The Effects of TID on Wear-Out of Advanced Flash Memories

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TID Effects on Wear-Out of Flash Memories

- Introduction
- TID Effects on Wear-Out of Erase/Write Capability
- Dependence of Wear-Out on Charge Pump Degradation
- Correlation of Charge Pump Degradation with Erase Failure
- Mechanism of Wear-Out
- Summary
Introduction

- Applications
  - Commercial: digital camera, wireless communications, storage
  - Space: solid-state recorder
- Flash memory technologies descriptions: NAND and NOR
- Internal charge pump: eliminate second power supply needed for erase and programming function
- Degradation of charge pump under TID effects
TID Effects on Erase Capability

Wear-Out of Intel Strata Flash Memories

The Effects of TID on Wear-Out of Advanced Flash Memories
Wear-out of irradiated and non-exposed Samsung flash memory device
Erase Voltage vs Total Dose (ref. To ground pad)
Samsung KM29U128T

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Summary

- **Issues:**
  - Internal Charge Pump Degradation
  - Wear-Out
- Radiation Harden the peripheral circuitry, including charge pump
- Prevent charge pump degradation from TID with well shield scheme
- Scale to lower erase/write voltage