**Body effect**

The **body effect** describes the changes in the threshold voltage by the change in *VSB*, the source-bulk voltage. Since the body influences the threshold voltage (when it is not tied to the source), it can be thought of as a second gate, and is sometimes referred to as the "back gate"; the body effect is sometimes called the "back-gate effect".[[1]](http://www.answers.com/topic/threshold-voltage-1#cite_note-0)

For an enhancement mode, n-mos MOSFET body effect upon threshold voltage is computed according to the Shichman-Hodges model [[2]](http://www.answers.com/topic/threshold-voltage-1#cite_note-1) (accurate for very old technology) using the following equation.

V_{TN} = V_{TO} + \gamma (\sqrt{V_{SB} + 2\phi_F} - \sqrt{2\phi_F})

\gamma = (t_{ox}/\epsilon_{ox})\sqrt{2q\epsilon_{si}N_A}

where *VTN* is the threshold voltage when substrate bias is present, *VSB* is the source-to-body substrate bias, 2φ*F* is the surface potential, and *VTO* is threshold voltage for zero substrate bias, s the body effect parameter, *tox* is oxide thickness, ε*ox* is oxide permitivity, ε*si* is the permitivity of silicon, *NA* is a doping concentration,*q* is the charge of an electron.