

Most Significant Bits

C&T Cancels 386SX, 486 Programs

In the first tangible indication of fallout from the 386 price wars, Chips and Technologies announced that it is abandoning development of discrete x86 microprocessors and will focus its future efforts on integrated processor/system logic chips, such as its PC/Chip. C&T says that its Super386DX is now in production, and the company will continue to market this device. The SX version will not be produced however, primarily because the collapse of prices provides little incentive to do so. The company reportedly laid off about 70 people involved with the 386 and follow-on projects.

C&T has suffered from numerous delays in product development. Its Super386 line was announced last October, with production promised for late in the first quarter of this year, but volume shipments are only now beginning. In the meantime, Intel has become even more aggressive, Cyrix has entered the market, and Texas Instruments is preparing to begin shipping Cyrix-designed processors. Delays in shipping its chips caused C&T to lose many early customers, and rapidly falling prices took away much of the profitability.

C&T apparently felt the need to make this announcement because it has been briefing customers on future product plans, including higher performance discrete processors, which it has now canceled. Recent press reports have suggested that C&T was accelerating its 486 efforts in response to falling 386 prices. Now it appears that the company realized that 486 prices are likely to follow the same path, and it is focusing its resources on follow-ons to its PC/Chip product.

C&T is developing an enhanced version of PC/Chip that replaces the CGA display controller with a higher-resolution VGA controller; this device is planned for production in the first half of '93. A future version with a 386 core, instead of the high-speed 8086-type core in the current device, is presumably in the works, but C&T declined to comment on plans for such a product.

Intel Slashes 386SL Prices

Intel's third-quarter pricing shows a dramatic cut in 386SL prices, with the 20-MHz version without cache support dropping 43% from \$84 to \$48, putting it under the \$59 price of a 20-MHz 386SX. Intel did not reduce its 386SX prices, which were slashed last quarter; it appears that Intel's strategy is to sell the cache-less 386SL against other vendors' 386SX chips for the low end of the market. Prices for 386DX chips dropped only a few dollars, with the 33-MHz version now priced at \$116 in plastic or \$122 in a PGA.

Intel announced its reduced 486SX prices for the third quarter earlier this summer, and no further re-

ductions have been announced. While the official price (in 1000s) is \$99 for the 20-MHz version in plastic, industry sources say volume prices are below \$80.

Prices for the 486DX were trimmed slightly. The 25- and 33-MHz versions dropped 10%, from \$406 to \$367, while the 50-MHz chip fell 6%, from \$570 to \$536. The 486DX2-50 price also dropped 6%, from \$517 to \$487.

Intel Announces 66-MHz 486DX2

Setting a new high-water mark for the x86 architecture, Intel has formally announced the 486DX2-66. This chip is pin-compatible with a 33-MHz 486DX but operates internally at a 66 MHz rate. It is priced at \$682 in quantities of 1,000, and it is in production now. The DX2-66 should all but obsolete the DX-50, since it works in a lower-cost, more common 33-MHz system design and provides higher performance.

The clock-doubler technique is essential for enabling mainstream PC system vendors to reach the 66-MHz clock rate. Many of them managed to build 50-MHz systems, but with considerable difficulty, and true 66-MHz systems would be very difficult for low-tech PC makers. Even in the workstation world, only HP has shipped 66-MHz systems.

Intel characterizes the chip's performance as about 70% faster than a 486DX-33. Intel claims a SPECint89 performance of 34.0 and a Dhrystone 1.1 MIPS rating of 54. The Dhrystone rating is next to meaningless, since the program fits in the on-chip cache; as a result, the 486DX2-66 is fully twice the speed of a 486DX-33 on this benchmark. Taking the more realistic SPECint89 ratings, the DX2-66 is a surprising 80% faster than the DX-33, 34% faster than the DX2-50, and 21% faster than the DX-50.

While Intel has established a high-quality performance measurement group, the marketing and PR departments continue to ignore much of its work. The press kit did not include any breakdown of the SPECint89 results, any SPECfp results, any SPEC92 results, or any BAPCo results. For a chip that is claimed to be in full production with dozens of system vendors ready to ship products, this is inexcusable.

Intel claims to have already shipped over 20,000 units of the 486DX2-66; the company is clearly following its new strategy of announcing products after full production has begun. Over 300,000 units of the DX2-50, introduced in March, have been shipped.

The 486DX2-66 has been announced only as an OEM product, but an OverDrive version is planned. Two OverDrive versions are likely, as with the DX2-50: one that is essentially just a DX2-66 with a heat sink and retail packaging, for upgrading existing systems

that don't have an OverDrive socket, and another version in the slightly different pinout required by the upgrade socket for newer systems. As with the DX2-50, well-designed 33-MHz systems should be upgradeable, subject to power consumption, heat dissipation, and BIOS speed sensitivity issues.

