MagSil

MagSil's MRAM Technology

August 10, 2011

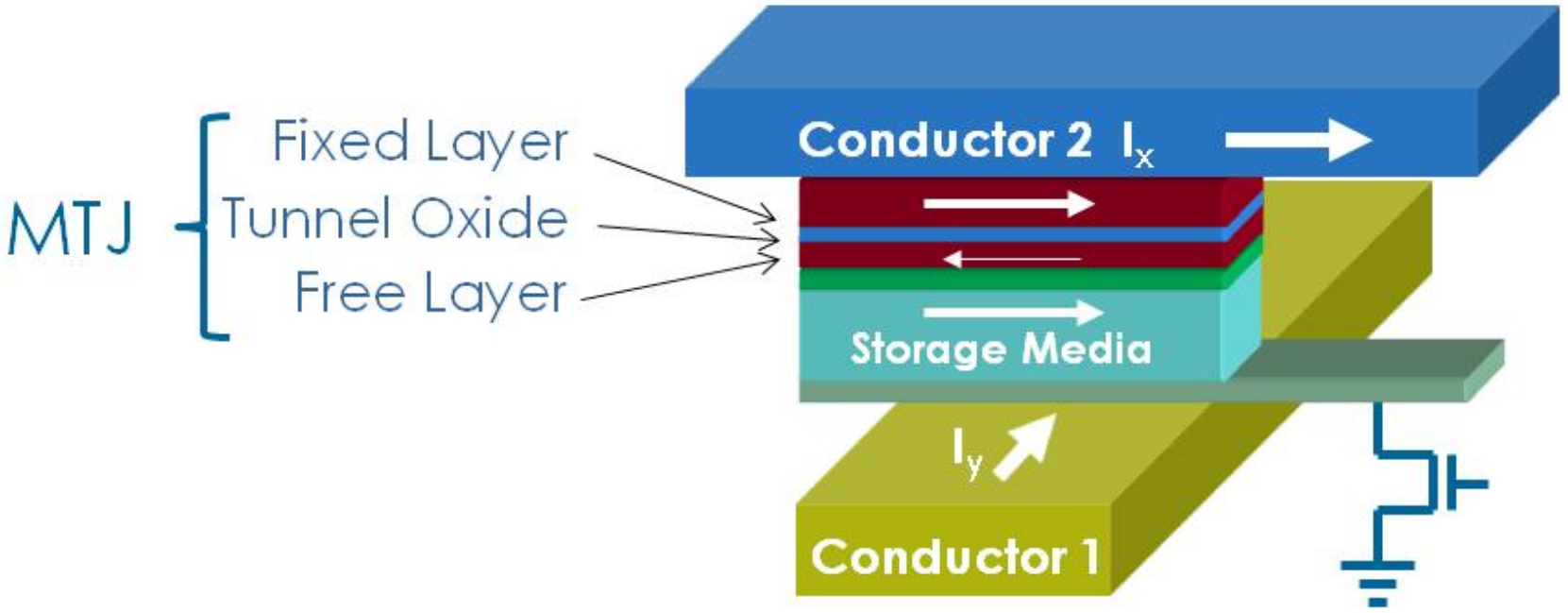
Company Overview

- Fabless Semiconductor Company
- Silicon Valley Based, Founded in 2004
- Breakthrough Magnetic Memory Technology
  - IP + Application Specific Standard Products Provider
- Research Alignment with MIT Scientists
- IP Portfolio -- ~30 Patents
  - Cell Architecture, Design, Process, Manufacturing
  - MIT - Fundamental MTJ patents
  - Licensed to major HDD manufacturers

