



# AIUB DSpace Publication Details

**Title:** Impact of Si and GaAs as Semiconductor Materials:  
Designing to Application-Level Comparison

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## Abstract:

The semiconductor industry has made life easier by providing many electronic devices. With the advancement of technology, electronic devices need to be updated. This gradual upgrade has led the industry towards nanotechnology. The study aims to provide an analytical comparison from design to application level of the impact of Si and GaAs as semiconductor materials in designing 3D density gradient nanowire MOSFETS. The model has been designed and evaluated based on the characteristics curve and transconductance range. The drain current in the  $I_d - V_g$  and  $I_d - V_d$  curves for the GaAs - used model is higher than the Si - used model by about 10 times, which is useful for analog applications. The threshold voltage for both models is 0.7V. Besides that, the electron concentration formed a potential well of about  $10^4$  for GaAs - used material compared to the model made using Si. In the case of AC analysis, the transconductance range for the model using GaAs is almost double that of the model designed using Si. Later, the extracted data from the curves were utilized to generate model and library files. Finally, an inverter circuit and biasing circuit have been designed with models where the output of the inverter circuit perfectly works. The frequency response curve generated using the biasing circuit showed that the cut - off frequency of the GaAs – used model is 10MHz, whereas it is 1MHz for the Si-used model.