

Self-aligned vertical double-gate MOSFET (VDGM) with the oblique rotating ion implantation (ORI) method

Abstract

A process of making a symmetrical self-aligned n-type vertical double-gate MOSFET (n-VDGM) over a silicon pillar is revealed. This process utilizes the technique of oblique rotating ion implantation (ORI). The self-aligned region forms a sharp vertical channel profile and decreases the channel length L_g . A tremendous improvement in the drive-on current is noted. The electron concentration profile obtained demonstrates an increased number of electrons in the channel injected from the source end as the drain voltage increases. The enhanced carrier concentration results in significant reduction in the off-state leakage current and improves the drain-induced barrier-lowering (DIBL) effect. These simulated characteristics when compared to those in a fabricated device without the ORI method show the distinct advantage of the technique reported for suppression of short-channel effects (SCE) in nanoscale vertical MOSFET. © 2008 Elsevier Ltd. All rights reserved.