

Impact of Notch Structures on Transfer Characteristics of AlGaN/GaN HEMTs: A Simulation Study

Abstract

Lateral GaN devices, with a substantial critical breakdown field and increased mobility of two-dimensional electron gas (2DEG), are particularly promising for future power applications. Despite low power consumption by design, further improvements are required in numerous areas, including reliability concerns and switching loss, usually contributing to significant power loss. The research objective concerns the impact of different notch structures on the transfer characteristics of GaN-based high-electron-mobility transistor (HEMT) devices. Thirteen simulated models were produced using COMSOL Multiphysics, incorporating the electrical, structural, and piezoelectric effects of the device. From the results, notch-structure devices demonstrated better electrical characteristics than devices using conventional architecture, particularly a model with a double-notch design. Higher transconductance and maximum drain current were among the improvements, benefiting from the notch structure at the barrier layer.

Keywords

2DEG; Gallium nitride; High-electron-mobility transistor; Notch