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New Considerations for Highly Reliable PMOSFETs in 100 nm Generation and Beyond

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The hot-carrier instability for surface channel PMOS is investigated intensively. We found from experimental data for the first time that hot-carrier injection is occurring at the center of channel at most serious stress condition of Vgs=Vds. We demonstrate that mechanical stress resulting from sidewall spacer accelerates this anomalous degradation in short-channel PMOS under hot-carrier stress. We show management of this degradation mechanism is crucial and indispensable for achieving high reliability of future generation PMOS devices.