Design of high performance FinFETfor low power applications below 22nm technology node

Suman Lata Tripathi

School of Electronics and Electrical Engineering Lovely Professional University, Phagwara, Punjab, India Email: tri.suman78@gmail.com

Abstract: FinFET isone of the promising devices for low power and high performance below 22nm technology nodes. Multiple-gate concept improves the current drive capability and speed of FinFETbased circuits with suppressed short channel parameters. FinFETis designed with the double gate or triple gate with the addition of multiple channels or fin for further performance improvement. Several types of research are carried out with fin shape variations like tapered or inverted-T FinFET. A single fin gate stack is explored for improved electrical characteristics. Compound material like SiGe is proven a useful material to replace channel or source regions. The major electrical parameters of evaluation are electric field, surface potential, drain current, leakage current and ON/OFF current ratios. The proposed high-performance transistors are ported to circuit-level implementation by designing logic and memory applications on different technology nodes. The design of FinFET for analog& RF applications is still needed to be explored. The design level analysis is mainly performed using 2D/3D Visual TCAD device simulators which are useful in any prefabrication device design and parametric analysis based on transistor electrical performance up to 10nm technology node. Also, FinFET is explored as biosensors with nanogap cavity region which is useful for sensing different types of bio-species present in human bodies or environments. The variation in presence of biospecies or molecules can be detected by the variation in electrical parameters like dielectric constant, drain current, and short channel parameters. These electrical quantities can be measured and converted proportionally to detect different shapes and sizes of the biomolecule.