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Design and fabrication of 1.2kV 10A 4H-SiC Schottky barrier diodes with high current density

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Abstract:

In this work, we have designed and fabricated 1.2 kV 10A 4H-SiC Schottky barrier diodes (SBDs) with current density of 400A/cm^2 at the anode voltage (V_A) of 2.6V and reverse leakage current of ~20uA at V_A=-1200V. To implement high current density, the epi-layer, the design parameters for active region including p-grid width and cell pitch, and field limiting ring space for edge termination were optimized by using analytic calculation and Silvaco^{TM} simulator. Figures 1 shows the forward I-V curve of 1.2kV SBD. The forward voltage drop measured at the rating current of 10A is 1.9V. This value was obtained by on-wafer measurement and thus can be reduced by packaging chip. The current density at the forward voltage drop is 400A/cm^2, which is higher than that of commercial product. Figure 2 shows the reverse I-V curve of 1.2kV SBD. The reverse leakage current at nominal blocking voltage of 1.2kV is about 20 uA, which is 5 times lower than that of commercial product. The detailed design procedures, explanation, and experimental results will be presented later.

Keywords

4H-SiC, Schottky diode, high current density

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