

Abstract Submitted
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Hot carrier injection from angstrom-scale silicon-on-insulator films measured by optical second-harmonic generation MING LEI, Univ. of TX at Austin, JIMMY PRICE, SEMATECH, MICHAEL DOWNER, Univ. of TX at Austin — Internal multi-photon photoemission (IMPE) and time-dependent electrostatic field-induced second-harmonic (TD-EFISH) generation are used to probe injection of hot electrons from silicon-on-insulator (SOI) films as thin as 20 angstroms (2 nm) into an overlying gate oxide and an underlying buried oxide (BOX). Photo-excited electrons are found to inject into both native gate and buried thermal oxides at different rates, including changes of opposite sign in the TD-EFISH signal, whereby they are distinguished straightforwardly. Techniques are demonstrated to measure kinetics of the two injection processes independently of each other and of competing charge injection at the substrate/BOX interface, enabling extraction of quantitative charge injection kinetic parameters for each SOI/oxide interface. The results demonstrate that optical SHG can non-invasively and quantitatively characterize hot carrier injection from ultrathin SOI — a key determinant of SOI device reliability and lifetime — without device fabrication.

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