platform - analytical models to support lab design.

**Opportunity:** Partners sought for development, prototype testing, and licensing.

**Category(s):** Transistors, energy, power circuits

**Keywords:** Power transistors, vertical transistors, gradual doping, high voltage converters

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