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Near Ideal Operation of Nanometer Gate Length Carbon Nanotube FETs KHAIRUL ALAM, ROGER LAKE, University of California, Riverside — Performance of coaxially gated carbon nanotube FETs is investigated in their scaling limit with gate lengths down to 2 nm. Both single-walled carbon nanotube (SWCNT) and double-walled carbon nanotube (DWCNT) are used as the conducting channels. With SWCNT as the conducting channel, the device has nearly ideal subthreshold slope $\sim$ 63 mV/dec, high on/off ratio $\sim 10^6$, and low intrinsic switching time $\sim$ 18 fs. While with DWCNT as the channel, the tube with larger diameter contributes more than 99% to the total current, the subthreshold slope is more than 120 mV/dec, and the on/off current ratio is very low ($\sim$ 100) although the drive current is a few times larger. The leakage current is a combination of inter-band and intra-band tunneling. This current can be significantly reduced by changing the tube length as well as the tube diameter. The simulation model is based on the π-bond of CNT and self-consistent solution of non-equilibrium Green function (NEGF) equations and Poisson's equation. The NEGF equations are solved using recursive Green function algorithm.

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