

## **Giant factory to make super-tiny chips**

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Intel Corp.'s impressive manufacturing capabilities grew even mightier Thursday as the company formally opened its latest \$3 billion chip-making factory in south Chandler.

Billed as the "best manufacturing machine on the planet," the state-of-the-art factory is Intel's first that can mass-produce chips with transistors that are 45 nanometers in size.

More than 2,000 such transistors — switches that direct the flow of electric current — could fit across the width of a human hair.

The current state of the art for the industry is 65 nanometers.

Santa Clara, Calif.-based Intel hopes the Chandler plant will keep it ahead of its smaller rival, Advanced Micro Devices, as the company seeks to remain dominant in the world market for microprocessors — the chips that run computers and servers.

"This factory is a representation that Intel is committed to investing in the U.S. and helping to ensure that the U.S. remains competitive in the global economy," Brian Krzanich, vice president of manufacturing and operations, said at a grand opening ceremony Thursday. "Arizona remains a key manufacturing site for Intel."

Fab 32, as the new factory is called, is the third chip-making plant at Intel's complex at Dobson and Ocotillo roads. Under construction since August 2005, the Fab's floor space is equal in size to 17 football fields. The clean room, where the chip manufacturing takes place, is the size of three football fields.

The remaining space in the four-level building is devoted to air-handling equipment, chemical- and gas-delivery systems, electrical systems and other activities needed to support the clean room.

Although highly automated, the plant will provide 1,500 jobs.

About 3,000 construction workers were needed to build the factory, and the world's third-largest construction crane set the roof trusses in place.

### **Smaller Oregon site**

Intel will ship its first 45 nanometer microprocessors on Nov. 12 from a smaller demonstration Fab in Oregon. The first chips from Fab 32 will be delivered in the first quarter of next year.

By making circuits smaller and smaller, engineers can pack more transistors on a single chip — up to 800 million on Intel's latest microprocessors. For the consumer, this miniaturization will mean more capable computers that use less power. As an example, game players will see more lifelike graphics on their consoles with better three-dimensional images, Krzanich said. Desktop computers will be smaller and quieter and use 30 percent less power, he said.

Laptop-computer users will find that their batteries last 20 percent to 30 percent longer, and they will be able to perform more tasks simultaneously, he said.

"The performance gains will be stunning," promised Intel factory manager John Pemberton.

Fab 32 also is notable in that it can process silicon wafers that are 300 millimeters, or about 12 inches, in diameter. The large wafers hold down the price of individual microprocessors by allowing more of them to be produced on a single wafer.

The new Chandler plant is Intel's sixth in the world to process 300-millimeter wafers.

The plant also includes the latest in environmental advances. The new 45-nanometer production process will reduce global-warming emissions by 15 percent, and 70 percent of the water will be recycled, the company said. Chandler Mayor Boyd Dunn said the huge investment is a "clear signal that Intel intends to stay . . . in Chandler for years and years to come."

Intel, which is the world's largest semiconductor company, is spending an additional \$5 billion to build more 45-nanometer capacity at a new Fab in Israel and to retool an existing factory in Rio Rancho, N.M. Both will open next year.

All of the spending should enable Intel to meet its aggressive goal of shipping more 45-nanometer than 65-nanometer products by the middle of next year, said Tony Massimini, chief of technology for Semico Research, a Phoenix-based market-research firm.

"They have an aggressive schedule for 45 nanometers," he said. "So far Intel has beaten all of the milestones that they set for themselves. I have no reason to think they won't reach that goal too."

### **More new-generation chips**

Massimini said the constant investment in new manufacturing capability has given Intel the economies of scale to keep the price of individual microprocessors down, which helps to fuel demand from consumers. He expects the new super-tiny circuits to play a big role in the notebook market, which is the fastest-growing segment of the computer industry.

The new-generation circuits also could drive future sales of more-capable mobile devices, he said.

AMD also is developing 45-nanometer circuits, but is not planning to roll them out until mid-2008. Still, AMD believes its devices will continue to hold their own in the world market.

"We may be behind certain companies by a few months in terms of introducing 45 nanometer, but we're way ahead in a number of critical design features," said AMD spokesman Gary Silcott. "We think we're in a very competitive position."

Even as Intel ramps up production of 45-nanometer circuits, its engineers are looking toward the next generation of 32 nanometer chips, Krzanich said.