

■ **Tillamook to Boost Notebook Performance**

Intel confirmed its plans to produce a 0.25-micron version of its Pentium/MMX processor, which we had reported under the name of Tillamook (see MPR 1/27/97, p. 4). According to the company, the part will be the first to take advantage of Intel's forthcoming 0.25-micron CMOS technology, known as P856 (see MPR 9/16/96, p. 11). Intel did not commit to a launch date for the new Pentium/MMX chip but said it is already shipping samples and has started to build production wafers; these statements point toward volume shipments in the third quarter.

Tillamook aims to fill a gap in Intel's mobile product line between the current 166-MHz Pentium/MMX and the forthcoming Mobile Deschutes, which is due in 1H98. Intel will offer the new part at speeds "exceeding 200 MHz," which we assume means 200 and 233 MHz, giving the mobile community two new speed grades. With Mobile Deschutes likely to start no lower than 266 MHz, Tillamook allows Intel to offer a range of mobile parts with small performance increments from one part to the next.

Tillamook will be available in either a TCP package or a Mobile Module (see MPR 2/17/97, p. 9). It will not be offered in a PGA package, however, discouraging desktop PC makers from adopting it; instead, Intel hopes these system vendors will move to Pentium II.

P856 is optimized for 1.8-V operation, and Intel confirmed Tillamook will use a "sub-2V" supply. The maximum power dissipation will be below 7 W at 233 MHz, much less than the 8-9 W required by current Mobile Pentium/MMX chips. In fact, the new process could yield 266-MHz parts, and possibly even 300-MHz ones, within the current thermal envelope. We don't expect Intel to sell products at these clock speeds, instead encouraging PC makers to move to Mobile Deschutes for more performance.

The die size of the new processor will be about 90 mm². Since Tillamook is an optical shrink of the current P55C design, it will not take advantage of the extra metal layer available in P856 and thus will not reap the full benefits of the new process. We estimate its manufacturing cost to be about \$45, 10% more than that of the 0.35-micron P54C Pentium. Intel, however, is likely to charge a premium for the mobile part; we expect list prices of \$500 to \$600 when the new processor debuts.

Typically, vendors devote the initial wafers from a new IC process to improving the performance of their high-end product, maximizing per-chip revenue. In this case, the new process, with its low supply voltage, is ideal for a mobile product, and Intel needs to fill a gap in its notebook product line between the P55C-166 and the much higher performance of Mobile Deschutes. Given its small die size and likely high price, Tillamook will also provide more revenue per wafer than any other product. —L.G.

■ **Intel, HP Developing Merced Follow-On**

Sources report that Intel and HP are working together to define the second new CPU core in the IA-64 family, following Merced. This effort has evolved from a previous HP effort, code-named after the Gunnison river in Colorado. The new project, which would have been called the P8 under Intel's old naming convention, is in the early definition stage and has not yet received a river name.

Unlike Merced, which is being developed entirely by an Intel engineering team, the follow-on effort takes advantage of HP's main CPU design team, located in Ft. Collins (Colorado). That team designed most of HP's PA-RISC processors, including the PA-8000 and its follow-ons. With the last PA-RISC chip, the PA-8500, approaching tape out, the team is turning its attention to the new IA-64 processor. The new project, however, will be led by Intel. Like all IA-64 processors, the chip will be manufactured and sold by Intel.

We expect the follow-on to Merced to appear in 2001, delivering at least twice the performance of Merced while retaining binary compatibility. It will probably debut in Intel's 0.18-micron CMOS technology.

The report demonstrates that Intel and HP are committed to delivering ongoing improvements in IA-64 performance. By using the design resources of both companies, the partners can deliver new processors more often than either could alone. —L.G.

■ **Intel Trims Most Prices**

Intel's second-quarter price cuts (see MPR 5/12/97, p. 23) were relatively modest. Although the vendor often slashes prices by 20% or more each quarter, most products received only single-digit adjustments this time. The Pentium Pro line, which Intel is no longer emphasizing due to the Pentium II launch (see MPR 5/12/97, p. 1), received particularly stingy cuts.

The price freeze was most pronounced at the low end. Each quarter, Intel typically ratchets a new speed grade down to its bottommost price point, spurring the industry to continually move to faster parts. This quarter, the 120-MHz Pentium remains the bottom of the line. During the past nine months, Intel's low-end clock speed has increased by only 20%. Notebook processors also saw little price progress; none of Intel's mobile products received a price cut of more than 8%.

The 200-MHz Pentium received the biggest price cut, a whopping 48%, after being trimmed just 2% in the previous quarter. When the P55C-200 debuted, Intel held off on dropping the P54C-200 price for fear of confusing end users who buy solely on clock speed. The company now feels the value of the P55C, with its larger caches and MMX, has been established, justifying a lower price for the P54C-200.