MagSil MRAM Technology

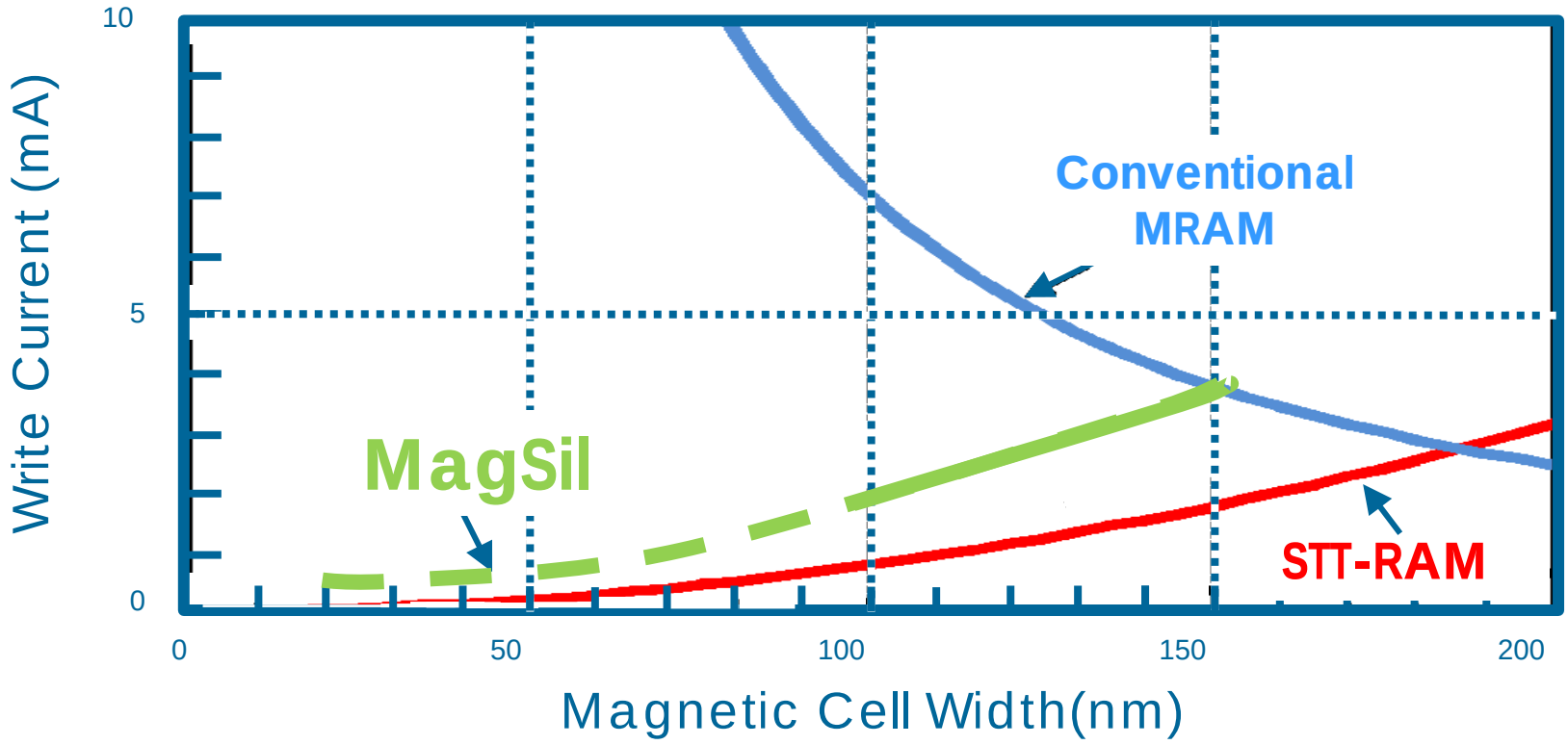
- MagSil Innovations Solves the Conventional Write Current and Scalability Problems
  - Proprietary FIMS
  - Memory Cell Architecture
  - MTJ and Magnetic Stack Engineering
  - Localized Magnetic Enhancement
  - Use of Industry Proven Magnetic Materials
- Scales from 180nm to 18nm w/o change in physics
- Manufacturing within CMOS Thermal Budgets

iMR Cell Architecture



- Patented iMR (Innovative Magnetic Recording) Cell Architecture
  - Cell is 1 MTJ + 1 Transistor
  - Field Induced Magnetic Switching

MagSil's MRAM Scalability



- Resolves write current limitation
- Scales from 180nm to sub-32nm using same magnetic principles
- Write current scales with the litho and process advances
- Simpler designs compared to alternative MRAM technologies

Comparing Embedded Memories

	6T-SRAM	eDRAM (Logic Proc.)	eDRAM (DRAM Proc.)	eFLASH	MagSil's eMRAM
Non-volatile	No	No	No	Yes	**Yes**
Process Complexity	CMOS + 0 Masks	CMOS + 3~5 Masks	CMOS +10~13 Masks	CMOS +10~14 Masks	**CMOS + 3 Masks**
Bit Cell Area (F^2)	~120	~15	~8	~15	**~10**
Typ. Capacities (bits)	Few – 8M	1M – 16M	1M – 64M	Few- 4M	**Few - >64M**
Write Cycles (Endurance)	Unlimited	Unlimited	Unlimited	100,000	**> 1.00E+17**
Read/Write Cycle (65nm)	1ns / 1ns	4 ns / 4ns	4 ns / 4ns	10 ns / 250ms	**2 ns / 2ns**
Scalability	High (limited by leakage)	Limited by Capacitor	Limited by Capacitor	Limited by FG Charge	**High**
Issues	High leakage	Refresh power	Refresh, complexity	Hi voltages, complexity, write power	**Maturity**

Target Markets & Commercialization Plan

- Embedded Memory Market
  - eSRAM, eDRAM and eFlash Replacement
  - Mobile Phones
  - Consumer Devices
  - Microcontrollers
- Applications Specific Standard Products (ASSP) for High Volume Applications
  - Game Changing Solutions
  - High Volume Applications
- Commercialization
  - 2013 – market will see MagSil's MRAM based products from consumer OEMs

Presentation Summary

- Conventional embedded memories pose severe scalability and endurance issues
- MRAM technology addresses existing eSRAM, eDRAM, and eFLASH issues
- MRAM technology is easily embeddable in logic
- MagSil's technological innovations solve conventional MRAM scalability and switching current factors
- MagSil's MRAM is ideal solution for embedded memory applications

Thank You