

x86 Market Approaching Overcapacity

Aggressive Fab Construction May Cause CPU Prices to Plummet in Future



Due to severe overcapacity in the DRAM market, prices have fallen by nearly 90% in the past two years. Could such a calamity happen in the x86 microprocessor market? With Intel, AMD, and National all aggressively building fab capacity over the next few years, the x86 market could become oversupplied in the near future.

For the most part, Intel has carefully managed its capacity so it grows at the same pace as the PC market. Intel's competitors have generally been in one of two situations. With the 386 and 486, AMD and Cyrix were able to produce relatively large quantities of parts, but only after most of the market had moved on to the next generation; thus, the overcapacity was limited to the low end of the market. More recently, these companies have developed parts competitive with Intel's midrange, but production limits have kept them from competing strongly in this area.

These production limits are starting to ease. AMD continues to build capacity in its primary fab (Fab 25 in Austin, Texas). When that fab reaches its full capacity of 5,000 wafers per week (wpw), which is expected in 1999, it should be able to produce at least 30 million CPUs per year (assuming AMD can solve the yield problems that have plagued its fab since last summer). Even though Fab 25 alone could serve nearly a third of the entire PC market, AMD has already broken ground in Dresden, Germany, on a new plant that, when fully built out in 2001, will have a capacity similar to Fab 25's.

Cyrix has often been production-limited by the number of wafers it obtains from its current foundry, IBM. As part of National, however, Cyrix will have access to that company's new South Portland, Maine, fab, which is slated to reach a capacity of 7,000 wpw by the end of next year. If that isn't enough, National's Intel patent license allows it to use third-party foundries to build x86 processors.

IDT, a recent entrant to the x86 market, has access to its own fab, which is smaller than the AMD or National plants but can still crank out at least 10 million CPUs per year. Like the other x86 vendors, IDT must use this fab for a variety of products, but it is likely to focus its production on profitable x86 chips whenever possible.

Intel is on its own building binge. The company plans to add three large fabs over the next year, including Digital's Hudson, Mass., facility. We estimate these new fabs, once they are fully built out, will increase the number of wafers available for Intel's PC processors from roughly 18,000 wpw today to about 30,000 wpw by early 2000.

Some of the market's excess capacity may be absorbed by adding L2 caches to the CPU chips, reducing the number of chips per wafer. Other wafers may be diverted to new products, such as Intel's 3D graphics chips and National's system-on-a-chip devices. I don't believe these changes are enough to absorb this massive increase in capacity.

As a result, the x86 processor market could be oversupplied as early as 2H98. An oversupply could result in several scenarios, none of which drive down processor prices across the board.

Supply-driven declines in prices will occur only in those segments where Intel has competition. If Intel's competitors can match only Intel's low-end performance, the situation will be the same as with the 486: stiff competition will drive low-end prices well below \$100 while the prices of Intel's mainstream products remain unaffected.

Over the past couple of years, AMD and Cyrix have managed to match Intel's mainstream performance in many quarters. Intel's rapid pace of product introductions makes it difficult for these vendors to keep up, but assuming they can, excess fab capacity could increase the supply of the midrange chips that represent the bulk of Intel's shipments. This oversupply could touch off a price war that would sap Intel's profits—and erase the profits of the other x86 vendors.

Given the relatively small number of serious x86 vendors, I foresee a more controlled decline. The word "collusion" is too strong, but all involved parties are likely to realize that an aggressive price war is unwinnable, particularly when one party has a \$10 billion war chest. In the DRAM market, there have always been vendors willing to sell at any price to gain market share. No one in the x86 market appears ready to play this kamikaze role.

Even after its fabs are built, Intel can trim capacity by slowing equipment purchases or process transitions. If CPU prices drop too quickly, Intel may be willing to give up a bit of its market share, but not so much that its fabs get too empty. A bit of Intel's share, however, would represent a large gain to its smaller competitors. In the meantime, Intel will try to block its competitors while raising its own performance as quickly as possible, hoping to avoid the need for price cuts by staying ahead of the competition. The ultimate winners in this battle will be PC buyers, who benefit from any reductions in CPU prices. ■