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Nanosale Effects in Junctionless FETs ABDUSSAMAD MUNTAHI, SAMEER AL-SIBIANI, SHAIKH AHMED, Department of Electrical and Computer Engineering, Southern Illinois University, Carbondale, IL — We investigate the performance of multi-gate junctionless FETs in the nanoscale regime of operation, and show how thin-channel, gate type, quantum size-quantization, random dopant fluctuations, and self-heating, affect the recently-proposed junctionless FET characteristics and compare to a junctioned FET counterpart. A 3-D fully *atomistic* quantum-corrected Monte Carlo device simulator has been used in this work. The essential bandstructure parameters (such as bandgap, effective mass, and the density-of-states) have been computed using a 20-band nearest-neighbour $sp^3d^5s^*$ tight-binding scheme. Quantum size-quantization effects have been accounted for via a *parameter-free* effective potential scheme (and benchmarked against the NEGF approach as implemented in the *nanoFET* toolkit, in the ballistic limit). To treat electron-ion and electron-electron interactions, the simulator implements a real-space corrected Coulomb electron dynamics (ED) scheme. Results on I_{ON}/I_{OFF}, S, DIBL, r_0, g_m, f_T, V_{TH} variation, RTS, and current degradation due to self-heating will be presented.

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