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By: Ionut Arghire, Hardware Editor



IBM plans to get the first hand on 22-nm
IBM

IBM Goes for the 22-nm Technology

The Big Blue plans to make the smaller die a reality before others

IBM seems determined to be the first to reach the next-generation 22-nanometer chip technology. The general tendency in the industry is to get to smaller geometries, as chips become faster and provide more power efficiency. Intel is making at the moment the transition from 65nm to 45nm manufacturing process, while Advanced Micro Devices is stated to start the process in the fourth quarter.

The next step after 45nm is 32nm, and the move towards it should be an easy task, as there are no manufacturing process barriers. Things are a little bit different when it comes to 22nm, but Big Blue plans to get to the smaller die ahead others.

Today's conventional technology for manufacturing semiconductor chips is based on photolithography, which consists of casting a shadow on a light-sensitive material, known as resist, with the use of a mask. The circuits are "printed" after that on the material. The 22-nanometer technology comes here to a dead end. According to Subu Iyer, an IBM distinguished engineer, "Once the wavelength of light becomes comparable to the size of the thing you're trying to print, things break down". The solution to this problem is supposed to be the use of a light wavelength of 193 nanometers, due to the fact that "extreme ultraviolet" radiation is still unusable.

"In straightforward physics (22nm) is kind of a tall order," said Iyer. He also added that IBM uses a new computational-intensive method which transforms the circuits the designers lay out into a pattern on the specified mask. This way, the company will be able to print the 22-nm characteristics using a 193nm light.

"There's a tremendous amount of computation involved in taking that design data and converting it to a mask which will illuminate with the right kind of illumination," Iyer added. "We build very fast computers. So, it's a matter of taking advantage of these very high-performance computers and doing these computationally intensive things."

There are a lot of IBM partners that announced their support for the Computational Scaling initiative, including Mentor Graphics and Toppan Printing. A connection between this initiative and Big Blue's cloud computing strategy also exists. The cloud computing provides scalable and more power-efficient Web services, and allows customers to use them "in a highly flexible and open environment", as the company noted.

The challenges IBM has to face in this project have been summarized as follows: "For nearly three decades... optical scaling has been enabled by the introduction of higher numerical aperture lenses and shorter exposure wavelengths. However, due to economic and technical issues, traditional scaling will not resume until next generation lithographic techniques such as extreme ultraviolet... become available."

Until the new technology becomes available, IBM is determined to continue working on the Computational Scaling initiative.