Hyperstone Drops Power Below 100 mW

Newer E1-32X RISC/DSP Slashes Power Consumption In Conservative Process

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by Jim Turley

Hyperstone has nudged its unusual hybrid CPU/DSP a step forward on the technology curve, shrinking the part's die size and power consumption even as it doubles the amount of on-chip DRAM. The new E1-32X, due to begin shipping in 1Q98, should help Hyperstone keep its toehold in the growing niche for embedded signalprocessing applications.

Speaking at October's Microprocessor Forum, Hyperstone's marketing manager Manfred Schlett detailed the changes his company made in moving from the current generation to the next. The alterations were evolutionary, and the E1-32X remains pin- and software-compatible with current parts. But the changes should be welcome to makers of instrumentation, digital cameras, and mobile communications systems.

New Design, Process Drop Power

The new chip doubles the capacity of the small on-chip DRAM to 8K, enhances the integrated memory controller, and packs a plethora of internal circuit-design improvements that slash its power consumption by a factor of four. This last detail makes the E1-32X most interesting.

The new chip sips just 80 mW (typical) from a 2.7-V supply when running at 50 MHz. This startlingly low number is all the more surprising because the E1-32X is built with conservative 0.5-micron two-layer-metal process technology that runs with supply voltages from 2.7 V to 5 V. At about 1.6 mW/MHz, the new chip's power efficiency nearly edges out Digital's famous SA-110, which hums along at about 1.5 mW/MHz (at 1.65 V).

Although Hyperstone has qualified the E1-32X's power consumption at 50 MHz only, in production the chip is expected to run at twice that speed. Early samples of the part are already running at about 100 MHz in the lab. At the faster rate, the E1-32X needs 5 V, so power consumption should jump to about 300 mW, still much lower than for other 100-MHz parts and cooler even than some slower PowerPC, ColdFire, MIPS, and V850 components.

Chip Is Pin-Compatible With Previous Versions

The new chip is architecturally identical to the current E1-32 and E1-16 chips (see MPR 4/21/97, p. 8). Programmers won't

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Hyperstone's Manfred Schlett describes the E1-32X CPU/DSP combination chip.

notice any difference, apart from the larger on-chip DRAM store and some newly defined control/status bits. Hardware designers will also be unruffled by the changes; the E1-32X (or E1-16X) is a pin-compatible, drop-in replacement for its predecessor, the E1-32 (or E1-16).

It's the users, one can hope, who will benefit from the changes through lower power consumption or lower prices. The E1-32X measures about 24 mm^2 (16 mm^2 excluding the pad ring) in UMC's process. Even with the extra 4K of on-chip DRAM, the E1-32X is less than half the size of its predecessor, which is currently built on UMC's relatively ancient 0.8-micron fab line.

One noticeable change to the exterior of the part is the new support for extended-data-out (EDO) DRAMs. Currently, the E1-32's memory controller handles only fast page-mode devices. As before, the Hyperstone chip refreshes both internal and external DRAMs automatically. The memory I/O pins can also be configured for either 3.3-V or 5-V signals.

Two new power-saving modes are useful when the chip is idle. The so-called power-down mode stops processor execution while internal timers, refresh logic, and interrupt processing continue. Sleep mode turns off everything, including internal and external DRAM refresh, and drops current consumption to 30 µA, according to the company. In either mode, an external interrupt can reawaken the processor in two clock cycles.

Leading the Charge to Hybrid Instruction Sets

Hyperstone is far from a household name, even in the byzantine world of embedded CPUs. But the company's schtick, mixing processors and DSP, is more in demand than ever before. Siemens, Motorola, and other vendors are following Hyperstone's lead, entering the market with similar products. With a few more design wins, some better process technology, and a bit of luck, the company may find a profitable niche. ◫

Price & Availability

The E1-32X is sampling now at 80 MHz; production is scheduled for 1Q98. For more information, contact Hyperstone (Cupertino, Calif.) at 408.257.1057.