# INTERFACIAL TUNNELING OXIDE: IMPACT ON ELECTRICAL CHARACTERIZATION OF UNIPOLAR Si/Si BONDED JUNCTIONS

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The paper numerically analyzes the effect of interfacial tunneling oxide on the electrical characterization of unipolar Si/Si bonded junctions according to the previously proposed methods (1, 2). With an interfacial oxide layer present in the bonded junction, two Si/$SiO_2$ interfaces, a “lee” one and a “windward” one in a junction under an applied bias voltage *V*, appear near the junction plane instead of the single Si/Si interface in an oxide-free junction. In addition to the built-in barrier due to the charged interfacial states, the tunneling oxide additionally restricts the carrier microfluxes onto deep interfacial states of each Si/$SiO_2$ interface from the opposite side of the structure, causing a difference between the Fermi levels at the two Si/$SiO_2$ interfaces in a biased junction and thus resulting in different populations of interface states at the two Si/$SiO_2$ interfaces. As a result, different energy intervals at the two interfaces are being probed simultaneously during the measurements. A close consideration shows that, as the bias voltage *V* increases, the occupation probability of the “lee-side” interface states first decreases and then increases, whereas the occupation probability of the “windward-side” interface states increases monotonically. As a consequence, depending on the transmission factor of the $SiO_2$ interlayer, in two limiting (by the oxide thickness) cases the characterization procedures (1, 2) yield either the interface-states density on the “windward” Si/$SiO_2$-interface (relatively thick oxide) or a combination of the interface-states densities on both interfaces (ultimately thin oxide). The oxide at a laterally uniform junction interface induces no substantial features into the direct current/high-frequency conductance ratio vs *V* curve comparable to that brought about by interfacial punctures, and CV-measurements (at a sufficiently high energy density of interface states and moderate oxide thickness) reproduce the doping profile in the near-interface region rather adequately.

## REFERENCES

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