

## New memory technologies pressure flash

As drivers request more features and functions, the amount of software needed in vehicles is soaring. Programmers need a place to store their code, so memory capacity is also rising dramatically.

Most observers feel that there are roughly a million lines of code in vehicles now being designed. That means software could account for more than 10% of the cost of a vehicle. Most of this code is now stored on conventional flash memory, but some chipmakers hope to change that.

**Ramtron International** and **Freescale Semiconductor** are both promoting nonvolatile memory that offers benefits over flash, though Freescale is not yet in volume production.

Ramtron is promoting its ferroelectric RAM (FRAM), which features read/write access times that are roughly equal to those of RAM and the essentially unlimited endurance of RAM. Conventional



Ramtron says the speed of ferroelectric memory brings significant benefits to the auto environment.

flash has endurance limits, with reliability issues after many reads and writes.

But it is write times that Ramtron will be touting at Convergence. Fast writes

are beneficial when storing data from sensors in noisy automotive environments or when power may suddenly fail. Flash memories have comparatively slow write

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times, so data can be lost during those delays, making them unsuitable for use in airbag systems and other applications.

FRAM products are already being used in smart airbag systems for eight different automobile manufacturers worldwide. Shipments into airbag applications should exceed 2 million units this year, the company said. **Hyundai Autonet** recently selected FRAM for its next-generation smart airbag systems, crash recorders, and occupant sensors.

Ramtron is also having success in infotainment. **Matsushita Electric (Panasonic)** selected FRAM for its DVD and HDD (high definition display) in-car navigation systems, as well as some car audio systems, to gain faster recall and resume-play functions. The FRAM saves board space by eliminating components and allowing a reduced capacitor size, which would not be possible with alter-

native memory solutions.

In 2006, Ramtron predicts that over 15% of its business will come from the automotive sector alone, with additional growth expected over time. The company is qualifying its FRAM parts to AEC Q100, the **Automotive Electronic Council's** Stress Test Qualification for Integrated Circuits standard. One part, the FM25640 64Kb serial SPI FRAM, is already Q100 qualified.

Earlier this year, Freescale—the largest semiconductor supplier for the auto industry, according to **Gartner Dataquest**—got plenty of attention when it unveiled the Magnetoresistive Random Access Memory (MRAM) technology it has been working on for years. Its 4-Mbit MRAM product is a fast, non-volatile memory with unlimited endurance—a combination of characteristics not available in any other individual

semiconductor memory product, claims the company. The device is built on a foundation of proprietary Freescale technology protected by more than 100 MRAM-related patents, including toggle-bit switching.

Freescale has not yet announced parts certified for automotive use, but the company has noted that there is no reason the technology cannot provide the ruggedization needed by automakers.

Other memory makers are developing magnetic RAM technologies, and observers feel it may one day be as popular as NAND flash technology now in broad use. "We believe MRAM and other new memory technologies have the possibility of exploding in the same manner as NAND," said Bob Merritt, Emerging Markets Analyst at **Semico Research**.

Terry Costlow

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