# Hot-Carrier Reliability of Transistors Fabricated by a 0.25-µm Fully-Depleted SOI CMOS Process

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**Abstract**

Fully Depleted (FD) Silicon-On-Insulator (SOI) transistors are particularly susceptible to hot carrier effects because the thin silicon body has two closely spaced, interacting oxide interfaces. In the present work, the hot-carrier degradation of transistors fabricated by a 0.25-µm FD SOI CMOS process was investigated. The degradation of key transistor parameters under drain voltage stress and worst-case gate bias was observed as a function of time. The shift of the front and back threshold voltages was analyzed with different back biases in order to separate front and back (buried) oxide degradation. A lifetime defined by a front threshold voltage shift equal to one sigma of the original distribution was extracted as function of the drain voltage. Whereas the first batch of transistors showed a large sigma but a reasonable lifetime at 2 Volt, the other had a reasonable sigma but a lifetime of only 1-day at that voltage. Even when comparing equal absolute degradation, the lifetime of the second batch was much inferior. It is shown that in the second case the short lifetime is caused by poor properties of the buried oxide (here created by a SIMOX process). Therefore, SOI wafers must be characterized for their hot-carrier susceptibility.

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