

Improving NDR and RF Characteristics of InGaAs MOSFETs through Ferroelectric Thickness Tuning for Enhanced Energy Efficiency

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Abstract

This study presents an investigation of negative differential resistance (NDR) in InGaAs MOSFETs utilizing a high-speed ferroelectric material, Y-HfO₂, as the gate dielectric. The study finds that while thicker ferroelectric thickness leads to improved capacitance matching and reduced subthreshold swing (SS), it also results in reduced unit gain cutoff frequency (f_T) and transconductance frequency product (TFP) due to an increased tendency toward NDR. By optimizing the ferroelectric thickness, the authors are able to achieve significant improvements in both RF and energy efficiency, without sacrificing much in terms of DC characteristics.

Keywords - InGaAs, Ferroelectric, NDR, RF, TCAD