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Fabrication of High-Power AlGaN/GaN Schottky Barrier Diode with Field Plate Design

Authors : Chia-Jui Yu, Chien-Ju Chen, Jyun-Hao Liao, Chia-Ching Wu, Meng-Chyi Wu

Abstract : In this letter, we demonstrate high-performance AlGaN/GaN planar Schottky barrier diodes (SBDs) on the silicon substrate with field plate structure for increasing breakdown voltage V_B. A low turn-on resistance R_{ON} (3.55 mΩ-cm²), low reverse leakage current (< 0.1 µA) at -100 V, and high reverse breakdown voltage V_B (> 1.1 kV) SBD has been fabricated. A virgin SBD exhibited a breakdown voltage (measured at 1 mA/mm) of 615 V, and with the field plate technology device exhibited a breakdown voltage (measured at 1 mA/mm) of 1525 V (the anode–cathode distance was L_{AC} = 40 µm). Devices without the field plate design exhibit a Baliga’s figure of merit of V_B²/ R_{ON} = 60.2 MW/cm², whereas devices with the field plate design show a Baliga’s figure of merit of V_B²/ R_{ON} = 340.9 MW/cm² (the anode–cathode distance was L_{AC} = 20 µm).

Keywords : AlGaN/GaN heterostructure, silicon substrate, Schottky barrier diode (SBD), high breakdown voltage, Baliga’s figure-of-merit, field plate
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