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Analisis dan perancangan buried-channel charge coupled device (BCCD) menggunakan bahan silikon

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Abstrak

Dalam Tesis ini dirancang dan dibuat suatu struktur CCD jenis buried channel (BCCD) 3 gate, menggunakan bahan silikon dengan gate dari bahan alumunium, yang dianalisis dan disimulasikan melalui program simulasi pada perangkat lunak SSUPREM dan MATLAB. Pabrikasi dilakukan di Laboratorium TELKOMA LIPI Bandung, menggunakan teknologi difusi planar, kemudian dilakukan pengukuran kedalaman kanal, kedalaman source-drain, karakteristik I-V junction source - bulk dan drain - bulk, karakteristik I-V hubungan source - drain, karakteristik I-V dengan Tegangan gate berbeda.
Hasil simulasi dan analisis menunjukkan bahwa semakin besar kedalaman kanal tipe n pada BCCD, akan mempercepat perpindahan muatan, serta mengakibatkan semakin tidak effisien proses perpindahan muatannya. Dan semakin besar panjang gate, akan memperbesar waktu perpindahan muatan, sehingga semakin effisien proses perpindahan muatannya. Hasil pengukuran diperoleh bahwa karakteristik I-V rancangan devais yang dipabrikasikan, telah menunjukkan fenomena BCCD.
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In this thesis, a CCD Structure, 3 Gate Buried Channel type (BCCD) was designed and fabricated using Silicon with Gate made from aluminum material. This analysis and simulation were done using by simulation software SSUPREM and MATLAB programs. The device fabrication was done at TELKOMA LIPI Laboratory in Bandung, utilizing Planar Diffusion Technolog, afterward the following measurement were done ; the depth of buried channel, the depth of Source-Drain, the current-voltage (I-V) characteristic of Source - bulk and Drain - bulk junctions, the current-voltage (I-V) characteristic of Source - Drain relationship, and the current-voltage (I-V) characteristic for various gate voltages.
The results of Simulation and analysis shown that the lower the n type channel depth of BCCD is, the slower the charge transfer, hence increasing transfer efficiencies. And also the more the length of the gate is, the greater the charge transfer, hence decreasing transfer inefficiencies. The result of the measurements proved that the current-voltage (I-V) characteristic obtained from the designed and fabricated device, has shown the phenomenon of BCCD.