

Published in issue of Chip Design Magazine

## Will changes in investment patterns dampen the market rollercoaster?

By Geoffrey James

After Moore's Law, the most obvious mega-trend in the semiconductor industry is the so-called "rollercoaster" effect. When chip demand is up, semiconductor firms invest in more capacity. When chip demand is down, semiconductor firms cut costs. Most of the time, semiconductor firms can't invest quickly enough. As a result, the new capacity goes online right at the end of the upward cycle. The supply is then increased just as the demand begins to decline, resulting in massive overcapacity and a correspondingly massive glut. Prices drop, creating a deep trough in revenues, until the next bump in the rollercoaster.

To make these periodic bumps less dramatic, semiconductor firms should invest in new capacity when revenues are down. That way, they'll be ready for the next upward demand curve. But that step hasn't been taken—at least in the past. Risto Puhakka, Vice President at VLSI Research Inc., blames "fear and greed." He also cites the tendency of executives everywhere to hunker down when things are bad and double down when things are good. "Logic does not always overcome organizational inertia," adds Dr. John Mentzer, a Professor at the University of Tennessee who has studied sales forecasting at more than 400 companies.

An echo of this shortsighted, "invest only when things are good" attitude can be found in our chip estimate report. Although designer interest has remained high in the 90- and 130-nm space over the past four months, the report reveals that there has been no interest in 65-nm designs (see the Figure). This fact strongly suggests that designers aren't preparing for the future. Instead, they're probably working to take advantage of currently available process technology. That trend is understandable. But the fact remains that 65 nm will soon be needed en masse. If designers want to be ready for the inevitable upswing, they should be paying more attention to 65 nm today. Organization inertia, indeed.

Despite the apparent blindness of the design community, there are signs that the semiconductor industry as a whole is beginning to dampen the rollercoaster effect, says Ken Cayton, Research Manager for Enterprise Platforms at the market-research firm, IDC. While Cayton agrees that semiconductor firms have invested at the wrong time in the cycle in the past, he emphasizes: "During the last cycle, Intel went against the grain and invested in new designs and fabs when most of the industry was doing the opposite." Cayton cites Intel's strong market performance as evidence that the decision was a valid one.

Jim Tully, Vice President and Chief of Research at Gartner, also sees a change in investment policy throughout the industry. "Looking forward, we are forecasting a less severe pattern of investments," he says. "Things will still be cyclical but more smooth." Tully sees that smoothness caused by two primary factors:

1. Slower market growth - The gradual slowing of semiconductor-market growth rates has lowered the penalties for making a mistake. In doing so, it has made executives more willing to invest. "When markets were growing at 20% per year, there was an attitude of investing large amounts in new capacity because of the fear of under capacity—and therefore of losing market share to a competitor that had sufficient capacity," explains Tully. "Slowing market-growth rates tend to lead to more measured responses."

2. Greater use of foundries - In the days of very high growth, most semiconductor firms were integrated device manufacturers (IDMs) that performed every step of the chip-making process. They were therefore forced to rely entirely on their own production capacity. This meant fighting an uphill battle with investors (who tend to think short term) while taking on all of the downside risk of investing at the wrong time. Today, Tully says, "there is a greater degree of partnership with foundries and therefore the ability to manage fluctuations in capacity utilization in a more satisfactory way."

Rich Wawrzyniak, Senior Analyst at Semico Corp., is a bit more skeptical. While he sees some signs of change, he cautions that this is primarily true for companies like Intel, which have the financial clout to invest quickly. Wawrzyniak notes that decision-making on major investments—even inside a well-run semiconductor firm—can easily take months. Months can stretch into years when the investment hinges on forging an agreement with another semiconductor firm—a requirement in an era when a new fab can cost \$3 billion or more. "Companies that must form consortia with other vendors must pay a cost, in terms of elapsed time, in order to negotiate

a co-investment deal," he says.

Yet Wawrzyniak isn't entirely downbeat about the industry's ability to adapt. He notes that the cost of a fab—relative to the overall size of the industry—is significantly smaller than it was 15 years ago. Making investments during a down cycle is therefore less of a burden on the industry as a whole (see the Table). "The amount of money that it takes to build a new fab, relative to the size of the overall semiconductor industry, has dropped from 1.58% to 1.21%," he explains. "Given enough cash on hand, it should be a relatively easier decision for a company to invest during hard times."

While there's little sign that the rollercoaster effect will disappear, the future may not see the same devastating ups and downs that wreaked so much havoc in the past. Over time, if the analysts are right, the semiconductor market might start resembling something more like the kiddie coaster at Santa's Village rather than what it is today—the equivalent of a major white-knuckler at Six Flags.