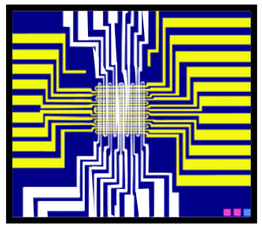
When you press the power button on your television, it instantly comes to life. But do the same thing with your computer and you are kept waiting while it boots up. Here is a product that could allow a computer to turn on instantly.

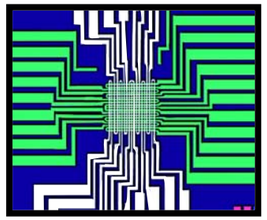
MRAM

How It Helps: Magnetic random access memory (MRAM) has the power to eliminate the boot-up process and enable instant-on computers and systems that consume less power. By combining the high speed of static random access memory (SRAM) and the high density of dynamic random access memory (DRAM), MRAM could be used to significantly improve electronic products by storing greater amounts of data and providing faster access speeds than existing electronic memory. MRAM devices will be considerably cheaper to manufacture than semiconductor-based DRAM and SRAM technology. MRAM is also expected to substantially reduce the power drain for battery-powered devices because it does not need to be constantly refreshed.



How It Works: MRAM consists of two layers of magnetic material separated by a thin, non-magnetic metallic layer through which electrons may pass. Two parallel conducting lines are laid at the top half of this ferromagnetic sandwich. Another set of conducting lines are laid perpendicular to the first set on the bottom half of the sandwich, resulting in a grid of conducting lines. Each point where the top and bottom lines meet represents a bit. When current is passed simultaneously to the top and bottom lines of the bit, data may be read or written. Once data are written, they remain even when the power is removed. This capability is unlike conventional random access memories, such as DRAM and SRAM, that store information only as long as electricity flows through them.

How Much It Will Cost: The goal is to make MRAM competitive in price with conventional memories like DRAM and SRAM.



When It Will Be Ready: MRAM production for high-end computer systems could begin as soon as mid-2003. The product should be in mass production by 2004.

Who Is Working On It: An innovator in this technology is NVE Corporation, a publicly traded company. Founded in 1989, the electronics component manufacturer now specializes in combining magnetically sensitive materials with integrated circuits. MRAM is the primary focus of the company. Because of the capital investment required for large-scale production of memory, NVE made a strategic decision to license its intellectual property and partner with memory manufacturers. Current licensees include Cypress Semiconductor, Motorola, Honeywell, and Union Semiconductor Technology. NVE currently employs 61 people and occupies 21,000 square feet of office space and development facilities in Eden Prairie, Minnesota. For more information, contact Bob Schneider of NVE at (952) 996-1603 or bobsch@nve.com. The company Web site is www.nve.com.

MDA Origins

Much of NVE's early research in MRAM was funded by BMDO's SBIR program. In 1993, NVE won a BMDO SBIR Phase II contract to design MRAM cells down to 0.05 micron line widths using electron-beam microscopy. In 1997, the company was awarded a BMDO SBIR Phase I contract to integrate giant magnetoresistive materials with semiconductor transistors. In 2002, it was awarded an MDA SBIR Phase I contract for magnetothermal MRAM designed to further increase both MRAM density and temperature tolerance. MRAM devices are ideal for BMDO space systems because they are radiation-hardened when combined with a radiation-hardened memory underlayer and can operate over a wide temperature range.