STUDY ON THE PERFORMANCE ENHANCEMENT MECHANISM OF THE MOSFET DEVICE BASED ON Si/SiGe STRAINED SILICON

BY :

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Sekian, harap maklum. Terima kasih.

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Merujuk kepada perkara di atas, bersama-sama ini disertakan 2 (dua) naskah Laporan Akhir Penyelidikan bertajuk 'Study on the performance enhancement mechanism of the MOSFET device based on Si/SiGe strained silicon' oleh kumpulan penyelidik dari Fakulti Kejuruteraan Elektrik untuk makluman pihak tuan.

Sekian, terima kasih.

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HASHIMAH HASHIM
Ketua
Projek Penyelidikan

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ABSTRACT

This project is done to design the $Si_{0.8}Ge_{0.2}$ on a relaxed silicon substrate Si PMOS semiconductor and to compare the electrical characteristics with the Si PMOS using a SILVACO device simulator. Firstly, the device structure of Si PMOS is created as a control device. Then the device structure of $Si_{0.8}Ge_{0.2}$ PMOS Si is developed. The simulation of the electrical characteristics is done and compared with the process of the device structures. The comparisons between Si PMOS and SiGe/Si PMOS characteristics are discussed and analyzed. From the electrical characteristics, the extracted results will prove that the $Si_{0.8}Ge_{0.2}$ PMOS Si gives better performance as compared to the control device. Based on the simulated results, the strained SiGe/Si PMOS heterostructure influences the threshold voltage, V_T. Besides that, the effects of hole and electron concentrations as well as the effect of electric field of both Si PMOS and SiGe PMOS devices are presented. Then, the electrical characteristic of different SiGe layer is extracted to compare with the constructed structure before. From the extracted parameters, it proves that SiGe PMOS device exhibits better performance by having lower V_T and higher I_{ds} provided the SiGe layer is deposited thinner. Lastly, the effect of shorter channel length for both devices are investigated and analyzed. From the simulated results it shows that lower V_T and higher I_{ds} can be achieved for shorter channel length, which indicates better in performance.