

Stacked Memory Chip Technology

Advanced Memory Technology Reduces Vulnerabilities of Integrated Circuits



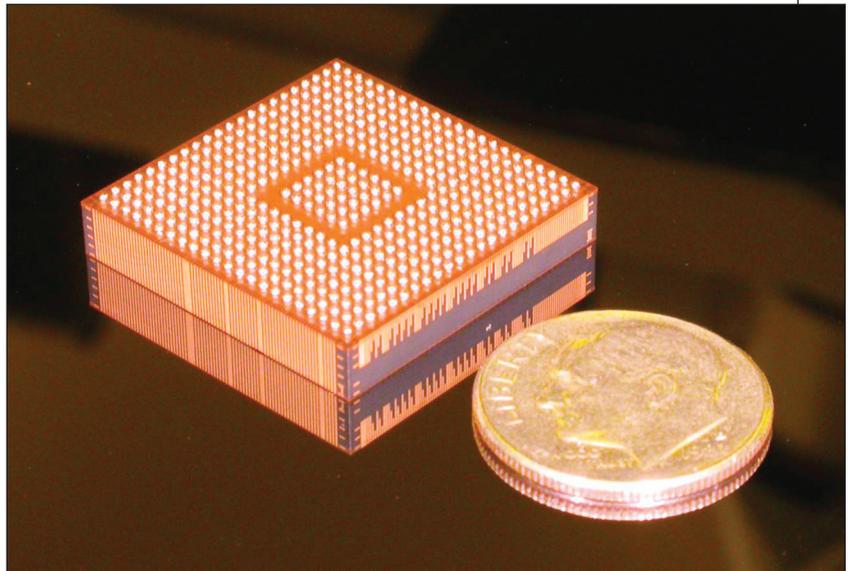
Technology and Innovation

Under this DARPA SBIR, Irvine Sensors Corporation (Irvine Sensors) developed a stacked-chip solution to ensure correctness, reliability, and functionality of designed integrated circuits (IC's). These circuits are critical parts of future weapons and defense systems. Based on a novel assembly of subcomponents, the stacked technology prevents determined adversaries from potentially intercepting and altering designs. The company's approach utilizes a "trust-enabler" stacked module, parts of which are designed and fabricated in a trusted foundry that monitors every activity of the non-trusted component and provides a safety agent for the surrounding critical system.

The DARPA solicitation and previous interactions with military users—particularly for anti-tamper uses of stacking technologies—prompted the idea, which is now in the feasibility stage.

Joint Collaborations

As a small business, Irvine Sensors has a limited ability to fund significant advances in the basic technologies related to direct stacking of integrated circuits. Accordingly, the company has a long history of end-user sponsorship of its innovative technology uses. The company has successfully moved many Phase I SBIR programs into Phase II and beyond. Sponsorship throughout various military organizations has been essential. Irvine Sensors has strong



working ties with a number of educational and government research and development institutions, including UC-Irvine, UCLA, JPL, UC San Diego and CalTech. The company plans to collaborate with a leading three-dimensional (3-D) electronics design provider and a leading university for the later phases of the SBIR program.

A system-in-stack module with programmable logic and multiple memory layers

Lessons Learned

- During the open dialogue period, focus on the real needs of the program manager, who typically has the best appreciation of the service user's unstated requirements.
- Work with tier I and tier II DoD suppliers such as Raytheon, Lockheed Martin, and others. They have important insights on funding, customer needs, and technology development.

- Be prepared for the funding gap during the transition between Phase II concept demonstrations and program insertion of the resulting technology.
- Embrace the fiscal discipline required by the DoD's audit process. It helps a small company meet the demands of being publicly held.

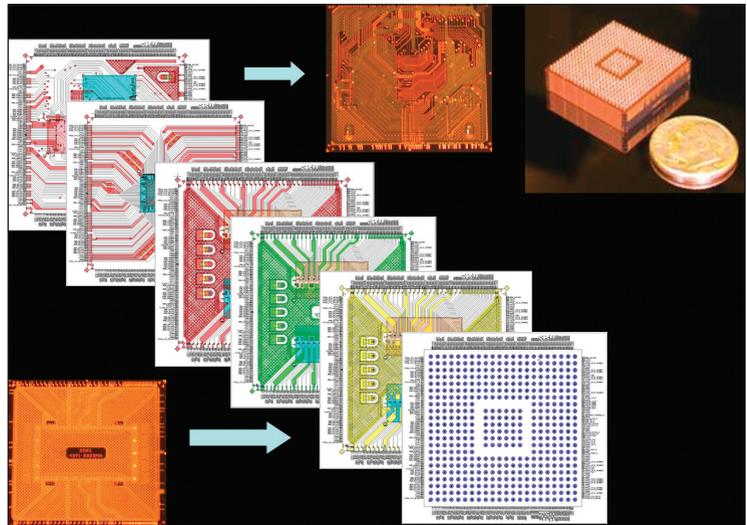
Economic Impact

DARPA SBIR programs have provided a direct and positive impact on Irvine Sensors' revenue stream, accounting for 26 percent of its external development funding. This funding and other DARPA funding obtained through Broad Agency Announcements have enabled Irvine Sensors to develop a competitive technology and establish a related patent base and evolving product catalog. More than 20 of the company's patents are a direct result of SBIR-funded technology innovations.

About the Company

Irvine Sensors Corporation, located in Costa Mesa, California, designs, develops, manufactures, and sells extremely compact 3-D electronic and imaging systems and modules. Since commencing operations in 1980, Irvine Sensors has pioneered 3-D semiconductor technologies related to advanced signal processing and image stabilization technologies for surveillance system focal planes.

Irvine Sensors sells products and prototypes from ultra high speed image processing, miniature infrared cameras, 3-D laser imaging, embedded computing, image enhancement and stabilization, stacked memory, and infrared data communications. The company offers standard and custom stacked memory products for military and commercial markets. ■



Details of the stack layers for the heterogeneous system-in-stack module

Company Information

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John Carson, President
Founded: 1980
Number of employees: 152