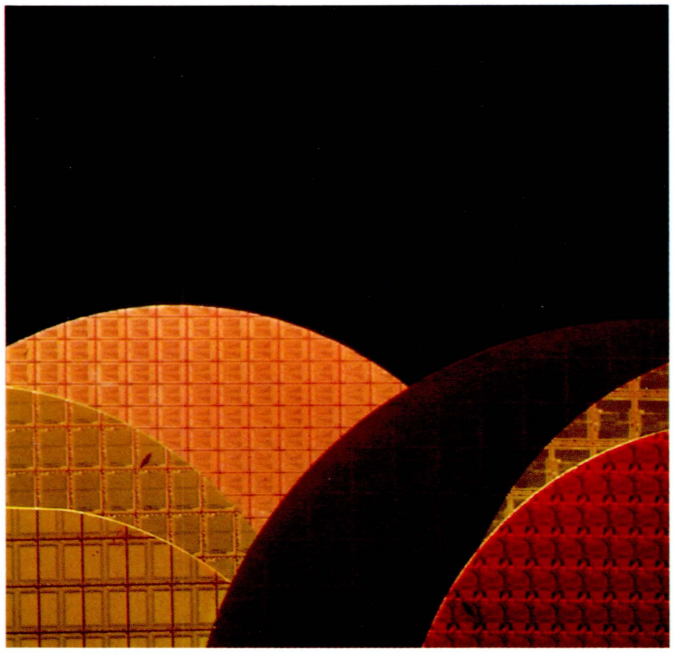
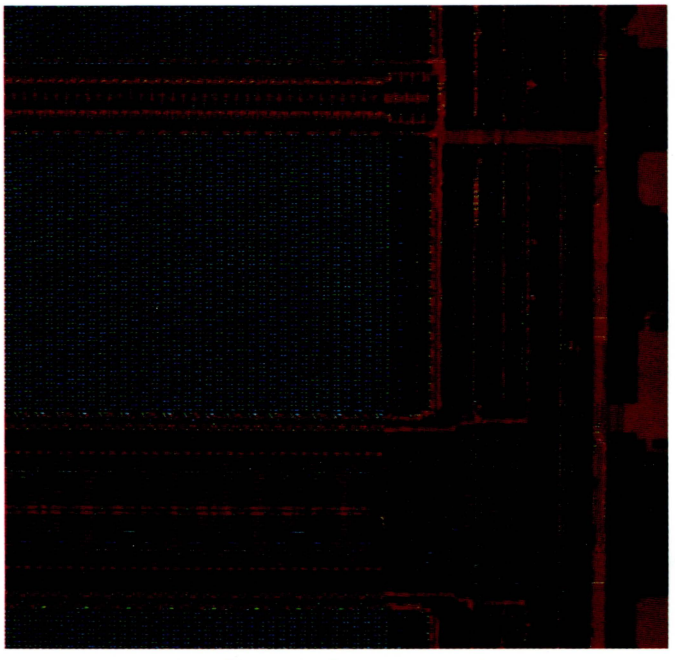
CONVEX

INTEGRATED CIRCUIT SIMULATION:

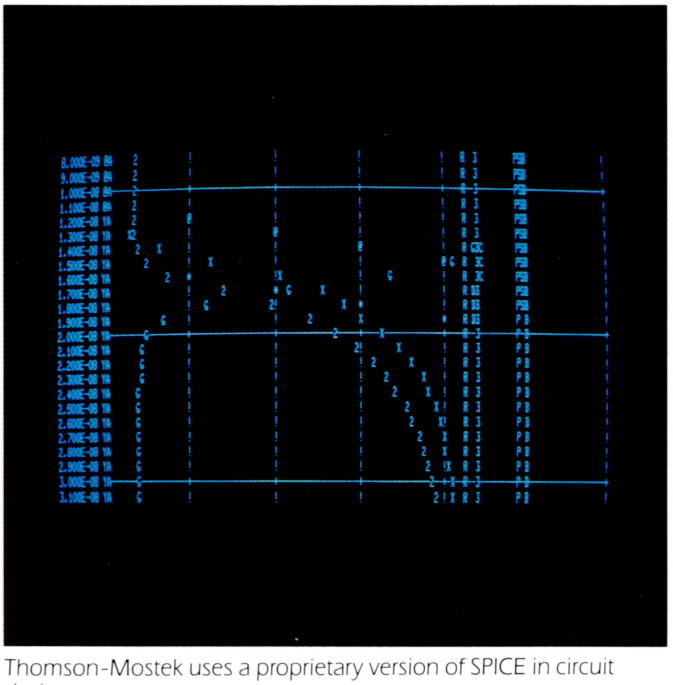
An Applications Profile from Convex Computer Corporation



