Computational analysis of ballistic saturation velocity in low-dimensional nano-MOSFET

Abstract

The computational analysis of ballistic saturation velocity for low-dimensional nano-devices was presented. The ballistic transport is predicted in the presence of high electric field for non-degenerate and degenerate regime. The saturation velocity is found to be ballistic regardless of the device dimensions. The intrinsic velocity limits this saturation velocity. It's does not sensitively depend on the ballistic or scattering-limited nature of the mobility. In the degenerate realm, the saturation velocity is shown to be the Fermi velocity that is independent of temperature but strongly dependent on carrier concentration. In the nondegenerate realm, the intrinsic velocity is the thermal velocity that depends only on the ambient temperature.