

SCHOOL OF ENGINEERING

FINAL REPORT

EVALUATION OF INVERSION LAYER PINCH-OFF AND VELOCITY SATURATION IN MOSFET

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Abstract

This report presents the evaluation of inversion layer pinch-off and velocity saturation in MOSFET by changing the parameters of each different theoretical models with and without supporting velocity saturation that have been proposed by other researches.

The effect of the parameters such as channel length, width, mobility, concentration of acceptors and gate insulator thickness on $I_{ds} - V_{ds}$ characteristics is investigated as well as the V_{ds} pinch-off versus each of the parameters characteristics in terms of simulation results. Comparison of the experimental data and the theoretical models is discussed.

It was found that changing each of the parameters value except mobility cause the threshold voltage to affect the saturation current of the device. From the analysis carried out reducing the channel length and gate insulator thickness to a certain size causes leakage current. Furthermore, the theoretical models with velocity saturation have lower saturation voltage point compared to theoretical models without velocity saturation when pinch-off occurred. As for comparison of the theoretical models and experimental data, the Simple Charge Control Model with Effect of Longitudinal Field has illustrated reasonable agreement with the experiment compared to the other models.

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