Most Significant Bits

AMD Adds 40-MHz 386SX

Continuing its clock-frequency leadership in the 386SX market, AMD has raised its maximum clock rate from 33 to 40 MHz. AMD's 386SX-40 is in production now and is priced at $43 in thousands. It's amazing what nine months of competition can do; at the start of this year, Intel's fastest 386SX was 20 MHz, priced at $82.50, and AMD's fastest was 25 MHz, priced at $76. In the course of the year, AMD has raised the clock rate 60% while lowering the price for the top clock speed by 43%. AMD's 25-MHz 386SX now sells for a mere $38, half of its 1Q92 price.

AMD claims to have captured 45-50% of the 386 market, and a major contributor to AMD's success is that it has offered 386 chips at higher clock rates than Intel. When AMD introduced its 386SX, it offered a 25-MHz version, while Intel offered only 20 MHz; Intel later added a 25-MHz version, and AMD jumped up to 33 MHz; now AMD has taken the final step to 40 MHz, so they offer two clock rates above Intel's.

AMD estimates that 40% of its 386SX business is at the 33-MHz clock rate; notable customers include AST Research and Digital Equipment Corp. DEC, which has been particularly close to Intel, is an exceptional win for AMD. The high clock rates have also been dominant in AMD's 386DX business; 80% of AMD's 386DX shipments are the 40-MHz version.

Intel Moves 486SX Up a Notch

Intel has also raised its maximum clock rates, with the 486SX now offered in a 33-MHz version. It is in production now and costs $189 in thousands. Intel's 33-MHz 486SX brings that chip one step closer to clock-speed parity with the 486DX. Until now, the 486SX has been limited to 25 MHz. Since the 486SX uses the same chip design and process as the 486DX, it presumably can run at the same clock rates. Intel has limited the 486SX to lower clock rates to keep it from cutting too deeply into 486DX sales, which have a much higher profit margin. (The 486DX-33 in plastic is $317, 68% more than the SX version.)

Power dissipation in the PQFP package is another factor that limits the clock rate. The 486SX is available in both PQFP and PGA packages, however, so there is no techni-

cal reason why the PGA version could not be offered at the same 50-MHz clock rate as the 486DX.

Intel has recently switched its 486SX production from defeatured 486DX chips to a redesigned version that eliminates the FPU, shown in the photo below.

Intel no doubt felt pushed to raise the 486SX clock rate by competition from Cyrix's 486DLC-33 and AMD's 386DX-40, which are in the same performance league as the 486SX-25. System vendors are no doubt eager for the chip; since they already have 33-MHz 486DX system designs, it gives them a new system configuration with no R&D investment.
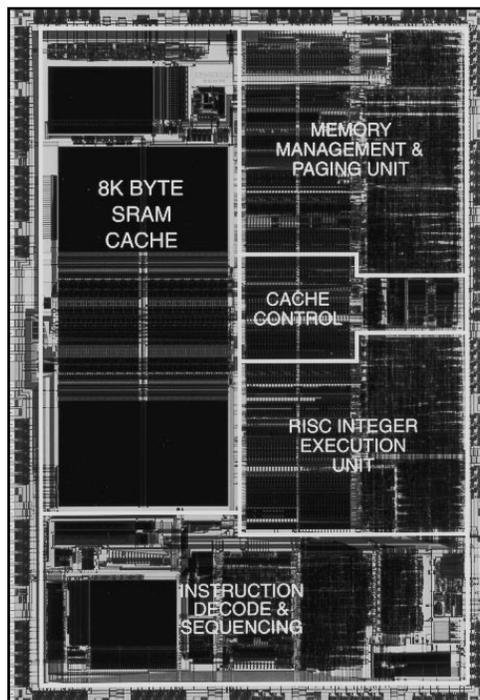
HP Takes Performance Lead with PA7100

HP took the wraps off of its first systems using the PA7100 microprocessor *(see **060406.PDF**)*, revealing the Models 887 and 897 HP-UX servers and the Model 987 for MPE customers. All three systems use a 96-MHz PA7100 processor and achieve 78 SPECint92 and 142 SPECfp92. These figures are about 10% higher than the estimates given at Hot Chips in August and make the PA7100 the fastest microprocessor shipping today. Pricing starts at $92,000 for the 887, and the products are available now. HP has not yet announced any PA7100-based workstations.

Although the 7100 is not available at the chip level, HP is offering it as part of a processor module that includes the CPU along with cache memory. Models range from the PA71051, with a 50-MHz CPU and 128K of cache, to the PA71103 at 100 MHz with 2M of cache. The modules are 4.1×4.4 inches and are about 1.2 inches tall, including the heat sink. They use a 100-pin connector to interface the processor to HP's P-BUS, which can run at a lower clock rate than the CPU. HP has not announced pricing or availability for the modules.

Die photo of Intel's redesigned 486SX, which measures approx. 1×1.5 mm (410×589 mils).

