

Effects of S/D doping concentrations on Vertical Strained-SiGe Impact Ionization MOSFET incorporating Dielectric Pocket (VESIMOS-DP)

Abstract

The Vertical Strained Silicon Germanium (SiGe) Impact Ionization MOSFET with Dielectric Pocket (VESIMOS-DP) has been successfully developed and analyzed in this paper. The effect of Source and Drain (S/D) doping concentration to the VESIMOS-DP on the performance of the device in terms of sub threshold swing, threshold voltage and drain current has been observed in this paper. There are significant drop (from $S=30\text{mV/dec}$ to $S=19\text{mV/dec}$) in sub threshold slope while threshold voltage is increase as the S/D concentration increases is observed in this paper. It is notable that for S/D doping concentration above $10^{19}\text{ atoms/cm}^3$, there are significant increase in S values which is not recommended as the switching speed getting higher distracting performance of the device. However, too low doping concentration is not essential as it didn't show any significance improvement on the performance of the device. Thus, optimum S/D doping concentration is imperative to obtain superb device characteristic. Due to the DP layer, a stable $V_{TH} = 1.35\text{V}$ obtained due to the vicinity of DP layer near the drain end has reduce charge sharing between the source and drain. The slight different and consistency of VESIMOS-DP sub threshold value ($S = 19\text{ mV/dec}$) has given advantages for incorporating