MOST SIGNIFICANT BITS

Sun Signs Four Java Chip Makers

Sun Microelectronics has announced the first four intended licensees for Java microprocessors. LG Semicon, Mitsubishi, NEC, and Samsung are expected to begin manufacturing Java chips for both commercial use and internal consumption in 1997.

None of the four companies is yet a licensee; each has signed a "memorandum of understanding" avowing interest in the Java chips, but the details of each license agreement are still being negotiated. Assuming all goes well, each vendor will receive from Sun a design package including RTL models, simulation tools, test vectors, and other deliverables.

All four potential licensees have several characteristics in common: large manufacturing capacity, a brand name in consumer electronics, a major market presence and distribution channel, and commitments to use Java chips for internal consumption. This strategy was deliberate, and Sun expects to increase the ranks of Java-chip manufacturers within a few months, adding vendors from the U.S., Europe, Taiwan, and Japan. We believe Philips, Motorola, Toshiba, and Hitachi may be among the second-round candidates.

Part of the licensee selection criteria involved commitments for substantial internal consumption. None of the four companies has said publicly what they intend to do with their Java chips, apart from some musings regarding cellular telephones, intelligent home appliances, and network computers.

Currently, Sun is licensing only the PicoJava core, not the peripheral logic or bus interface used on MicroJava *(see* **1002MSB.PDF** *)*. Each licensee will develop its own application-specific implementations, possibly competing head-on with Sun's own versions of MicroJava. At this stage, Sun is more interested in seeding the market with Java processors (and collecting royalties therefrom) than in dominating the market with its own implementations.

Each of the licensees already has at least one embedded microprocessor line, although each emphasized that the Java core was not intended to replace any current product line. Mitsubishi, for one, recently launched its new embedded CPU/DRAM family with the M32R/D *(see* **100702.PDF** *)*. Since all four vendors are major memory producers, future chips that merge a PicoJava core with substantial amounts of on-chip DRAM might not be far off.

Separately, Sun announced the first customer for Java chips: Northern Telecom. The telecommunications giant plans to embed Java processors in future telephones for home and business use. These telephones would be able to access the Internet in addition to their standard functions, so the Java chips would be useful in executing downloaded content. The Java phones are expected to begin appearing next year. Given the interest level of four major chip makers, more customers must be in the pipeline.

AMD Boosts K5 to 100 MHz

As both Intel and Cyrix announced parts with Pentium-200 performance *(see* **100801.PDF** *)*, AMD has just reached the 100-MHz level with its K5 processor. The company reaches this milestone a bit ahead of schedule; when it announced its 90-MHz K5 *(see* **100401.PDF** *)*, AMD expected volume shipments of the 100-MHz version in 3Q96.

The company has changed its nomenclature for the device. Originally code-named the K5, the part was first announced as the 5K86. Now the company has backtracked, using K5 as the official product name. AMD continues to compare its parts to Intel's using the P-rating system, but it now uses the suffix PR instead of merely P. (Cyrix continues to use the P suffix.) Thus, AMD's new chip is known as the K5-PR100, with performance similar to that of a 100-MHz Pentium processor.

The PR100, now shipping in volume, is priced at $84 in quantities of 1,000, a whopping 37% below Intel's list price for the Pentium-100. AMD is committed to delivering its K5 chips for at least 25% less than Intel's prices. The company has cut the price of its K5-PR90 to $67 and the K5-PR75 to $55. These prices mirror the relatively small gaps between Intel's Pentium pricing at 75, 90, and 100 MHz.

Moving to the Pentium-100 level ahead of schedule helps AMD, but the gain is not enough to propel it above the $100 price point. In fact, the price of AMD's best K5 chips has dropped from $99 to $84 in less than three months, despite the clock-speed boost. At these prices, profitability for AMD's chips is poor, and the company is restricted to the lowest-price portion of the market, preventing it from gaining significant share.

The next step for the K5 is a new version that AMD expects to boost per-clock performance by 20%. The company plans to ship this enhanced K5 by September. With Intel moving the low-end market to the Pentium-120 by the end of the year, AMD needs this version to keep pace and perhaps even get prices into three digits again.

First PA-8000 Workstations Appear

After a three-year hiatus, HP is again shipping the industry's fastest workstations. The HP9000 Model C180-XP, using a 180-MHz PA-8000 processor with 1M of instruction cache and 1M of data cache, delivers 10.8 SPECint95 and 17.2 SPECfp95 (base), surpassing the fastest Alpha workstations from Digital. The HP system has an entry price of $49,850 in a configuration with 32M of memory, a 2G disk, and a 17" color monitor. The company also offers a 160-MHz system, appropriately called the Model C160, that has an entry price of $22,520.

