



The World's Best Price-Performance Flash Memories



Spansion™ Flash memory

with MirrorBit™ technology



“Second-generation MirrorBit technology will free our customers from the fundamental price-performance limitations of multi-level cell (MLC) floating-gate technology.”

Bertrand Cambou
President and CEO
Spansion

Spansion, the world’s leading supplier of NOR Flash memory for code and code-plus-data storage, continues to lead the industry with MirrorBit technology’s unmatched price-performance and aggressive roadmap to future cost reductions. Solutions with second-generation MirrorBit™ technology are available today from AMD.

At-a-glance

- Two physically distinct bits per memory cell
- Over 2 billion megabits shipped during the first year of production
- Cost structure rivals 90 nm multi-level cell (MLC) floating-gate technology
- Product families optimized for wireless and embedded systems

Award-winning MirrorBit™ technology

MirrorBit technology is fundamentally different and more advanced than conventional MLC and SLC floating-gate technology. As a result, MirrorBit technology enables designers to create innovative, cost-effective solutions like never before.

The MirrorBit cell doubles the intrinsic density of a Flash memory array by storing two physically distinct bits on opposite sides of a memory cell. Each bit within a cell serves as binary unit of data (e.g. either 1 or 0) that is mapped directly to the memory array.

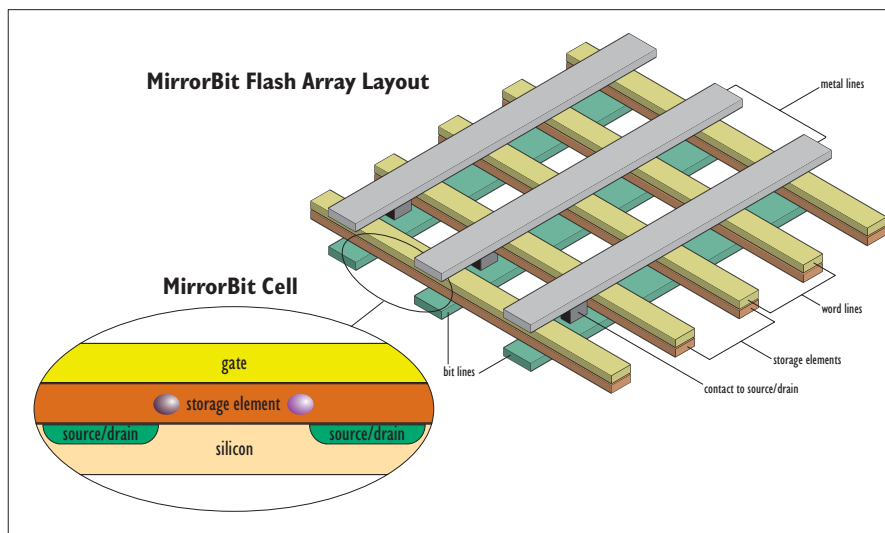


Figure 1: MirrorBit™ technology’s symmetric design doubles the density of a Flash memory array. In addition, the MirrorBit array layout greatly simplifies the manufacturing process.

Reading or programming one side of a memory cell occurs independently of the data that is stored on the opposite side of the cell. As a result, MirrorBit technology delivers exceptional read and write performance for wireless and embedded markets.

Because of its symmetrical memory cell and non-conductive storage element, MirrorBit technology has been engineered to take advantage of a simple, efficient memory array. This array design greatly simplifies a device’s topography and manufacturing process. The end result is the industry’s best price-performance Flash memory technology.

"SAMSUNG Electronics is very pleased with Spansion's focus on customer needs in the development of second-generation MirrorBit technology. Spansion's new technology provides exactly the kind of price-performance needed for us to continue delivering many of the industry's most innovative and unique mobile phones."

KS Hyun
Vice President of
Telecommunication Networks
SAMSUNG Electronics

Understanding cost structure

Cost structure refers to the sum of all intrinsic device parameters that determine the potential manufacturing cost of a Flash memory device. Because cost structure is not influenced by potential fluctuations in market forces (e.g. changes in demand), relative cost structure is a reliable indicator of medium- and long-term relative pricing.

On its own, die size (and by extension process lithography) paints an incomplete picture of cost structure, in the same way that the cost of real estate isn't determined solely on the basis of acreage. Additional manufacturing parameters – such as intrinsic defect density and total number of manufacturing steps – also play a decisive role in determining cost structure.

