

Impact of Low-Standby-Power Device Design on Hot Carrier Reliability

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Hot-carrier (HC) reliability of low-standby-power 0.1 μm n-MOSFETs is investigated, and design guidelines for channel and halo profiles are described. Heavy channel-doping needed for obtaining high V_{th} enhances HC-injection efficiency, and heavy halo-doping dramatically reduces the lifetime when using substrate-bias (V_{bb}). Shallow-channel and tilted-halo doping is optimal to keep the HC-generation site away from the SiO_2/Si interface and to minimize the vertical electric field that is responsible for secondary impact ionization.