

Jordan University of Science and Technology

Recent Transport Models in Nanoscale MOSFET Transistor - Study and Analysis

Authors: Abdoul Rjoub, Mamoun F. Al-Mistarihi, and Nedal R. Al-Taradeh

Abstract: In this paper, recent MOSFET transport models in Nanoscale technology have been analyzed and compared. Modeling scenarios for each of these models are presented and compared with the others. Modeling of some nanoscale parameters such as mobility (μ), temperature (T), injection velocity (V_{inj}), backscattering coefficient (RB), and effective electric field (E_{eff}) are presented in some or all of these models for short channel effect (SCE) condition. A new proposed model for carrier transport low field mobility is introduced and compared with these models based on elastic and inelastic scattering mechanisms and channel potential profile (V_x). Recommendations and results taken from the evaluated comparison are: determining the simultaneous injection and temperature dependence of the sum of the majority and minority carrier mobilities in silicon wafers is an important issue in modeling mobility. Insertion of partial mono-layers of oxygen during silicon epitaxial of the channel layer is the best in modeling the effective electric field effect in nanoscale MOSFET transport models.