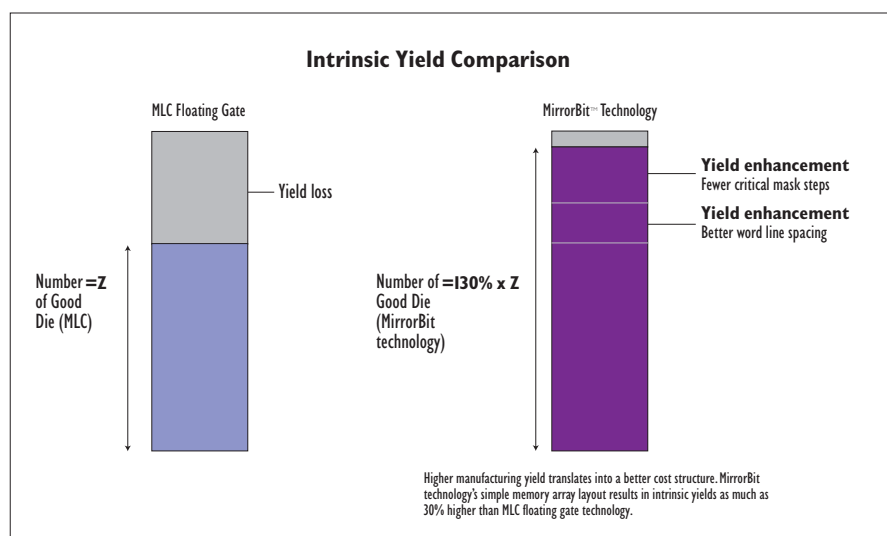


Figure 2: MirrorBit™ technology results in an industry-leading cost structure.

MirrorBit technology delivers an incredible combination of leading-edge process lithography, intrinsic manufacturing yield, and manufacturing throughput to enable the industry's best price-performance Flash memories. MirrorBit technology delivers:

- Second-generation technology on 110 nm process lithography ramp to mass production expected in July 2004
- Intrinsic manufacturing yields as much as 30% higher than multi-level cell (MLC) floating-gate technology
- Number of critical mask layers reduced by 40% as compared to MLC floating-gate technology
- Streamlined manufacturing process for 10% higher fab throughput than MLC floating-gate technology

Manufacturing yield becomes more critical when multiple products are combined into a single package. If any one die contained in a stacked-die product fails, the entire device must be scrapped. As a result, MirrorBit technology's yield advantage translates into a greater cost structure lead for multi-chip products.

MirrorBit technology scales easily to smaller process lithography, and Spansion plans to extend its cost structure leadership with third-generation MirrorBit technology (90 nm) in 2005.

"MirrorBit technology, which was only a specification in 2001, required just three years and two generations of development to surpass what competing MLC floating-gate solutions achieved in seven years and four generations."

Bertrand Cambou
President and CEO
Spansion

Performance and features

With the industry's best price-performance Flash memory, MirrorBit technology supports features and specifications comparable to single-level cell floating-gate technology:

Optimized for wireless markets

- Burst-mode access as fast as 80 MHz; page access times as fast as 25 ns
- Simultaneous Read/Write operation for award-winning storage of code and data
- Typical standby power as low as 1µA
- Multi-chip products (MCP) available

Optimized for embedded markets

- Densities from 16 Megabits to 512 Megabits
- Up to 8-words per Page-mode access; page access times as fast as 25 ns
- Advanced Sector Protection for robust security
- Easy-to-use TSOP and Fortified BGA packages

And with new product families in development and a clear roadmap for future innovation, customers can continue to benefit from MirrorBit technology's features and specifications for a long time to come.

Request samples today

With over 2 billion megabits shipped during its first year of mass production, MirrorBit technology from Spansion is well on its way toward becoming the next industry standard in Flash memory. Take the next step toward the industry's best price-performance Flash memory solutions. To learn more and to request product samples, contact your local sales representative today.

