

News & Trends

NAND flash moves into new markets

Posted: 01 May 2006

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NAND flash, like the Pac-Man videogame character of old, continues to gobble up new storage markets, in many cases replacing tape- and disk-based storage. While NOR-type flash will continue to be used in hundreds of systems to store boot-up code, market research firms report that it is NAND flash that is growing fast, in turn driving growth in the IC industry.

Alan Niebel, principal analyst at Web-Foot Research, estimates that the volume of NAND bits sold this year will be 10 times the number of NOR bits, with NAND revenue roughly tripling over the rest of this decade. NOR revenue is expected to be roughly flat for the same period.

"NOR is going to stick around; it is not going to disappear. But pricing will be bloody, almost at cost."

NAND's fast growth is aided by the advent of "managed NAND" products, such as Samsung Electronics' OneNAND family and Spansion's OrNAND product line. These chips are aimed at cellphones, which use NAND to store both code and multimedia files. But managed-NAND devices add error-detection and wear-leveling techniques, and are designed to overcome cellphone customers' reliability fears.

M-Systems Inc. offers managed-NAND technology at the card level, with its MDOC card-based storage subsystems, Niebel added.

### **HDD adoption**

Jim Handy, non-volatile-memory analyst at Semico Research, said Intel Corp. and Microsoft Corp. are pushing NAND chips for use in PC HDDs. Now, hard drives use DRAMs to cache data in order to cut down access times to often-used information. When power is lost, so is the data in a DRAM HDD cache. But a nonvolatile NAND-based HDD cache retains that data.

Another benefit of NAND the reduction of wear and tear on the hard drive by decreasing the number of times the platter must start spinning. Handy said Microsoft estimates that a gigabyte of NAND cache in an HDD system could mean the drive would not need to spin up at all for a week or longer, depending on usage patterns.

Intel, whose NAND-based hard drive cache technology is code-named Robson, recently demonstrated a system with NAND cache on a PC motherboard, providing easy access to the Vista operating system. At the recent Intel Developer Forum, the Robson technology sharply improved the performance of a PC playing a combat game.

Handy estimates that NAND-based HDD cache adoption could add roughly \$600 million to a NAND market that he predicts will hit \$26 billion in 2007. And it could help PC users. "With hooks built into the Vista OS, the Robson technology could be configured to stuff more of Outlook in the HDD cache for heavy Outlook users," Handy said.

The fastest-growing market, however, remains cell phones. Although NAND has a minuscule share of the handset market thus far, many high-end phones have slots for flash-based cards to store photos, music and videos, and sales of high-density cards are growing rapidly, Handy said.

- David Lammers  
EE Times

This article was printed from EE Times - Asia located at:

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