Intel also slashed the prices of the P55C-166 and P54C-166 by 25-30%. At a list price of \$209, the non-MMX part is

now at the high-volume “sweet spot” of Intel’s line. The MMX version, at \$270, is close behind, and Intel is counting on that chip to boost the volume of MMX systems in the market. We expect MMX shipments to cross over non-MXX shipments in the third quarter.

The modest price cuts may be due to Intel’s current capacity crunch (see MPR 4/21/97, p. 3). With limited capacity, the vendor has no reason to spur demand with lower prices. The lack of price movement at the low end opens an opportunity for AMD’s K5 to take up some slack, freeing Intel’s capacity for more profitable midrange and high-end chips. Intel saved its biggest price cuts to protect its midrange desktop processors from the K6. The lack of movement at the high end leaves room for Pentium II to extend the vendor’s desktop price range to nearly \$800 for the first time in several quarters. —L.G.

■ Exponential Plans Delayed

Even as Motorola and IBM are deploying PowerPC chips ahead of schedule, fledgling vendor Exponential is falling behind. The startup had hoped to launch a 533-MHz version of its x704 PowerPC processor by the end of this quarter (see MPR 10/28/96, p. 1), but the latest version of the BiCMOS chip still does not reach its target clock speed. The good news is that these parts are functionally clean. The latest plan is to deploy products with clock speeds “in the 400s” by midyear, followed by parts above 500 MHz in 3Q97.

The situation is reminiscent of the problems with another BiCMOS processor, SuperSparc. In both cases, the company’s tools were not good enough to accurately model the timing of the processor, preventing the vendor from finding and repairing critical timing paths in simulation. Instead, the company must fabricate new parts and see how fast they run. In Exponential’s case, this could cause further unpleasant surprises in the future.

In the meantime, the critical question is whether an x704 at, for example, 433 MHz is fast enough. According to the vendors’ SPECint95 estimates, a 433-MHz x704 would be similar in performance to the 250-MHz Arthur (see MPR 2/17/97, p. 10), which is due at about the same time and avoids the socket and thermal design issues of the Exponential chip. The faster Mach 5 (see MPR 4/21/97, p. 1), due in 3Q97, could match the performance of a 533-MHz x704.

Sources indicate that Apple has developed a version of its 9600 system based on the Exponential chip, and that the company remains committed to the new device. Even a 400-MHz x704 would have a higher clock speed than any other PC processor, a number sure to catch the attention of unsophisticated buyers. For applications that make limited use of the x704’s small caches, the Exponential chip may deliver better performance than SPECint95 would indicate.

Given the turmoil at Apple, however, the x704-based product is in a tenuous position. Even in the best case, Exponential is unlikely to be able to charge \$1,000 for its chip, as it had previously hoped, leaving the startup reevaluating its

Letter to the Editor

Dear Jim,

Your article on ARM (see MPR 4/1/97, p. 1) was the pits. I really couldn’t stomach it. It started out highbrow, but soon you showed your cheek. Eye don’t kneed your gall. Everyone nose that Finger is an underhanded and lily-livered attempt to collar the market and so soon will be elbowed out. Next time, bone up on the topic, flesh it out, and try to stay abreast of the subject.

Best wishes,
Jim Slager

Letters to the editor are welcomed and may be sent via e-mail to editor@mdr.zd.com.

financial prospects. —L.G.

■ Chromatic Gains First Design Win

More than three years after its creation, and seven months after shipping the first Mpack media processors, Chromatic can finally announce a customer. The company will also make its own board-level product available through resellers and vertical-market system integrators.

STB Systems will use the Mpack/3600 and version 1.6 of Chromatic’s Mediaware in an as-yet-unnamed DVD add-in card for OEM customers, while Chromatic itself has manufactured 50,000 Mpack Blazer Max add-in cards for sale through a number of domestic and overseas distributors.

STB will not immediately sell Mpack-based cards using its own sales channels, which are among the best in the graphics-card industry. Instead, the first goal of the relationship with Chromatic is to develop OEM interest in Mpack for DVD-playback products. STB expects to announce OEM customers soon and will begin selling cards through retail channels later in the year.

Similarly, the Blazer Max card makes it possible for value-added resellers to add DVD-playback support to their systems. Given the small size of most of the resellers Chromatic has signed up, it is clear the company is primarily looking for feedback on its technology before going after mainstream sales.

These announcements, while a positive step, represent a setback for Chromatic’s plans. The company had originally targeted motherboard design wins for its media processor but has yet to announce a single PC maker as a customer. When it realized it would miss the 1996 holiday season, Chromatic decided to pursue the add-in card market, which does not rely on OEM relationships.

These relatively small initial efforts lay the groundwork for a more concerted push behind Mpack 2 later this year. While Mpack/3600 has good 2D performance and makes a good DVD decoder, its 3D-graphics performance is

not competitive with that of today's mainstream chips. Mpaact 2 should solve this problem and give Chromatic a shot at the big time. —*P.N.G.*

■ First SDRAM Faces Tough Battle

The first product based on work from the SDRAM Consortium is set to sample in early 1998. Siemens is the first vendor to announce plans to produce SDRAM (formerly known as SyncLink DRAM) as a commercial product. Its chips are based on a design from Mosaid that takes advantage of a new 0.25-micron process codeveloped by Siemens, IBM, and Toshiba for 64-Mbit DRAMs.

