ANALYSIS OF SELF-HEATING REDUCTION ON NANOSCALE MOSFET

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Introduction

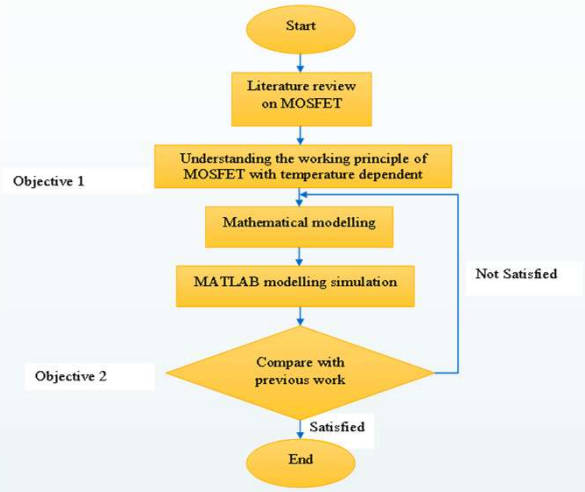
- MOS transistor channel lengths have been halved every two or three years for the past 20 years, resulting in a virtuous cycle of rising packing density (more complex electronic devices), improving performance, and lowering prices per unit silicon surface.

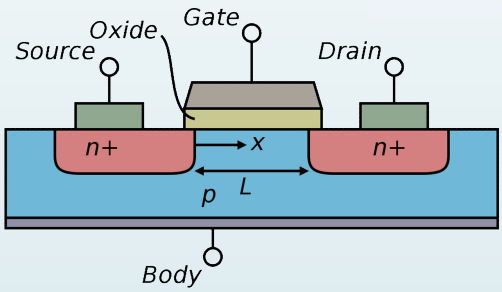
Problems

- Many factors affect the performance of the FET, such as the length, components used in, strategical structure, and many other external factors. The thermal energy generated by a current-carrying element is referred to as self-heating.

Scope of Work

- Adjusting parameters such as oxide capacitance, channel length, and other physical parameters that are temperature-dependent which lead to an increase in Thermal Resistance

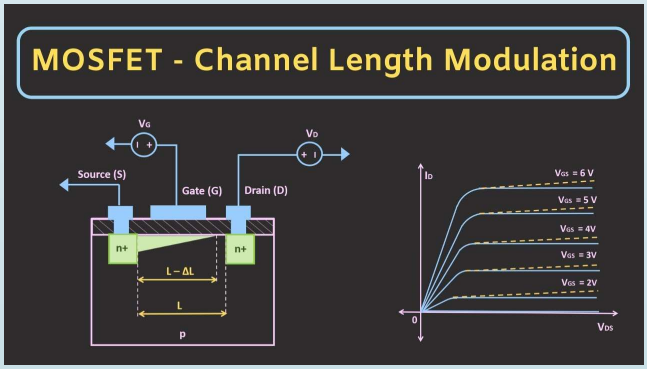




Conclusion

- It is to study the effect of threshold voltage, oxide thickness, channel length, and channel width. Research on the leakage current model using MATLAB simulation to perform graph analysis.

Sample output as the parameter adjust.



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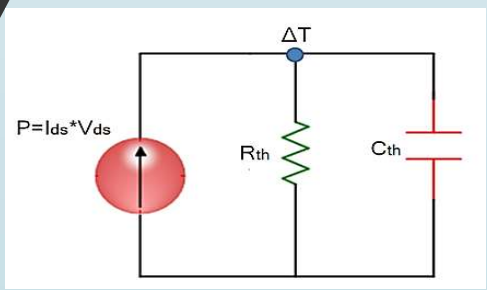
Main Idea



$$I_D = \mu_{eff} . C_{ox} . \frac{W}{L} . \left(\frac{V_{GS} - V_{TH}}{2n}\right)^2 . (1 + \lambda . V_{DS})$$