

**ABSTRACT:**

The degradation of ballistic mobility in a metal-oxide semiconductor field-effect transistor is attributed to the nonstationary ballistic injection from the contacts as the length of a channel shrinks to the length smaller than the scattering-limited mean free path. Apparent contradiction between the rise of magnetoresistance mobility and fall of drift mobility with increasing channel concentration is attributed to scattering-dependent magnetoresistance factor. The ballistic mean free path of injected carriers is found to be substantially higher than the long-channel drift mean free path. Excellent agreement with the experimental data on length-limited ballistic mobility is obtained.