

Has Moore's Law Outlived its Usefulness?



There is an interesting topic being debated on various industry blogs right now. One that is very polarizing and may impact the semiconductor industry far beyond what we have seen thus far. The critical question seems to be: How long will Moore's Law be reliable?

Moore's Law, named after Intel Corporation co-founder Gordon Moore, states that the number of transistors that can be placed on an integrated circuit doubles roughly every two years. The starting point for this exponential growth curve is usually set at 1962, the period of time when the first silicon planar transistors were designed and tested. Purists will note that Moore defined the rule originally in relation to ICs alone, since the microprocessor was not even a possibility to a design engineer at the time.

For more than four decades chip geometries have gotten smaller and smaller, allowing Moore's Law to remain viable. But will we be able to make the same statement a decade from now?

By 2014, the high cost of semiconductor manufacturing equipment will threaten Moore's Law, "altering the fundamental economics of the industry," according to a report released in June by iSuppli.

"The usable limit for semiconductor process technology will be reached when chip process geometries shrink to be smaller than 20 nanometers (nm), to 18 nm nodes," said Len Jelinek, director and chief analyst, semiconductor manufacturing, for iSuppli. "At those nodes (levels), the industry will start getting to the point where semiconductor manufacturing tools are too expensive to depreciate with volume products, i.e., their costs will be so high, that the value of their lifetime productivity can never justify it."

Fortunately, there are companies that still continue to invest in developing chip geometries. Intel, for example, is currently in the process of moving to a 32-nanometer manufacturing process; and Taiwan Semiconductor Manufacturing Company (TSMC) has moved to 40-nanometer. However, there are other companies that have already found chip making prohibitively expensive and are unable to make the necessary investment in updated fabs and equipment.

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I do believe we have at least another decade where this rule will be applicable. Manufacturers of advanced semiconductor products will continue to migrate to more advanced small-geometry processes in order to stay competitive. The landscape is what might change. We may not see as many peaks and valleys and a slowdown in process technology transitions will be inevitable for some. Semiconductor manufacturers will need to get the most revenue out of their current geometries before moving on to the next level.

Let me know what you think? Will we continue to see exponential growth in the semiconductor industry as we have for decades?

Editor's Note: Starting with this issue, WDD will publish bimonthly. With this reduction in frequency, we intend to significantly broaden the scope of our online content and provide essential, more current editorial that will solve the challenges you have today.

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