

AMD Uses 80186 for Network Control

Eight Serial Channels and 186-Based Processor Battle Motorola 68302 Series

by Jim Turley

AMD's first foray into intelligent network controllers starts out small. The company's new Am186CC combines the modest 80186 processor core with eight serial channels, including USB and HDLC. The chip is the first of a planned series called Comm86 for networking, telecommunications, and data communications systems.

The 186CC competes with a bewildering mix of integrated microprocessors from Motorola for similar applications. Products like DSL modems, ISDN terminal adapters, central-office line cards, and PBX systems all need intelligent integrated devices. The boom in such applications and the plethora of embedded-CPU vendors looking for a viable niche have driven many a microprocessor into the arms of waiting OEMs. Nortel, Cisco, Bay Networks, and Cabletron consume such devices like popcorn.

186CC Strong On HDLC Links

Code-named Serrano, the 186CC is better characterized as a peripheral controller with a CPU lurking in the spare silicon than as a CPU with some I/O. Its eight serial ports provide four HDLC channels, two asynchronous serial channels, a USB controller, and an SSI port. Other features include 14 chip-select pins, a memory controller (for DRAM, SRAM, ROM, and flash memories), some timers, and up to 48 multiplexed general-purpose I/O pins, as shown in Figure 1.

Each HDLC channel has two DMA channels to itself, one each for transmitting and receiving. The SSI (synchronous serial interface) channel works like I²C, connecting the 186CC to simple serial peripherals.

AMD would not release the die size or transistor count for the 186CC, but an examination of the chip reveals that the die is dominated by its serial channels. The biggest single

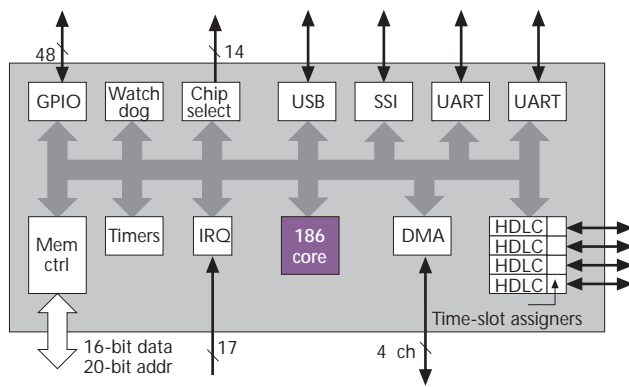


Figure 1. The Am186CC connects each of several peripherals to a shared 16-bit internal bus.

block of logic on the chip by far is the USB controller. Each of the four HDLC controllers is as large as the 186 core itself, which is about the smallest feature on the part.

The 186CC has no cache or memory and must transfer every instruction and operand across its 16-bit bus. Because the x86 and 68K instruction sets have similar code density, memory usage will be about the same. Performance is also comparable, with Dhrystone MIPS ratings in the low single digits at 25, 40, or 50 MHz.

A Good Foil to Motorola 68302 Series

AMD's chip nestles into some of the cracks left in Motorola's exhaustive line of controllers that are variously based on the 68K, CPU32, and PowerPC cores. Motorola's prices start lower than AMD's, but even with so many chips, there's no clear one-to-one match between Motorola and AMD devices.

The 186CC fares best in applications that emphasize HDLC links and don't require Ethernet. The Motorola parts don't all have HDLC capability, but they do mostly include Ethernet. The low-end 68302, 'SC302, and 'LC302 are priced near the 186CC but generally offer fewer features.

As Table 1 shows, the 68LC302 is priced within pennies of the \$13.50 186CC but has no DRAM controller, no Ethernet, no USB, and only two HDLC channels. To add Ethernet and a DRAM controller, a customer must pay Motorola nearly \$20 for the 'EN302. Adding USB moves the price up to \$26 for the PowerPC 850 but removes all HDLC capability. Only the \$34 PowerPC 850DH has all these features together.

In all these permutations of features, AMD's 186CC comes out on top if the system needs multiple HDLC links and either USB or DRAM control. Outside of these bounds, Motorola probably has a cheaper part for the need. With four HDLC channels, the 186CC could be more popular in telephone line-card applications than Motorola's 850DH, which has only two HDLC links and costs more than twice as much.

	AMD 186CC	Moto 68302	Moto 68LC302	Moto 68EN302	Moto MPC850	Moto 850DH
Frequency	25 MHz	25 MHz	25 MHz	25 MHz	33 MHz	33 MHz
DRAM Ctrl	Yes	No	No	Yes	Yes	Yes
Ethernet?	None	None	None	1	1	2
HDLC	4	3	2	None	1	2
ATM?	No	No	No	No	No	No
USB?	Yes	No	No	No	Yes	Yes
Available	4Q98	now	now	3Q98	now	3Q98
Price (10k)	\$13.50	\$16.14	\$13.20	\$19.68	\$26	\$34

Table 1. AMD's 186CC is similar to Motorola's low-end 68K-based communications controllers but has more HDLC channels and a USB port found only on the PowerPC controllers.

The 186CC doesn't have Ethernet, though, which nearly all the Motorola devices have. This makes the AMD chip less attractive for small/home office environments, where Ethernet is ubiquitous. To add Ethernet, a separate chip (such as the Am79C961A) is needed. An Ethernet-to-USB adapter would be inefficient, but a USB-to-ISDN adapter based on the 188CC would be quite straightforward.

That leaves AMD with potential design wins in the central-office and PBX categories but not in office printers and low-end network hubs and routers.

The Road Ahead Gets More Crowded

The 186CC is a first step in AMD's larger journey into communications territory. Given the company's experience with back-end interface silicon (i.e., SLIC, SLAC, and Ethernet adapters), it's reasonable to assume that future Comm86 chips will integrate some combination of these features.

It also seems inevitable that the 186 CPU core will be updated with AMD's less modest 386 or DX5 (133-MHz 486) processor cores. A K6-based device would be much larger but could stand toe-to-toe with Motorola's PowerPC-based MPC860 chips. Such high-end parts have the performance headroom to manage network traffic on their own, without the assistance and extra cost of a host processor.

One advantage AMD would have over Motorola is that all these hypothetical new parts would be code compatible,

Price & Availability

AMD's Am186CC chip is sampling now at 25 MHz, 40 MHz, and 50 MHz. In 10,000-piece quantities, the chips are priced at \$13.50, \$15.95, and \$18.50, respectively. Production is scheduled for 4Q98.

For more information, contact AMD (Sunnyvale, Calif.) at 800.222.9323 or point your favorite Web browser to www.amd.com/products/lpd/lpd.html

whereas the Motorola product line switches from 68K to PowerPC at around the \$25 level. AMD's x86 architecture also has better code density than PowerPC, potentially giving its customers a small advantage in memory cost.

Like IDT (see MPR 6/1/98, p. 12), AMD has a presence in communications markets with chips other than processors. Its familiarity with these vendors, and the growth rate in these areas, should make 186CC design wins easier to obtain. As popular as the x86 is, it's not significantly better supported than the 68K, so issues of support tools and compilers are moot. What's at issue is the peripheral mix, and so far AMD has narrowly missed competing head-on with Motorola's 68302 family. As AMD's Comm86 product line broadens, avoiding Motorola's products will be harder. □