

SIMULATION OF DIBL EFFECT AND SUB-THRESHOLD SWING IN LOW POWER JUNCTIONLESS MOSFETS WITH DIFFERENT GEOMETRIES

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Recently, nanoscale junctionless metal-oxide-semiconductor field effect transistor (JLMOSFET) have been proposed to avoid doping concentration gradient and therefore diffusion during thermal processing steps which needs in forming source and drain areas in normal MOSFET. Though the scaling of JLMOSFET, particularly, result in the low power consumption, alongside with it, the decreasing of sizes to nanometer scale induces degradation effects such as technological variability of parameters, drain induced barrier lowering (DIBL) effect and increasing of subthreshold swing (SS). In this work, the short channel effect such as DIBL effect and SS is compared for JLMOSFETs with different silicon body shapes and geometries. It was considered the original device, which is straight without narrowing at the top and a set of devices that exhibit the mentioned narrowing, up to the case where the top of the gate has no surface and so the body cross-section is a triangle. We have studied different variations from the original geometry of a 10 nm gate length JLMOSFET device with equivalent oxide thickness 0.35 nm. n-type channel has doping concentration $8 \cdot 10^{19} \text{ cm}^{-3}$ and p-type poly silicon gate are doped with concentration $6 \cdot 10^{19} \text{ cm}^{-3}$. Silicon body of the device has height and width of 5 nm and 5 nm respectively. Simulation results show DIBL effect as well as SS of the considered JLMOSFETs depends on body top thickness and is increased with increasing of the body top thickness. Minimal DIBL and SS are shown for device with the triangle cross-section body. Lateral extension W_{ext} of the poly silicon gate also has influence to DIBL and SS. However, this influence is nonmonotonic. Up to 2 nm of W_{ext} DIBL as well as SS is increased, however at higher W_{ext} it is again slowly decreased

Biography

Mahkam Khalilloev has completed his BS diploma in 2012 from Urganch State University and MS diploma in Radio engineering in 2014 from Uzbek national university. He is pursuing his PhD at Physics department of Urganch State University. He has published one paper in reputed journals. At Urganch State University, he is Member of the group of electronics and modelling of semiconductor devices and participates in several national and international research projects. He is Advisor for two BS student at the Physics department of Urganch State University.

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