IBM Counterpunches with 62.5-MHz POWER

Just after the HP announcement, IBM announced two new RS/6000 systems using a 62.5-MHz POWER chip set. The deskside Model 580 and the rack-mount Model 980 both achieve 59 SPECint92 and 125 SPECfp92, with a rating of 126 on the old SPECmark89 suite. Both systems use a selected version of the

chip set used in the Model 970 *(see **0607MSB.PDF**)* and include a 32K instruction cache along with a 64K data cache. The performance numbers are exactly 25% higher than the 50-MHz 970, indicating that IBM has not made any compiler enhancements lately. The base price of the 980, which has more I/O expandability, is $114,500. The 580 brings a significant reduction to the cost of high-end POWER with a base price of $62,500. (There is no Model 570, so the 32K cache has previously been available only in a large, rack-mount system.) Both systems will ship this month.

IBM also noted that first silicon for the PowerPC 601 was received in August, precisely as originally scheduled. Systems using this chip are expected to ship in 3Q93. The 601 is fabricated using the same CMOS4 process used for the 970/980 chips. The low-end Model 220, which currently uses the single-chip RSC processor, will be field-upgradeable through a board swap to the 601. To tide users over until then, a faster version of the RSC (probably around the 42 MHz range) will be available around 1Q93.

AMD Offers Cost-Reduced 29000 Variant

AMD has introduced a cost-reduced version of its 29200 processor (see µPR 11/20/91, p. 1), which combines in a single chip a 29000 core, memory controller, DMA controller, timer, serial and parallel ports, and a video interface for laser printers. The new 29205 provides only a 16-bit bus interface and trims the number of address lines, interrupts, DMA control signals, I/O pins, and power and ground pins to fit into a less-expensive 100-pin PQFP. (The 29200 is packaged in a 168-pin PQFP.) Initially, only a 16-MHz version is being offered, priced at $34 in thousands. Samples are available now, with production planned for 1Q93.

The 29200 was designed to provide a low-cost, highly integrated laser printer controller, but the functions it provides are applicable to many embedded applications. The lower price of the 29205 brings it into direct competition with Motorola's 68300 family, which offers lower performance but has a wider range of devices and a massive user base. Embedded RISCs are just now reaching significant unit volumes (millions per year), and AMD has recognized that the key to dramatically bigger markets is lower prices, not higher performance.

AMD recently captured another significant laser printer design win: the 29000 (not the 29200) is used in Compaq's new Pagemarq 15 and Pagemarq 20. The lower-end 15-ppm printer uses a 16-MHz 29000, while the 20-ppm version uses a 20-MHz processor with a 128-Kbyte cache. These new printers offer internal network interfaces, resolution up to 800×400 dpi, 11" × 17" paper, and optional fax modems.

With Compaq's brand recognition and distribution channels, these printers could become a significant factor in the mid-range laser printer market. The 29000 is also used in HP's LaserJet IIIsi and Apple's LaserWriter II NTR. If AMD can convince HP to switch its high-volume LaserJet II line from the 68000 to a 29000-family processor (such as the 29205), it could become the new standard for laser printers. AMD's arch competitor, Intel's 960 family, has a few laser printer design wins but they are mostly in high-end models that don't have the same volume potential.

Motorola Adds 68306 Embedded Processor

Motorola has added another low-end member to the 68300 family. The new 68306 is based on the 68EC000 core; unlike the 6833x and 6834x devices, it does not have a 32-bit CPU core or use Motorola's standard intermodule bus. In addition to the CPU core, the 68306 includes a 68681-equivalent dual UART, a DRAM controller, an interrupt controller, programmable chip selects, and 16 parallel I/O lines. Priced at $8.95 in quantities of 10,000, this chip is aimed at the high-volume embedded applications in which the 68000 family has long held a leadership position. Samples are promised for 4Q92, with production in 2Q93.

The 68306 is the first 68300 family member designed using a standard-cell method; the peripherals on the 68306 are implemented in 12,000 gates of standard-cell logic. Previous devices have been full-custom designs, which typically result in a smaller die size but take longer to create. Motorola's adoption of this design approach suggests that a proliferation of customized 68000-family versions may be in the works.

Motorola also announced higher-speed versions of the 68330 and 68340 processors. The 5V versions are now available at 25 MHz (formerly only at 16 MHz), and the 3.3V version of the 68340, formerly limited to 12 MHz, has been raised to 16 MHz. All are available now. Pricing for quantities of 10,000 (in 1993) is set at $14 for the 68330, $21 for the 68340, and $23 for the 3.3-V 68340V.

Star Semi Upgrades SPROC DSP Chip

By moving to a 0.8-micron process, Star Semiconductor (Warren, NJ) has upgraded its SPROC-1400 digital signal processor chip from 20 to 50 MHz while cutting the price 33% to $74 (in quantities of 1000). The SPROC chip has an unusual architecture, with four on-chip processors providing parallel computation resources. SPROC is also distinguished by its high-level design environment, which allows systems to be designed and debugged by modeling them with traditional analog function modules. The "SPROCcells" function library now has over 200 elements.

Star plans to offer the SPROC-1400 in plastic packaging for under $50 by the end of 1993. To further reduce costs for less demanding applications, 1- and 2-processor versions are in development and are promised for production in 1993. Volume pricing of the single-processor version is expected to be under $15. ♦