

UMC Announces Enhanced 486SX-Compatible U5S Offers About 30% Higher Performance at Same Clock Rate

by Michael Slater

With all the attention on the high end, Intel has a new competitor to face at the low end. As expected, United Microelectronics Corp. (UMC) has entered the 486 market with a 486SX-compatible microprocessor based on a design licensed from Meridian Semiconductor, based in Irvine (Calif.) and now part-owned by UMC. The effort dates back to early 1991, when Meridian announced that it had completed a TTL breadboard for its superscalar design and was seeking a semiconductor partner (see MPR 3/6/91, p. 7). UMC is Taiwan's second-largest semiconductor maker and, with shipments of 700,000 system-logic chip sets per month, it claims to be the largest supplier of such chips worldwide.

UMC calls its 486SX family the U5S. Clock rates of 25, 33, and 40 MHz have been announced, but most current production is at the two lower speeds. Because the chip has a more aggressive microarchitecture than Intel's 486, it delivers higher performance at the same clock rate. According to UMC's benchmarks, the performance advantage ranges from 23% on Landmark 2.0 to 48% on the PC Magazine 486 mix (version 6.0).

The chip is available in either a 486SX or 486DX 168-pin PGA pinout, though neither version has an on-chip FPU. Versions operating at 3.3 V are offered in a 208-pin QFP as well, at either 25 or 33 MHz. All versions have built-in SMM, which is hardware- and software-compatible with AMD's implementation. Typical power consumption at 33 MHz is 0.7 W at 3.3 V, or 2.3 W at 5 V, about 20% less than Intel's 486SX. The processor is built in a 0.6-micron (effective), two-layer-metal CMOS process.

Taiwanese motherboard makers ASI and Chain-tech have placed orders for more than \$6 million worth of U5S processors.

Focus on Asia and Europe

UMC plans to market the chip only in Asia and Europe. This is partly a matter of business focus: UMC has close relationships with many Taiwanese motherboard and PC makers but no marketing or support organization in the U.S. Intel's relationships with most Taiwanese motherboard makers are poor, making these companies eager to do business with a local vendor.

Intellectual property concerns are another factor influencing UMC's strategy of not marketing in the U.S. The U5S design is based on a different microarchitecture than Intel's 486, and a clean-room design method was

used for the microcode, so copyrights are probably not an issue. Patents are another matter, however. UMC and its design partner, Meridian, believe that they have designed around all of Intel's patents, but Intel has taken the position that any software-compatible chip must infringe at least one patent.

UMC has already taken action to invalidate the French and Taiwanese equivalents of Intel's '338 patent, which covers the 386 memory-management architecture. UMC's claims are based on prior art that allegedly anticipates the Intel patent and therefore makes it not novel. In the U.S., this patent was at the heart of recent litigation between Cyrix and Intel (see [080202.PDF](#)), which resulted in an out-of-court settlement that granted Cyrix a license to two claims of this patent. The settlement was reached one week into the trial, just before Cyrix was to present its evidence of prior art that anticipated the '338 patent. Several sources believe that this patent could not survive a sustained legal attack.

Other makers of x86-compatible chips also claim that their designs work around Intel's patents, but all have chosen to avoid fighting this battle in court and have instead relied on foundries holding Intel patent licenses. This is not an option for UMC, since its purpose in entering this market is to create high-value products from its own fabs. Taking legal action in Europe or Taiwan is surely more difficult for Intel than in the U.S., but it nevertheless seems unlikely that Intel will allow UMC to go unchallenged. UMC could be the first company to attack Intel's patent position head-on, both by attempting to overturn key Intel patents and by asserting that its design does not infringe the patents.

If boards or computers using UMC's chips are imported into the U.S., Intel is likely to take legal action to stop them at the border—an approach it has already tried against Taiwanese PC maker Twinhead in a failed attempt to enforce its '338 system-level patent claims. UMC reportedly is telling its customers that products using the chips are not to be exported to the U.S. While

Price & Availability

No pricing has been released, but UMC's strategy is to offer pricing similar to Intel's at the same clock rate while delivering higher performance.

UMC does not market its chips to customers in the U.S. Companies in Europe and Asia can contact UMC in Hsin-chu City, Taiwan, at 035.782258, fax 035.774767.

UMC can't enforce this, motherboard and system makers won't want to face a legal challenge from Intel, so systems with UMC's chips are unlikely to be seen in the U.S.

Moving Upscale

Although the focus on systems that aren't made in or shipped to the U.S. limits UMC's impact somewhat, it could still be a major force in the worldwide processor market. UMC has established relationships with dozens of PC makers via its chip set business, and it has a ready customer base in Taiwan. The emerging market in

mainland China is another major opportunity for UMC.

The U5S is only the start of the company's x86 product line: 50-, 60-, and 100-MHz 486SX2, DX2, and DX3 processors are promised for introduction within 6 to 12 months, and highly integrated processor/system logic chips are also under development.

By offering higher performance in a pin-compatible device, UMC offers makers of 486 systems an easy way to boost their performance. A 100-MHz, 16K-cache version of UMC's 486 could outperform the DX4 and extend the life of the 486 architecture. ♦