## Work Function and Gate Length Effect On Electrical Characteristics Of n-FinFET in 3D Using ATLAS SILVACO

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## Abstract

This work investigates the threshold voltage, subthreshold slope and leakage current sensitivity to metal gate work function and gate length for a n-channel fin field-effect transistor (FinFET) in a 3-D structure using the numerical simulation tool Atlas Silvaco. Silvaco-Atlas was used to construct, examine and simulate the structure and characteristics of the FinFET device in three dimensions. Results were analyzed and presented to show that the threshold voltage is reduced with the decrease in gate work function and gate length. The behavior of the subthreshold slope and the leakage current improves with increased metal gate work function. The SCE in FinFET 3-D can reasonably be controlled and improved by proper adjustment of the metal gate work function. The obtained results also show that when there is a reduction of gate length the subthreshold slope decreases and leakage current increases giving a good saturation region in output characteristics ( $I_{ds}$ - $V_{ds}$ ). Simulation shows possible scaling to 8 nm gate length.

**Keywords:** Device Scaling, FinFET, Silicon On Insulator "SOI", work function, gate length, Silvaco Software.

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