NexGen Developing Two-Chip P5 Competitor

According to press reports, NexGen Microsystems is developing a two-chip competitor to the P5 that will be marketed in Japan by a joint venture with NexGen investor ASCII Corp. This chip set is rumored to be a reimplementation of the existing eight-chip design in Hewlett-Packard's 0.5-micron process. Using HP as the foundry not only gives NexGen access to leading-edge process technology, but it may also provide protection from claims of patent infringement by Intel.

While press reports characterized the chip set as a P5 clone, this is an exaggeration; it is not derived from the P5 design. As a two-chip set, it will not be pin-compatible with the P5, and it is unlikely to include the P5's architecture extensions, since Intel has not yet released the specifications for that device. It will be aimed at the same market as the P5, however: higher-performance, 486-software-compatible systems.

Although some reports claim that the chip set will be introduced this fall, NexGen has yet to publicly announce or demonstrate any product, and the chance of a fall shipment date seems remote. NexGen's two-chip design is unlikely to beat the P5 to market, and it remains to be seen whether it will match or beat the P5's price or performance. The company did recently close a new round of financing from private investors, giving it another year or so to generate revenue before it runs out of money again. Total investment in the company is rumored to be close to \$50 million.

IBM Selling 386SLC Processor Modules

As if Intel didn't have enough to worry about with AMD, Cyrix, TI, and maybe NexGen, IBM is now indirectly competing in the microprocessor market as well. IBM's first customer is Reply Corp., a maker of Micro Channel systems. Although IBM is prohibited from selling the chips alone by its agreements with Intel, it is allowed to sell boards, and apparently this can be as little as a CPU chip on a circuit board with some interface chips.

If appropriately priced, IBM's 386SLC could be a strong competitor to 386SX chips from Intel and AMD and 486SLC chips from Cyrix and TI. IBM's newer 486SLC2, which has a larger on-chip cache and a clock doubler, would be an even more potent competitor. (Note that IBM's 486SLC2 has no relationship to Cyrix's 486SLC, except that both have 486-like CPUs and are 386SX-pin-compatible.) IBM's biggest barrier will be the need to sell the chips as part of a board.

LSI Ships Updated SPARC Chip Set, IU/FPU

LSI Logic has begun shipping the SparkIT-40/MBus, an updated version of its long-delayed MBus chip set. The new devices in the chip set are the L64855 SBus graphics controller and the L64831 integrated IU/FPU; the remainder of the set is the same as originally announced over two years ago. With a chip-set price of only \$629 (in quantities of 100 per month) including the processor, LSI believes that it will make possible an under-\$5000 color SPARCstation.

LSI is also offering a complete manufacturing kit. Unlike the SPARCstation-10 design, the basic design includes the CPU on the motherboard for minimum cost, even though it is MBus-based. The chip set is supported by Solaris 1.x.

The new L64831 IU/FPU follows in the footsteps of similar integrated SPARC processors from Fujitsu and Weitek. LSI claims that its device offers a floating-point performance increase of "up to 25%" more than its competitors because of the faster FPU core. The processor alone is priced at \$168 in an MQUAD package, or \$206 in a ceramic PGA, in 100s.

LSI faces a tough battle in finding a sizable market for this chip set. MBus chip sets are already on the market from Fujitsu, Nimbus, and Cypress, and the market for SPARC-based systems outside of Sun's own products remains small. Even more daunting for LSI is the prospect of systems due this fall using the Tsunami processor/system logic chip from TI and an integrated peripheral chip set from NCR, which will provide a much higher level of integration and should therefore have significantly lower production costs.

HP Licenses PA-RISC to Winbond

Hewlett-Packard has signed up another PA-RISC licensee: Taiwan-based Winbond Electronics Corp. Winbond will design and manufacture PA-RISC chips for embedded applications. Winbond recently completed construction of a submicron CMOS fab, in which it will build the chips for sale primarily to Asian customers.

For a company seeking to enter the high-performance embedded microprocessor market, PA-RISC may indeed be a reasonable choice. The leading embedded RISCs, AMD's 29000 and Intel's 960, are not available for licensing. SPARC is an option, as is MIPS, but neither has any compelling advantage over PA-RISC for the embedded market. Given HP's need to gain licenses in an attempt to achieve critical mass for the architecture, the licensing terms are no doubt quite liberal.

Nevertheless, it isn't clear how much this will help establish PA-RISC. HP will presumably get some royalty stream, but this is about the only benefit; having embedded controllers available using the architecture won't do anything to bolster PA-RISC's position in the workstation arena. ♦