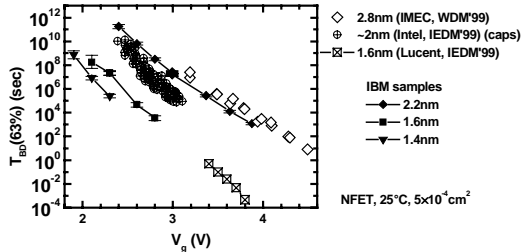


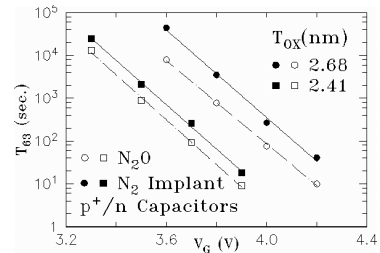
TDDB Data



- Essentially same results from various fabs
- Low voltage data critical for best projections

W. Abadeer, IBM Microelectronics

Effect of Oxidation Process



- Best quality oxides show only subtle reliability differences, however t_{ox} and γ have stronger effects

W. Abadeer, IBM Microelectronics

Reliability Methodology

- Statistical aspects
- Avoid series resistance
- Accurate measurement of β as a function of t_{ox}
- Stress data at low V_g
- Fundamental understanding of the physics of oxide breakdown.
- Interaction of breakdown on circuits is critical

W. Abadeer, IBM Microelectronics

Summary

- Various fabs show essentially same results.
- Careful attention to all aspects of measurements, physics of breakdown and statistics.
- Reliability limit depends on circuit, operating conditions, and tolerable fail rate.
- Other considerations also constrain technology scaling.
- Oxide reliability should not prevent the industry from meeting performance objectives.

W. Abadeer, IBM Microelectronics