The SDRAM Consortium—which includes most major DRAM manufacturers—also plans to deploy an evaluation platform for the new memory chips by mid-1998. The SDRAM specification is currently under review by the JEDEC standards body and will probably be released to the public by the end of this review process.

This announcement puts SDRAM on track for 1999 volume availability—but only if these first devices manage to distract Intel and other PC technology vendors from their current fixation with Direct RDRAM (see [MPR 4/21/97, p. 12](#)). If the SDRAM crew can't convincingly demonstrate that their parts will be faster, cheaper, or more widely available than Direct RDRAM, SDRAM may be relegated to niche markets like workstations and graphics adapters.

If the consortium had been able to sample devices last year, its chips might have become Intel's DRAM of choice. Instead, Intel chose Rambus as its partner, putting SDRAM in a difficult position. If SDRAMs lose the fight for the hearts and minds of Intel and PC OEMs, the consortium may have to go back to the drawing board and develop even more advanced devices that could succeed in the post-Direct RDRAM era, at least five years away. —*P.N.G.*

■ UltraSparc-2 Reaches 300 MHz

Sun has announced the first systems using the new 300-MHz version of its UltraSparc-2 processor. The Ultra 2 1300 includes a 300-MHz CPU, 2M of external cache, 128M of main memory, a Creator graphics accelerator, and a 20" monitor, all for \$26,495. For more information on the system, see www.sun.com/desktop/news/ultra2.

Sun had initially expected US-2 to reach 300 MHz by the end of last year (see [MPR 11/13/95, p. 20](#)), putting the chip about six months behind schedule. US-2 is the lead product in Texas Instruments' 0.29-micron C10 process (see [MPR 9/16/96, p. 13](#)), and the company had significant problems bringing up this process (see [MPR 2/17/97, p. 3](#)). TI began producing enough 250-MHz parts for Sun to begin shipments in January; UltraSparc-2 is now yielding well at speeds of up to 300 MHz, enabling volume shipments.

The new system is now shipping and is rated at 10.4 SPECint95 (base) and 14.5 SPECfp95 (base). This integer performance puts the chip roughly on a par with HP's PA-8000 and the 200-MHz R10000 but behind Digital's 21164

and even the forthcoming 300-MHz Pentium II (see [MPR 5/12/97, p. 1](#)). UltraSparc-2 has not yet reached its 18-SPECfp95 target and lags all other high-end RISC processors in floating-point performance. The high memory bandwidth of the chip helps it outperform its rivals on some applications, such as transaction processing and large scientific data sets.

Sun Microelectronics (SME) has also announced immediate availability of the 300-MHz UltraSparc-2. The new CPU carries a 1,000-piece list price of "about \$2,000," on a par with other high-end RISC processors. —*L.G.*

■ Argonaut Licenses ARC to Opti

Following in the footsteps of its English neighbor ARM, Argonaut RISC Cores (ARC) has signed the fifth licensee for its eponymous processor technology. Chip-set maker Opti signed up to embed ARC cores in future core-logic products and other chips. In addition to the ARC core, Opti also licensed Argonaut's existing 3D technology. Opti's agreement makes it the fifth public licensee for ARC, behind Brooktree, Fujitsu, S-MOS, and ULSI.

Although Opti would not discuss its plans for the new technology, the ARC core would be a good AC97 audio controller, giving Opti a programmable device capable of handling 3D sound, wavetable audio, and soft-modem functions. We expect Intel to add AC97 controllers to its chip sets in 1998, so this move should allow Opti to keep pace. The chip-set maker could also use Argonaut's 3D engine to add 3D graphics acceleration to future chip sets.

Like ARM, ARC is a simple 32-bit RISC design developed specifically for ASIC development. Argonaut, however, distributes its core as synthesizable VHDL source code rather than a hard macro, which makes the design user-configurable and independent of fab technology. Although ARC is well behind ARM in the number of licensees, this advantage seems to be winning it new business. —*J.T.*

■ MMX Trademark Conflict Resolved

Cyrix and AMD have each reached agreements with Intel regarding their use of the MMX name. Both companies will credit MMX as an Intel trademark and will use the term in specific ways that are acceptable to Intel. The settlements were triggered by the limited upside for the companies in fighting the trademark, the desire to eliminate the cost of litigation and the potential confusion in the marketplace, and a concession from Intel on how the term MMX can be used.

Sources indicate that Intel initially wanted AMD and Cyrix to use terms such as "MMX compatible" or other lengthier phrases, which the other companies found unacceptable. As part of the settlement, Intel agreed to accept "MMX-enabled" and "MMX-enhanced" instead. AMD will phase out the term "MMX processor," which Intel takes issue with. AMD also extracted from Intel an agreement not to trademark the term AGP. —*M.S.* 