

Challenges of Being Fabless

Fabless Companies Have Been Key Players But Face Many Challenges



The semiconductor industry today comprises an interesting mix of traditional manufacturers, fabless companies, and “chipless” companies. The nonmanufacturing companies have played essential roles in the evolution of the PC industry, and they will continue to do so in the future—but serious challenges loom.

Traditional semiconductor companies are extremely capital-intensive, especially if they want to stay on the leading edge. Intel, which is spending \$4.5 billion this year on capital equipment, is the Goliath of this style of company.

Fabless companies arose because the heart of a new company idea is typically a chip design, not a manufacturing process. Fabless companies take advantage of the huge investments being made worldwide in semiconductor plants. Companies such as TSMC in Taiwan and Chartered Semiconductor in Singapore exist solely to serve as foundries.

Fabless companies have long been an essential part of the PC industry. The first system-logic chip sets were created by Chips and Technologies, and for many years, most chip sets came from fabless vendors. Now, however, Intel dominates the chip-set business. Ownership of a fab was not the deciding factor; it was Intel’s industry leverage and ability to invest. But the result was nevertheless the near-elimination of a major market for fabless companies.

The vast majority of graphics chips for PCs have been made by fabless vendors; industry leader S3 is today’s largest consumer of foundry wafers. Recognizing the risks of its fabless position, S3 has made a \$100 million investment in a partnership with UMC to guarantee part of its wafer supply.

No fab-based company has ever been a major force in graphics, but the history of the chip-set business must be a source of anxiety to fabless graphics-chip makers. Intel’s forthcoming 3D chip could, some fear, do to the graphics-chip industry what Intel’s first Pentium chip sets did to the chip-set industry. There are many reasons why this outcome is far from assured, but it cannot be entirely discounted.

Whether a fabless x86 microprocessor vendor can prosper is another unanswered question. Cyrix is the one company that has persisted in trying to do this, and the task has been challenging. Part of Cyrix’s troubles has come from the company’s lack of access to IBM’s leading-edge processes (in adequate volume and at affordable prices), as well as the relatively long turnaround time for each wafer run. These challenges contribute to Cyrix’s difficulty in competing with the high end of Intel’s product line.

To get even the limited access that it has to IBM’s fabs, Cyrix has paid a steep price. Cyrix paid \$88 million for capital equipment and makes regular prepayments for fixed quantities of future wafers (whether it needs them or not). Cyrix also gave IBM the right to sell Cyrix-designed chips directly to customers without paying royalties.

Cyrix has wanted to use other foundries, but as an x86 processor supplier, it needs more than just wafers—it needs a foundry with an Intel patent cross-license. Unfortunately, Asian foundries do not, in general, have such a license. Ultimately, Cyrix is likely to leave the comfort of a licensed foundry and hope that the patents it has asserted against Intel will give it enough ammunition to drive a settlement.

Cyrix may be able to pull it off, but succeeding as a fabless x86 supplier will be tough. Of the new x86 vendors emerging, most are tied to fabs. Centaur is a subsidiary of IDT, and Metaflow Technologies is now part of SGS-Thomson. Rise and Transmeta remain under wraps, but they may have close ties to foundries. Among the RISCs, it is no coincidence that the fastest processor—Alpha—comes from a company that has its own fab.

An interesting twist that avoids the challenges of being fabless is to go all the way to chipless. This is the model used by companies such as Chromatic, Rambus, and ARM. They aren’t in the chip business at all, but in the intellectual property business. Rambus, for example, gets about 2% of the revenue produced by its DRAM partners—a small percentage that could mean a lot of money if future RDRAMs become the mainstream memory for PCs, as seems likely.

Chromatic has come up with another twist—its chip requires a lot of software, and Chromatic hopes to make most of its revenue selling this software to the chip companies, which then bundle it with the chips. This tactic could enable Chromatic to get, in theory, a much bigger part of the chip makers’ revenue than Rambus can ever get.

Fabless companies will continue to be a vibrant part of the landscape, but some markets—such as high-performance microprocessors—will be difficult for them to succeed in. Intel has already shown that the chip-set business is not safe for fabless companies, and it remains to be seen whether graphics will follow. It is tempting to think that being a fabless chip company is no different from being a book publisher that doesn’t own printing presses—but unless progress in semiconductor technology slows dramatically, the analogy just doesn’t hold. ■

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