

Elpida Verifies the Physical Phenomena of Defect Repair Technology on a Microscopic Level

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Elpida Memory announced recently that it has successfully developed defect repair technology that leads to dramatic improvement of data retention, and has also identified the physical phenomena that dominate DRAM retention characteristics by applying a technique known as electrically detected magnetic resonance (EDMR) for the first time. This research and development was done in conjunction with NEC Corporation's System Devices Research Laboratories, and the University of Tsukuba.

As DRAM speed increases for servers, high-end laptops and desktop PCs, the temperature of the chip tends to rise during operation. Therefore, it becomes more difficult to maintain sufficient data retention time. It is therefore essential that memory manufacturers develop a DRAM that can deliver excellent data retention characteristics while operating at high temperatures and high speeds in the realm of 667 or 800 MHz.

A DRAM cell consists of one transistor and one capacitor; the electrical charges stored in the capacitor represent memory information. The charge stored by a capacitor decreases gradually through the junction leakage current. A periodic re-write operation called a refresh is therefore necessary for DRAM operation. It is essential to identify the physical phenomena that dominate the junction leakage current.

Elpida has considered vacancy-type defects to be dominant sources of junction leakage current, and so Elpida has focused its research on these defects. Based on this research, Elpida has developed a new technology that can repair these defects. The key to this technology is intentionally supplied interstitial silicon which repairs vacancy-type defects generated during the fabrication process. By using this technology, Elpida has not only dramatically improved the data retention time in actual products, but has also verified that the data retention time strongly depends on the amount of vacancy-type defects that remain. This fact was verified for the first time using a highly sensitive physical analysis technique known as electrically detected magnetic resonance (EDMR).

Elpida has already started applying this defect repair technology to all of its products, which has resulted in significantly higher production yields. The company also plans to apply the new technology to all products developed in the future.

The microscopic-level information obtained through the use of an advanced analysis techniques is the result of fundamental research that will lead to higher DRAM cell performance. Elpida expects that the defect repair technology developed on the back of this research will form the backbone of ultra-high-speed DRAM devices in the future.

Elpida, NEC Corporation and the University of Tsukuba presented these achievements at the 2006 IEEE International Reliability Physics Symposium (IRPS) held in San Jose, U.S.A.

Source: Elpida Memory

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