Athlon Is First PC Processor to 700 MHz

Reluctant to cede its recently acquired performance title to Intel's forthcoming Coppermine, AMD has raised the frequency of Athlon by 8% to 700 MHz, becoming the first x86 processor to reach that mark. Coppermine, which we expect to debut later this month at 733 MHz with a 256K on-chip L2 cache, would probably have taken the performance lead from a 650-MHz Athlon on integer code. But the boost to 700 MHz should keep Athlon close to Coppermine on integer code and allow it to retain its large lead on floating point.

AMD says the Athlon-700 achieves a SPECint95 (base) score of 31.1, almost matching the 31.8 posted by the fastest workstation RISC processor, the 667-MHz 21264. Athlon's SPECfp95 (base) score of 23.3 is still well below the 21264's score of 49 but far exceeds the 14.6 of the current Pentium III-600. According to AMD, the Business Winstone 99 (Win98) rating for Athlon-700 is 28.7 (with Irongate chip set, 512K L2, 128M PC100, WD 41800, and TNT2).

AMD's accomplishment should worry Intel. While Athlon has hit 700 MHz in 0.25-micron CS44E, Intel was able to coax Pentium III to only 600 MHz in its 0.25-micron P856.5 process, which, according to our estimates, is a faster process than CS44E (see MPR 8/23/99, p. 1). To break into the 700-MHz realm, Intel has had to resort to its 0.18-micron P858 process. If Athlon's 17% frequency advantage is due to an inherently faster design, it could retake the frequency lead when AMD introduces its 0.18-micron CS50 later this year, and then its 0.18-micron copper process next year.

Of course, AMD must prove that it can produce the 700-MHz speed grade in volume if it is to compete with Coppermine. It is still to early to obtain reliable market data on how well AMD has done so far with its 650-MHz part, but the company claims that Athlon yields are "very good" for all speed grades and that 700-MHz parts are now being produced at high volume with no problems.

Coincident with the 700-MHz introduction on October 4, AMD shifted the prices for all Athlon processors down one speed grade, with the 700-MHz part replacing the 650 at $849 (quantity 1,000). An Athlon-500 now sells for only $209. (See MPR 10/6/99, p. 35 for a full price list.) —*K.D.*

Mobile Celeron Jumps Ahead of Pentium II

In an unusual move, Intel rolled out new speed grades in the Mobile Celeron line that are faster than the top-of-the-line Mobile Pentium II. The new parts operate at up to 466 MHz, while Mobile Pentium II tops out at 400 MHz. This inversion is temporary, as Intel will be rolling Coppermine (Pentium III) into its mobile line next month at clock speeds of up to 500 MHz. The two announcements were originally set to coincide, but the Mobile Coppermine announcement was recently pushed back a month from the previous schedule (see MPR 7/12/99, p. 4).

The Mobile Celeron parts continue to rely on the 0.25-micron process, while Coppermine will use the new 0.18-micron process to achieve power reductions. In fact, Mobile Celeron dissipates 15.6 W (TDP) at 466 MHz, well beyond Intel's traditional 10-W limit. The new Celerons appear to be a response to AMD's Mobile K6-2P, which dissipates up to 16 W. Increasing the power dissipation enables higher clock speeds but requires notebook makers to add more fans or other cooling devices to their systems.

The new Mobile Celeron-466 carries a list price of $209 in a BGA package, while a 433-MHz version is priced at $159 (see MPR 10/6/99, p. 35 for a full price list). These parts will compete against AMD's Mobile K6-2P, which is now available at speeds of up to 475 MHz (see below). The higher power dissipation of the new Celeron parts shows that Intel is not above stealing a trick from its competition—or, as Intel would say, exploiting a growing market niche. —*L.G.*

Mobile K6-2P/IIIP Gain Speed, Market Share

AMD's new mobile strategy appears to be meeting with some success. Since the introduction of its K6-2P and K6 IIIP "mobile" processors (see MPR 3/29/99, p. 4 and MPR 6/21/99, p. 4)—which at 16 W were more like desktop processors than mobile processors—AMD has attained a 67% share of the U.S. retail notebook market, up from its pre-P-part high of 49%, according to *PC Data Hardware Report*. Even though U.S. retail accounts for only a small portion of the total notebook market, AMD's "P" parts are clearly having an impact.

