MRAM brings native persistence at speed to memory applications

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Safe Harbor Statement

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This presentation contains “forward-looking statements” that involve risks, uncertainties and assumptions. If the risks or uncertainties materialize or the assumptions prove incorrect, our results may differ materially from those expressed or implied by such forward-looking statements. All statements other than statements of historical fact could be deemed forward-looking statements, including, but not limited to: any estimates of addressable market size and our ability to capture that market, market trends and market opportunities, customer growth, product availability, technology developments, or other future events; any statements about historical results that may suggest future trends for our business; any statements regarding our plans, strategies or objectives with respect to future operations or business performance; any statements regarding future economic conditions; and any statements of assumptions underlying any of the foregoing. These statements are based on estimates and information available to us at the time of this presentation and are not guarantees of future performance. Actual results could differ materially from our current expectations as a result of many factors, including, but not limited to: market adoption of our products; our limited operating history; our ability to raise capital; our history of losses; our rate of growth; our ability to predict customer demand for our existing and future products; our ability to hire, retain and motivate employees; the effects of competition, including price competition; technological, regulatory and legal developments; and developments in the economy and financial markets.

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MRAM’s Time Has Come!

MRAM is here **today**

MRAM is the **key technology** for tomorrow’s need for a universal memory

Everspin is at the forefront of driving the MRAM **revolution**
STT-MRAM Hype Cycle

Everspin is driving MRAM toward the slope of enlightenment.
MRAM is the future of memory technology
Technology Life-Cycles & Disruptive Waves

- 1993: Flash on Space Shuttle/777
- 1995: Flash in PDAs and industrial
- 1997: Flash in Digital Cameras
- 2008: Flash in Smart Phones
- 2013: Flash in PCs/Data Center
Technology Life-Cycles & Disruptive Waves

- MRAM
- 2016: Industrial/Automotive Innovators
- 2018: SSDs and Storage Accelerators
- Early Adopters
- Early Majority
- Late Majority
- Laggards

Propensity to Adopt: High to Low
Propensity to Resist: Low to High
- **DRAM** is fast, but volatile and requires refresh cycle
  - Both require external batteries or capacitors to provide constant power
- **SRAM** has lower density than DRAM, but also volatile
- **SCM** (Storage Class Memory) is faster than NAND, but lower endurance
- **NAND** Flash is non-volatile, but high latency and low endurance
MRAM combines performance of memory with persistence of storage

- High Performance: DRAM-class write performance
- Non-Volatile: Maintains memory without power
- Fast Read/Write Speeds: Similar to SRAM & DRAM
- Superior Durability: Survives memory workloads
- No Refresh: Data requires no charge
The MRAM Universe

Integrated persistent memories with sensor and compute for industrial

Low power inference engines

Incorruptible memory for smart meters

Ultra low latency DC storage/network

Machine Learning Processor Memory

CPU L2 Cache

Data Center

ECU, infotainment & EDR memories in automotive

Instant on memories for mobile products

Data collection and code storage for wearables

Industrial

Consumer
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Current Focus

Emerging Markets
Case Study: Server Message Log

- Meets regulatory compliance without the performance penalty of flash
  - 9X Acceleration of message log storage
- Standard NVMe integration with no special drivers required
- Capacity up to 1GB
  - Sufficient for most NoSQL flash optimized databases
Case Study: Intelligent Security Video Cam

- Remote dispersed deployment, battery powered, solar charge
- Low power motion detecting inference engine front end
  - ANN weights and executable stored in MRAM
  - Fast wake upon motion, analyze image, return to standby
- Doesn’t enter record until front end detects interesting event
Case Study: Health Monitor Wearable

- Integrated sensor, compute, wireless, MRAM
- Extended temperature operation
- Low power system implementation
  - No need for boot during recovery from sleep
- Longer term integration of inference engines for advanced diagnostics
  - Real-time health monitor
  - Automatic Health Risk Event detection

AI diagnostic coupled with Bit data analytics
Case Study: Instant-on Mobile

- No more extended wait for system boot at power on
  - Execution memory stored in MRAM
  - Truly Instant-on

- No DRAM held in refresh during system standby
  - Extends by days need for device to be turned off
What Is Next for MRAM?

- Broader adoption in legacy markets
  - Toggle MRAM with its unique characteristics will be very long lived

- Growth of today’s STT products in data center applications
  - Storage and Network focus
  - “Data persistence at speed”

- MRAM TAM Expansion through further improvements in density, cost, endurance and power
### Strong Top-Tier Customer Base in Growing Markets

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<tr>
<th>Industrial</th>
<th>Automotive &amp; Transportation</th>
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**Toggle MRAM Shipments**

**Initial STT-MRAM Focus**
MRAM is the future of memory technology.

Thank you.