Abstract

This paper investigates the electrical characteristics of the nanoscale n-channel double gate fin field-effect transistor (FinFET) structures and their sensitivity to gate dielectric materials with different channel materials using SiGe and 3C-SiC in the channel region. In this work, the numerical tool Atlas Silvaco was used to simulate the device in three dimensions and evaluate the electrical characteristics of the device at 300K. The influence of the gate dielectrics on threshold voltage roll-off, subthreshold slope, transconductance, drain induced barrier lowering, leakage current, on-current, and on/off current ratio has been investigated. The simulation results show that high drain current and transconductance were obtained with SiGe channel material. The results also show that a higher value of gate dielectric constant can increase the drain current and improve the leakage current. Drain induced barrier lowering is reduced with the increase in gate dielectric constant. It can be noticed with different and useful results which led researchers to further manufacturing process in order to get the complete device.
2. Narendar, V. and Mishra, R. A. 2015 Analytical modeling and simulation of multigate FinFET devices and the impact of high-k dielectrics on short channel effects (SCEs), Superlattices Microstruct., 85, 357-369.

Index Terms

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Nanoscale, Double gate, FinFETs, SCEs, DIBL, Silvaco Software.