In an effort to maintain its momentum, AMD recently boosted the top speed of its K6-2P to 475 MHz and its K6 IIIP to 450 MHz. Unlike the older "P" parts, however, which operated on the same 2.2-V supply as their desktop equivalents, the new speed grades operate at a 9% lower voltage. The new 2.0-V supply cuts power by 17%, offsetting most of the power increase from the faster speeds.

AMD attributes the higher speed-power product of the new parts to its fab, which apparently discovered one more way to push the performance of its CS44E 0.25-micron transistors. AMD has also rolled this improvement into its desktop line, raising the frequency of K6-2 from 475 MHz to 500.

The boost gives the K6-2P a small frequency lead over Intel's latest Mobile Celeron-466 (see previous item), while the K6 IIIP takes a sizable 13% lead over Intel's top-end Mobile Pentium II-400. According to AMD's benchmark tests, its performance lead is even greater. The K6 IIIP-450, with 1M of L3 cache, bested the Mobile Pentium II-400 by 12% on Winstone 99. On Futuremark's Max CPU 3DMark 99, the K6-2P-475 outran Mobile Pentium II-400 by almost 45%. (AMD: ALi V chip set; Intel: 440BX chip set; both: 64MB SDRAM, ATI Rage LT Pro w/8M, 1024 × 768, 4.0G UDMA HDD.)

The initial success of AMD's "P" processors was probably due to their low price compared with that of traditional 10-W mobile parts. Perhaps in response to this success, last month Intel dramatically lowered the prices of its mobile processors (see MPR 9/13/99, p. 5). Even though AMD will price its new mobile processors aggressively, as the table below shows, the lower price differential may slow its market-share growth. Manufacturing costs of the new parts, however, will not increase, as AMD says the process enhancement required no new fab equipment and did not impact yields.

	AMD Mobile Parts		Intel Mobile Parts	
Frequency	K6-2P	K6 IIIP	Celeron	Pentium II
475 MHz	$209	–	–	–
450 MHz	$189	$320	–	–
433 MHz	$159	$283	–	–
400 MHz	$106	$246	$106	$358
380 MHz	$95	$209	–	–
366 MHz	$85	$172	$85	$187
350 MHz	$74	–	–	–
333 MHz	–	–	$74	$161

This is not the first time AMD has taken the mobile-processor performance lead. Just days after it first grabbed the title with the K6 IIIP-380, AMD saw its bubble burst when Intel pricked it with a 0.18-micron 400-MHz Dixon. Deflated but not defeated, AMD has now recaptured the lead, but may again see its bubble punctured when Intel brings forth its 0.18-micron Mobile Pentium III (Coppermine), at speeds up to 500 MHz. That processor will almost certainly outperform the K6 IIIP-450 and, with SSE, eliminate 3DNow as a differentiator for AMD.

But the tenacious x86 competitor isn't ready to give up yet, saying it will deploy its own 0.18-micron mobile K6 IIIP this year. The company hopes this part will carry it until Athlon can be outfitted with an on-chip L2 and brought into the mobile space with its 0.18-micron copper process, which is now being installed in its new Dresden fab with help from Motorola. —*K.D.*

Rise Revisits Roadmap

Rise Technology is revisiting its roadmap (see MPR 5/31/99, p. 15) in light of the new competitive landscape that has resulted from Via's acquisition of Cyrix and Centaur. The company withdrew its presentation from Microprocessor Forum, where it had planned to describe a Socket 370 chip code-named Tiger. It is now reconsidering whether to focus its resources on Tiger or on the mP6 II, a Socket 7 device with on-chip L2 cache.

Rise had samples of its original mP6 rated at PR333 and PR366 (250 MHz) in a 0.25-micron process but decided not to ship these chips. Instead, it is now sampling these speeds using 0.18-micron silicon and is beginning to ramp up production. The company expects to have PR400 and PR433 chips in production by the end of the year. Pricing for the PR333 and PR366 chips is $43 and $48, respectively.

With Intel's bottom-of-the-line Celeron now at 400 MHz, Rise's current offerings place it below the bottom of the desktop PC market. Company officials say most of the customers are in Asia, with interest coming from makers of consumer notebooks and mininotebooks who are attracted to the chip's low power consumption; the mP6-366 consumes a maximum of 5 W from its 2-V supply. Company officials also indicated that they are receiving strong interest from makers of Linux-based PCs, set-top boxes, and thin clients. —*M.S.*

Nvidia Allies With ALi on Integrated Chip Set

Avid 3D gamers may finally have an integrated-graphics chip set to call their own. Codeveloped by Nvidia and Acer Labs (ALi), the Aladdin TNT2 should greatly outperform existing integrated chip sets, including Intel's 810E (see MPR 10/6/99, p. 30) and SiS's 630 (see MPR 5/31/99, p. 22), on 3D games.