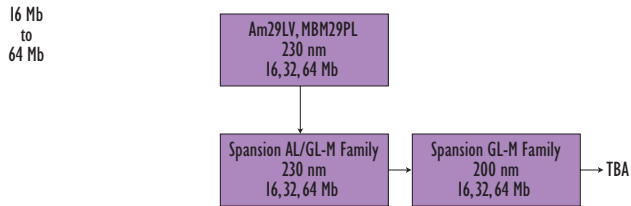
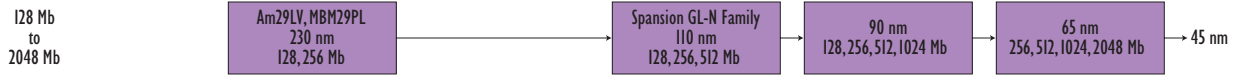
MirrorBit™ Technology Timeline

- 2001: Announced revolutionary new Flash memory technology
- 2002: Ramped first product to mass production
- 2003: Ramped first full family of products (16 to 256 Mb) to mass production
- 2003: Received INSIGHT Award for Most Innovative Memory Device
- 2003: Introduced world's first 512 Mb NOR Flash memory on second-generation technology
- 2004: Introduced industry's best price-performance Flash memory for wireless using second-generation technology
- 2004: Ramping second generation technology to mass production
- 2005: Introduction and production ramp of 90 nm MirrorBit™ technology including solutions for high-density media storage

"In fact, it is even possible that with MirrorBit technology, [Spansion] may encroach into some traditional NAND Flash markets."

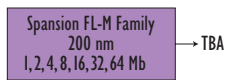
Technology Roadmap for Embedded Markets: 3.0 volts

Mainstream Products for Embedded Markets



Serial Peripheral Interface

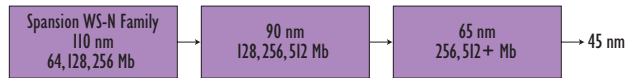
MirrorBit™ Technology



Planned roadmaps, June 2004

Technology Roadmap for Wireless Markets: 1.8 volts

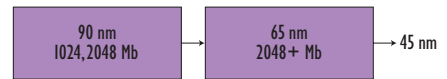
Performance Flash Memory for XIP



Flash Memory for XIP or Media



Flash Memory for Media

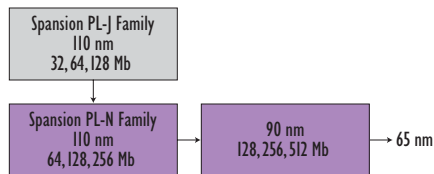


MirrorBit™ Technology

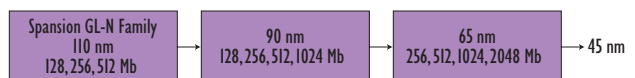
Planned roadmaps, June 2004

Technology Roadmap for Wireless Markets: 3.0 volts

Performance Flash Memory for XIP



Flash Memory for XIP or Media



Flash Memory for Media



MirrorBit™ Technology

Floating-gate Technology

Planned roadmaps, June 2004



About Spansion™ Flash Memory Products

Spansion™ Flash memory products encompass a broad spectrum of densities and features to support a wide range of markets. Spansion Flash memory customers represent leaders in the wireless, cellular, automotive, networking, telecommunications and consumer electronics markets. There are a variety of Spansion Flash memory products, such as devices based on the innovative MirrorBit™ technology; the award-winning simultaneous read-write (SRW) product family; super low-voltage 1.8-volt Flash memory devices; 3.0-volt solutions for embedded and wireless markets; and burst- and page-mode devices. Information about Spansion Flash memory solutions is available at <http://www.spansion.com/overview>.

Spansion was formed by the integration of AMD's and Fujitsu's Flash memory operations in 2003. It is the largest NOR Flash memory company in the world. Spansion Flash memory solutions are available worldwide from AMD (NYSE: AMD) and Fujitsu (TSE:6702).



www.amd.com

One AMD Place
P.O. Box 3453
Sunnyvale, CA 94088-3453, USA
Tel: (408) 732-2400 or (800) 538-8450
TWX: 910-339-9280
TELEX: 34-6306

About AMD

AMD (NYSE:AMD) designs and produces innovative microprocessors, Flash memory devices and low-power processor solutions for the computer, communications and consumer electronics industries. AMD is dedicated to delivering standards-based, customer-focused solutions for technology users, ranging from enterprises and governments to individual consumers. For more information visit www.amd.com.