MAR07-2006-006281

Abstract for an Invited Paper
for the MAR07 Meeting of
the American Physical Society

New Developments in MRAM

SAIED TEHRANI, Freescale Semiconductor Inc.

Bringing a new technology from Research and Development to first commercialization requires overcoming numerous technical challenges while maintaining continuous business commitment. Magnetoresistive Random Access Memory (MRAM) is a recent example of this process. MRAM combines magnetic devices with standard silicon to obtain the combined attributes of non-volatility, high-speed operation, and unlimited read/write endurance not found in any other existing memory technology. The first successful commercialization of MRAM was enabled by the convergence of several solutions to underlying challenges in the technology. One of the keys to manufacturability was the invention of the Toggle Write mode that provides robust magnetic switching margin. For high-speed read, a key solution was the ability to deposit and pattern high-quality, high-TMR magnetic tunnel junctions with narrow bit-to-bit resistance variation, low defect density and long-term reliability. In this talk, I will present details of each of the above technology elements, the performance and reliability of the 4Mb product, and the outlook for extending and scaling MRAM to other markets and nodes.