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2006 North American Frost & Sullivan Award for Product Innovation Presented to Innovative Silicon

Z-RAM memory recognized as innovative technology

SANTA CLARA, Calif., February 8, 2007 —The 2006 Frost & Sullivan Product Innovation Award in the field of silicon-on-insulator (SOI) technology was presented to Innovative Silicon Inc. for the invention of the capacitorless memory device that overcomes the limitation in scaling dynamic random access memory (DRAM) for future memory needs. The award was presented last night at Disney's Grand California Hotel in Anaheim, CA.

Most volatile memory applications use DRAM due to its relatively simple structure and low-cost features. However, as the scaling of semiconductor devices advances, DRAM is facing limitations in packing its capacitor even smaller--squeezing the pitch of the device into previously deemed impossible dimensions. However, DRAM design is encountering the physical limits of the materials while adopting strategies to maintain the performance of the shrinking device.

In the light of this problem, Innovative Silicon has introduced the world's first capacitorless one-transistor volatile memory device to eradicate the problems encountered in scaling the capacitor. The capacitorless device, Z-RAM (which stands for 'zero capacitor RAM') offers performance similar to the standard six-transistor static RAM (SRAM) cell used in cache memory but only has a single transistor. Without any capacitor, it is denser than conventional one-transistor, one-capacitor DRAM, which is used extensively in modern computers' main memory. The large reduction in size allows tremendous increment in memory densities and smaller total die area.

Z-RAM works by using floating body effect (FBE). The parasitic phenomenon was first encountered in processor chip design, which is based on a new SOI process introduced in the early 2000s. This effect causes capacitance to form between the transistor and the underlying insulating substrate, and was a problem that needed to be solved in conventional designs. However, researchers at Innovative Silicon have turned this parasitic effect into a useful feature by replacing the capacitor in a conventional DRAM cell with the capacitance between the gate and the buried oxide layer (BOX). Thus, consisting of only one component instead of two, Z-RAM offers twice the density of

DRAM, and six times that of SRAM. Moreover, Z-RAM is compatible with the conventional SOI-complementary metal-oxide-semiconductor (CMOS) processes and does not need any additional masking steps or the introduction of any new materials.

SRAM is known to operate faster than DRAM and is preferred in high-speed applications such as level 1 cache where the speed of SRAM is required. Due to its small dimension, Z-RAM is normally much faster than DRAM and in a way, faster than SRAM. The larger cell size of the SRAM occupies a larger real estate on the processor chip area. This means that the capacitance induced by the long conduction paths, which carry current into the cells, could delay the driver circuitry. Although Z-RAM's individual cells are not as fast as SRAM, the lack of the long conduction paths allow a similar amount of cache to be run at roughly the same speeds by avoiding this delay. Innovative Silicon executives claimed that response times as low as 3 ns have been achieved.

In addition, Innovative Silicon has shown that this technology is less susceptible to soft errors than SRAM and comparable with embedded-DRAM. The company is expected to demonstrate 65-nanometer silicon samples of its memory later in 2006. At the point of writing, the company has achieved silicon validation of its Z-RAM memory array on 90-nanometer SOI process technologies at a leading semiconductor foundry and Freescale Semiconductors. Innovative Silicon also announced that it has validated its memory bitcell in additional 10 fabrication processes that include 130 nm SOI, 90 nm SOI, and FinFET technologies.

Founded in 2002 by Drs. Pierre Fazan and Serguei Okhonin, Innovative Silicon started as a project on the development of a new ultradense semiconductor memory technology exploiting the FBE of SOI devices. The technology won accolades in the semiconductor community and was awarded the "Best Invention of the Year" status by the Swiss Federal Institute of Technology (EPFL). In 2003, Innovative Silicon received the best start-up label from the Swiss Innovation Promotion Agency (CTI). Funded by leading European and US venture capital firms, the company raised its first round of financing of \$6 million in 2003.

Innovative Silicon completed its first memory designs in 2004 and launched its Z-RAM technology in January 2005. Recently, AMD has given a big boost to the company by licensing the Z-RAM technology, for reducing the size and power consumption of its processor's cache memories.

Frost & Sullivan acknowledges the impact of Z-RAM technology on the future DRAM design and SOI applications, and is honored to present Innovative Silicon with the 2006 Frost & Sullivan Product Innovation Award.

About Frost & Sullivan

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About Innovative Silicon

Innovative Silicon Inc. (ISi) delivers ultra high density memory IP for embedded SoC, MPU, and portable consumer applications. Endorsed by IEEE Spectrum Magazine in January 2007 as one of five 'winning' technologies, ISi's Z-RAM® memory offers double the density of embedded DRAM and is up to five times denser than embedded SRAM, making it the world's lowest-cost semiconductor memory solution. The company closed its first round of VC funding in 2003, completed its first 90nm megabit Z-RAM memory designs in 2004, its first 65nm designs in 2005 and its first 45nm designs in 2006. The company is incorporated in the USA with R&D in Lausanne, Switzerland. For more information see <http://www.z-ram.com>.

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