These systems are the first workstations from HP to include PCI expansion slots. HP sells PCI-based personal computers and can now use the same PCI cards in both

product lines. IBM and Digital, which both also have PC and workstation lines, also offer RISC workstations with PCI slots. The HP workstations do not, however, take advantage of any PCI-based devices on the motherboard. In the future, HP may be able to lower its build costs by using standard PC chips for basic I/O and networking functions.

The company also formally announced K-class servers using the PA-8000, which it has been shipping since April *(see* **1005MSB.PDF** *)*. The HP9000 K260 and K460 support up to four 180-MHz processors and come standard with 128M of memory. Prices start at $62,245. Because these systems are designed with many banks of memory, SPECfp95 performance is slightly better than on the C180; the K460, with 32-way interleaved memory, rates at 18.3 SPECfp95 (base). The SPECint95 score, which mainly focuses on CPU-cache interaction, is unaffected by this change to main memory.

The photo at right shows the PA-8000 chip mounted to a daughterboard with dual external 1M caches. To support the two 128-bit data paths to the caches plus tag bits, control signals, and the 64-bit system bus, more than 1,000 connections are required between the die and board. Many of these connections carry power; the PA-8000 consumes well over 40 W peak. (The company would not provide more precise figures.) Instead of using an extremely expensive PGA package, HP mounts the die to the board using flip-chip attachment, completely eliminating the package.

The new announcements are a huge step forward for HP, raising the SPECint95 performance of its high-end workstations by more than 2.5× in one fell swoop. The company gained prominence in the workstation industry in the early 1990s by grabbing the performance lead with its original PA-RISC systems, but HP lost the workstation performance lead to Digital in 1993. The PA-8000 overcomes the disappointment of the PA-7200 and thrusts HP back into the spotlight. It may be difficult to stay there, however; Digital continues to aggressively push the clock speed of its Alpha chips and is likely to surpass HP's performance soon.

TI Promotes 0.25-Micron Effort

In a widely publicized nonannouncement, Texas Instruments hyped its forthcoming 0.25-micron CMOS process. The company believes this process, which it refers to by its effective gate length of 0.18 microns, will eventually enable chips with as many as 125 million transistors. Even with such an advanced process, such a design would be quite large, 19 × 19 mm, and expensive to build. Furthermore, the only way to reach such high transistor counts would be to devote most of the transistors to memory. Intel, for example, today builds a 30-million-transistor cache chip for the Pentium Pro in 0.35-micron CMOS.

The new process is a future derivative of TI's EPIC-4 process *(see* **090905.PDF** *)*. The company is currently sampling UltraSparc-2 processors built in a 0.29-micron version of EPIC-4 and expects these parts to reach production in 3Q96. The first products in the 0.25-micron process are scheduled to sample late this year, with volume production in 1H97. The company did not disclose specific product plans, but the first devices are likely to be versions of UltraSparc-2 and TI's multiprocessor MVP DSP. Neither of these chips is likely to approach 125 million transistors.

Of course, many other vendors are also developing quarter-micron processes. If TI can stick to its schedule, it may be one of the first to reach this milestone; Intel, for example, does not expect to ship 0.25-micron parts until 2H97. These advanced fabrication processes will certainly give chip designers a significant increase in transistor count to play with. But don't expect a 100-million-transistor CPU chip in the next few years.

Sigma Launches MPEG-1 for Video CD

Sigma Designs (Fremont, Calif.), formerly a graphics-board vendor, has recently redirected its business to become a multimedia component supplier. The RealMagic EM8000 is the first product released under this new guise.

The EM8000 is the first chip to integrate MPEG-1 audio and video decoding plus X-Y scaling in a single device. Based on horizontal and vertical bilinear interpolation, the Sigma chip's proprietary video-scaling scheme permits the display of a clear video image in sizes ranging from a postage stamp to a full screen.

This chip is well designed for video CD players. These devices are popular in Asia, where they are used as karaoke machines and movie players, but they have seen little action in other geographical areas. Within one or two years, these systems will be obsoleted by DVD players.

The chip also has a glueless interface to the ISA bus, enabling EM8000 PC add-in cards. These would be most useful in older PCs, as most recent Pentium systems can perform MPEG-1 decoding in software.

Sigma offers a reference design to OEMs with a complete turnkey manufacturing kit. The EM8000 is sampling now, with full production expected in 3Q96. The unit price is $41 in 1,000-piece quantities. This price is a bit expensive, even for the level of integration offered; MPEG-1 video decoders sell for $25 or less, and audio is easily handled by the host CPU. The EM8000 will be more useful in a standalone video system than a PC. M