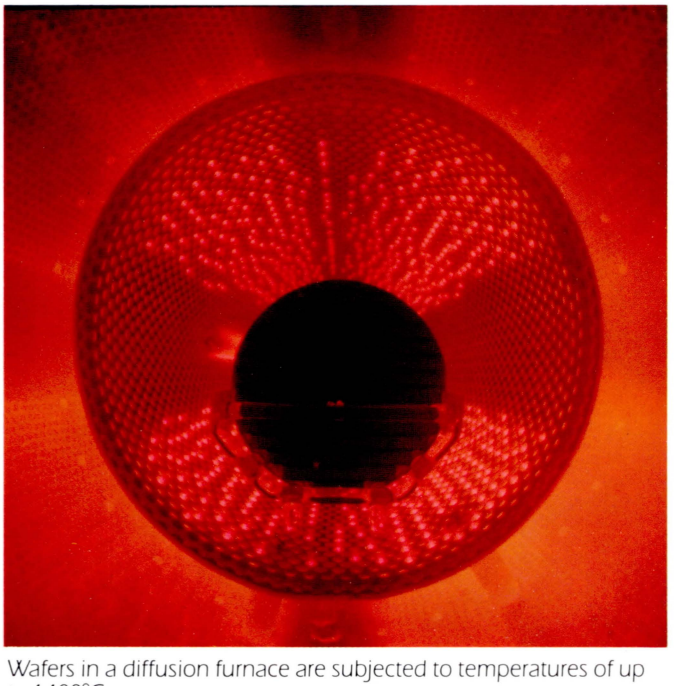
An assortment of wafers from Thomson Components-Mostek Corporation.



A memory array from Thomson Components-Mostek Corporation.



Thomson-Mostek uses a proprietary version of SPICE in circuit design.



Wafers in a diffusion furnace are subjected to temperatures of up to 1,100°C.

Thomson Components-Mostek Corporation designs and manufactures integrated circuits for data communications, microcomputers, specialized memories, and semi-custom fabrications. The company uses the latest computer-aided design techniques, employing SPICE simulation software for circuit design and other programs for device and process design.

THE PROBLEM

As semiconductor geometries shrink and simulation accuracy becomes more critical, the run length of any given simulation program increases dramatically. At Thomson-Mostek, work is underway to develop memory simulations that have up to 8,000 devices. At this level of complexity, device characterization runs with SPICE can take hours or days to complete.

In 1984, Mostek was using a Cyber 205™ on a time-sharing basis to run its SPICE simulation codes for the design of semiconductor devices. Because of the high cost of renting time on the 205 during peak hours, the company often resorted to running large jobs on the Cyber over the weekend. Using the company's scalar minicomputers was out of the question because SPICE requires large amounts of memory, not readily available on existing minicomputer systems. Moreover, Mostek engineers found that the runtime on scalar minis far exceeded acceptable turnaround. In short, the minis simply could not provide the performance they required for SPICE runs.

The Cyber 205 solution was frustrating. Even though the system ran its SPICE up to 150 times faster than the company's minicomputer systems, the company frequently had to wait until nights or weekends for its runs and results because of the high cost of the weekday rates. In addition, the time required to transfer data to and from the Cyber was longer than some of the short runs that Mostek engineers needed. The Cyber 205 was simply too expensive — and, ironically, had an inherent delay factor.

"The C-1 system is a small Cray; it is not a large VAX. It is truly a mini-supercomputer. Convex has opened up that architecture to a much broader group of people, and we have had to come rapidly up the learning curve to understand the power and potential of working with a vector machine. The vectorizing compiler allows easier vectorization of our existing VAX FORTRAN programs. We can drop anything on it. On the Cyber, we had to do a considerable amount of hand-coding — this is simply not necessary on the Convex.

For our application, parallelism cannot help much — there are only so many things you can do at one time. SPICE is not parallelisable, and, typically, vector pipes are fast enough. The C-1 is the solution for SPICE — the machine pays for itself on SPICE alone.

As the development of integrated circuits becomes more complex, owing to the advances in science which allow for a greater density of transistors on any given IC, simulation needs in the ECAD market become more complex also. To win in this market, companies need the large memory capacity and performance levels of a supercomputer."

— Branon Dunn, Manager, Computer Aids to Design, Thomson-Mostek

THE SOLUTION

In the fall of 1984, Mostek found its solution in the Convex C-1 supercomputer, a 64-bit, integrated scalar and vector processor with a Cray™-like architecture. The system cost $500,000, and delivered performance one-quarter that of the Cyber 205 but was between 13 and 40 times faster than the company's scalar computers. The design engineers at Mostek found they could do multiple program runs per day on a system which offered supercomputer performance, UNIX™, VAX/VMS® FORTRAN compatibility at the source code level, and ease of conversion of the existing software base.

THE ORGANIZATIONS

Mostek Corporation was founded in 1969 and specializes in data communications, microcomputers, specialized memories, and semi-custom products. The company, now a wholly owned subsidiary of Thomson, is located in Carrollton, Texas.

Convex Computer Corporation is headquartered in Richardson, Texas, and was founded in September 1982 to design, manufacture, market, and service affordable supercomputers for a wide range of technical users. The company's first product, the Convex C-1, began shipment in March 1985, and the company has installed over 50 systems to date. The C-1 combines the memory and vector processing capabilities previously found only on supercomputers, with the software advantages and price of minicomputers.

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