The chip set's core-logic features include everything needed for a high-end PC, including support for a 133-MHz front-side bus and up to 1.5G of PC133 SDRAM with optional Virtual Channel support. The graphics controller supports a separate 64-bit, 150-MHz memory array up to 32M in size. This optional array fully offloads graphics bandwidth demands from the main memory.

As its name suggests, the Aladdin TNT2 includes a graphics controller derived from Nvidia's Riva TNT2 chip. Like the original TNT2, the new chip set has two texture-mapping pipelines, and can render 200 Mpixels/s, twice the speed of Intel's 810E. Unlike the 810E, the Aladdin TNT2 offers 32-bit color and true trilinear texture filtering, making it a better choice for 3D content creators as well as for gamers.

The integrated north-bridge chip is coupled with ALi's existing M1535D south bridge. The set is priced at $33, $6.50 less than Intel's 810E and well below the cost of a comparable core-logic chip set combined with Nvidia's discrete TNT2 chip. The Aladdin TNT2 is sampling now and will enter production by the end of the year. Several motherboard makers have already announced plans to use the new chip set. We expect it to be popular among users as well. —*P.N.G.*

USB 2.0 Speed Goal Raised

The USB Implementers Forum used last month's IDF to announce that it has doubled the goal for USB 2.0 to 30–40 times the speed of the current version. This translates to a rate of 360–480 Mbits/s, matching the speed of today's IEEE-1394 interface. This range gives the interface more headroom for connecting high-speed storage devices and allows multiple devices in the 100-Mbit/s range to share the interface without bandwidth contention. The group expects to release the draft specification in October and the final specification in 1Q00, with products due to appear in 2H00.

Even though USB 2.0 may reach 1394 speeds, the consumer electronics industry is likely to stick with 1394. Thus, PCs that want to connect to digital video equipment will

require both 1394 and USB interfaces. For all other PC functions, USB 2.0 is likely to be the winning interface. —*M.S.*

K8 Loses Architect

AMD's next-generation K8 project has lost a key player. Following the recent departure of president and COO Atiq Raza (see MPR 8/2/99, p. 4), Jim Keller, coarchitect of the K8, has left the company. Keller, who was previously the architect of the Alpha 21264, was hired away from Digital by Raza specifically for the K8 design.

Keller's departure is especially disquieting for AMD coming shortly after the loss of AMD Fellow and K6 architect Greg Favor to startup Siara. Although Favor wasn't working directly on the K8, AMD suddenly finds itself short two top architects. AMD Fellow and IC-process expert Don Drapper has also reportedly resigned.

Although the loses will have an impact on the K8 project, AMD says it will be minor. According to AMD, the K8 definition is already complete, and the remainder of the team remains intact. Fred Weber, coarchitect of the K8 along with Keller and Dirk Meyer, has assumed responsibility for the K8 project. Keller's high-speed logic-design experience will be sorely missed, but luckily AMD still has Meyer, chief architect of Athlon, and previously coarchitect of the 21264 with Keller at Digital, to fill that gap. AMD insists that the K8 schedule will not be affected and the chip remains on track for 2001 delivery.

The reasons for Keller's departure are not known, but it may have been precipitated by the departure of Raza, who was highly respected by the engineers and was considered by most to be AMD's best hope for success against Intel. Assuming that AMD can prevent further defections, Keller's loss may not be too serious. Athlon is looking good and still has the potential to return AMD to profitability in the near term. Meyer's design team in Austin remains solid, and if he can coax enough out of Athlon to stay within marketing distance of Willamette, he could buy enough time to make up for any delay Keller's departure may cause. —*K.D.*

Clarification

The article "Mercy, Mercy, Merced," which appeared in the previous issue of *Microprocessor Report*, should have been identified as a Guest Viewpoint. From time to time we publish viewpoint articles as a way of exposing our readers to a variety of opinions and to provoke debate on timely issues. Guest viewpoints, however, do not necessarily represent the opinions of MicroDesign Resources analysts or the editors of *Microprocessor Report*. —*Editor* M