

Transport Mobility and Injection Velocity Model for Nanoscale MOSFET Transistor

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Abstract: In this paper, the effective carrier transport back scattering (BS) models for describing the low field mobility (μ_0) in nanoscale Metal Oxide Field Effect Transistor (MOSFET) with short channel effect (SCE) are discussed. The impact of acoustic and optical phonon scattering mechanisms on the total leakage current has been analyzed with more accurate approaches at Ballistics Limits. The acoustic phonon scattering models (phonon scattering (PS), surface roughness scattering (SRS), and the Coulomb scattering (CS)) have been proposed for MOSFET devices. The effect of electrons injection velocity (V_{inj}) and temperature (T) on the transport mobility is modeled in an accurate relation. The proposed models are simulated and compared with well-known models using MATHEMATICA and H-SPICE simulators for 22nm gate length with a good agreement and high accuracy.