Coupled Energy-Drift and Force-Balance Equations for High-Field Hot-Carrier Transport DANHONG HUANG, PAUL M. ALSING, TZVETA APOSTOLOVA, DAVE A. CARDIMONA, Air Force Research Lab (AFRL/VSSS) — Coupled energy-drift and force-balance equations are derived for hot-electron transport under a strong dc electric field. The work done by the frictional force is included into the energy-drift equation for electron relative scattering motion and is found to increase the thermal energy of the electrons. The importance of the hot-electron effect in the energy-drift term under a strong dc field is demonstrated to reduce the field-dependent drift velocity and mobility. The Doppler shift in the energy conservation of scattering electrons interacting with impurities and phonons is found to lead to an anisotropic distribution of electrons in the momentum space along the field direction. Defining a state-independent electron temperature is found to be impossible.

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