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Alok et al.

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(54) **PASSIVATED SILICON CARBIDE DEVICES WITH LOW LEAKAGE CURRENT AND METHOD OF FABRICATING**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

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(57) **ABSTRACT**

(21) Appl. No.: **09/455,663**

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(51) **Int. Cl.**⁷ **H01L 31/0256**

(52) **U.S. Cl.** **257/76; 257/77; 257/109; 257/449; 257/454; 257/471**

(58) **Field of Search** **257/109, 77, 471, 257/472, 473, 480, 481, 449, 454, 76**

Semiconductor power devices with improved electrical characteristics are disclosed including rectifying contacts on a specially prepared semiconductor surface with little or no additional exposure to other chemical treatments, with oxide passivation and edge termination at a face of the semiconductor substrate adjacent to and surrounding the power device. The edge termination region is preferably formed by implanting electrically inactive ions, such as argon, into the substrate face at sufficient energy and dose to amorphize a portion of the substrate face and preferably self-aligned to the device. The passivated, edge-terminated devices exhibit improved characteristics relative to passivated devices with characteristics approaching those of the native semiconductor with the additional advantages of passivation protection. Methods for making and using the devices are also disclosed.

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20 Claims, 5 Drawing Sheets

