

AMD 45nm Process Technology Generation

Fact Sheet/FAQ/Q&A

Q1: When will AMD introduce 45nm processors?

A1: AMD is on track to meet key production milestones, which support OEM and channel product delivery plans. AMD is ramping production of its first 45nm products in the first half of 2008 and expects 45nm products to be available in the second half of 2008.

Q2: Which products will be first available at 45nm?

A2: AMD native quad-core products will be first introduced on 45nm technology, both the first server 45nm product, "Shanghai" and the first desktop device, "Deneb".

Q3: What process improvements will AMD introduce at the 45nm node?

A3: At 45nm, AMD plans on introducing new leading-edge submicron technologies along with significant improvements to existing ones. These enhancements are aimed primarily at improving AMD's transistor designs and interconnect circuitry to enable sustained linear increases in processor and platform performance-per-watt, while also overcoming inherent challenges introduced from continued reduction of transistor size.

Key innovations within AMD's 45nm process are scheduled to include the following:

- **Immersion Lithography.** Through the IBM partnership, AMD has developed a stable, highly-productive, immersion lithography process which achieves a 40 percent gain in resolution over conventional lithography while maintaining yields consistent with conventional lithography. Immersion tools are online and running wafers using AMD's 45nm technology. AMD's analysis shows that immersion lithography is a more efficient, cost-effective approach than the double-mask, double-etch lithography method used by our competition.
- **Fourth-generation Strained Silicon.** AMD's first 45nm product features transistors using AMD's fourth generation of strained silicon technology, utilizing Silicon Germanium, Dual-Stress Liner and advanced Strain Memorization techniques for increased switching speed and power-efficiency.
- **Ultra-low-k Dielectrics.** In some later 45nm products, AMD plans on using ultra-low-k dielectrics to reduce wire delays by as much as 15 percent and enable greater overall processor performance.
- **High-k/metal Gates.** As part of AMD's Continuous Transistor Improvement (CTI) approach, AMD has the option to introduce high-k/metal gates into 45nm production to further enhance transistor performance. The "gate first" approach, developed with IBM, is designed to provide a simpler, less time consuming way to migrate to high-k metal gate technology and secure benefits that include improved performance and reduced power consumption.

Q4: Is AMD making progress on the goal to speed its microprocessor process technology cadence?

A4: Yes, AMD is consistently focused on increasing operational speed, but also efficiency and agility. However, there's an important and relevant distinction between when a company ships its first microprocessor on a new process generation, and when it is fully converted to the new process. AMD achieved full conversion to 65nm production within its fabs in approximately mid-2007. This rapid fab conversion has been a hallmark of AMD, allowing the company to remain competitive in both cost-efficiency and fab utilization, and we expect to convert quickly to 45nm.

Q5: What are the benefits of 45nm process technology for customers?

A5: Working in concert with design and manufacturing excellence, process technology plays a key role in enabling continued performance-per-watt and functionality improvements in AMD processors and platforms.

Q6: How does the IBM relationship contribute to your 45nm progress?

A6: The IBM alliance allows us to achieve greater operational accuracy and agility, while maximizing return on R&D. Throughout its history, AMD has efficiently combined its strengths with those of key partners for mutual benefit. This focus on open and collaborative innovation provides cost-effective access to a wealth of partner developed technologies and techniques.

Q7: How does AMD determine when to transition to a new process technology generation?

A7: AMD transitions to a new process technology generation when it is right for our customers and right for the company.

A common misconception is that being first to a new process technology generation is the fundamental determinant of performance and energy efficiency leadership. AMD has proven this to be false.

Rather than the more costly and higher-risk method of making a full technology transition every two years, AMD uses a unique and highly efficient method called Continuous Technology Improvement (CTI).

CTI allows us to maximize the benefits and increase the return on investment of a single process technology generation for as long as possible by evolving and improving the transistor designs within that generation. This is why at many points in our history our processors and platforms have remained competitive, even when compared against those from our competitors based on the next process technology generation.