

leading edge

What's hot
in the
design
community

Edited by
Fran Granville

Antenna Super Bowl

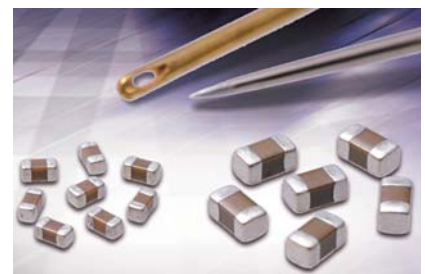
**"In all phones,
the RF groups fight for
every millimeter,
while the antenna guys
are given a comparative
'football field'
of space to play in."**

**—Simon Kingsley,
chief scientist
of radio-antenna maker
Antenna**

Materials science enables capacitor doubling

TAIYO YUDEN claims that its newest MLCC (multilayer-ceramic-chip capacitor) is the first to pack 2.2 μF into an EIA 0402 case. This doubling of capacitance results from advances in material technology, fabrication, and crystalline structure, thus reducing the size of the dielectric particles to less than 0.2 microns and the dielectric layer to less than 1 micron. The 1 \times 0.5 \times 0.5-mm

device can replace 1.6 \times 0.8 \times 0.8-mm, 0603-size capacitors of the same rating, offering the same capacitance in a smaller footprint. For designs requiring the ubiquitous 10- μF rating, the vendor uses the same technology in a 0603 package. The 2.2- μF , $\pm 20\%$ units cost 10 cents each, and the 10- μF units cost 20 cents (small quantities).—by Bill Schweber
► **Taiyo Yuden**, www.t-yuden.com.



Rethink your capacitance-versus-footprint guideline for MLCC decoupling and bypass applications with the 2.2- μF , 0402 (left) and 10- μF , 0603 (right) units from Taiyo Yuden, which uses advanced materials and processing to achieve this increased density.

Fingerprint modules simplify biometrics

By Warren Webb

FINGERPRINT CARDS recently announced two new biometric subsystems that allow designers to easily integrate biometrics-enabled

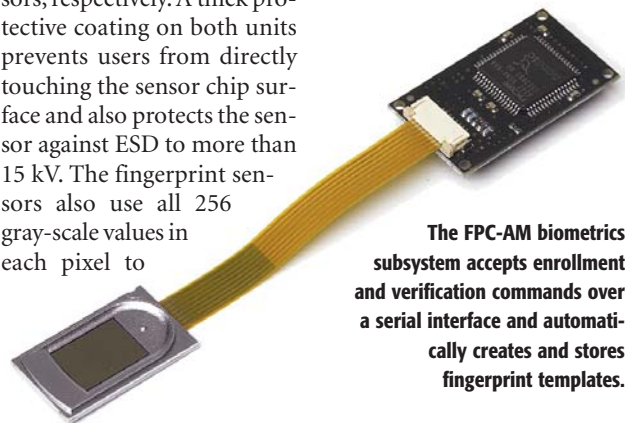
authentication into other products. Based on the company's sensor technology and patented analysis algorithms, the FPC-AM and -SM modules include both the fingerprint-sensing hardware and the image-processing firmware. A host processor, sending simple commands over a serial interface for enrollment and verification, controls the modules. The product automatically creates fingerprint templates and stores them in a local module memory. Designers can also use the module with externally stored fingerprint templates from central databases, smart cards, or

portable flash memories.

The vendor based the FPC-AM and -SM subsystems on the company's capacitive FPC1011C area and FPC-1031B swipe fingerprint sensors, respectively. A thick protective coating on both units prevents users from directly touching the sensor chip surface and also protects the sensor against ESD to more than 15 kV. The fingerprint sensors also use all 256 gray-scale values in each pixel to

increase image quality. The FPC-AM or -SM subsystems cost \$100 (five). Both modules are also available in a \$350 test-and-development package comprising one FPC-AM or -SM, cables, a power supply, Windows-based evaluation software, and start-up support.

► **Fingerprint Cards AB**, www.fingerprints.com.



The FPC-AM biometrics subsystem accepts enrollment and verification commands over a serial interface and automatically creates and stores fingerprint templates.

Antenna module breaks new (balanced) ground

SIGNIFICANT INNOVATION has occurred in the past few years in antennas for handheld devices, and an entry from Antenova Ltd offers

further proof. The company's Radionova radio-antenna module combines radio and RF components with a balanced dielectric antenna that yields, according to company analysis, lower cost; pc-board-design flexibility and noninteraction; improved radiation efficiency; and reduced chassis currents, which adversely affect pc-board design. The product also offers reduced front-end losses, user-induced

detuning, and SAR (specific absorption ratio). Notes Professor Simon Kingsley, chief scientist of Antenova, "In all phones, the RF groups fight for every millimeter, while the antenna guys are given a comparative 'football field' of space to play in."

By using balanced, self-complementary antennas resting atop an active-circuitry module and integral balun, this approach minimizes the

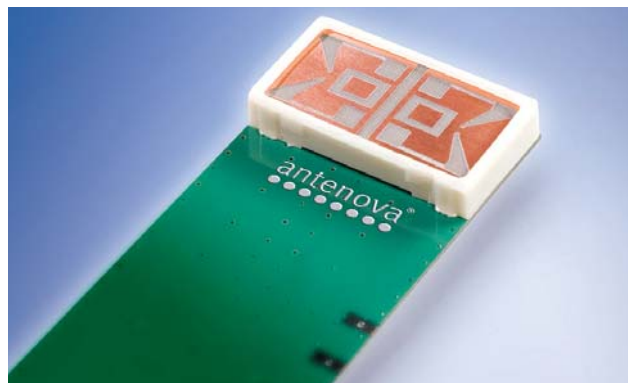
need for designers to customize antennas for each radio and reduces the pain of redesign when their underlying pc-board-design layout or ground plane changes. Although engineers have for about 100 years understood the advantages of balanced, dipole antennas over unbalanced, monopole antennas, the balanced devices have practical implementation challenges, such as the inability to work well near ground planes. The balanced Radionova design, in contrast, works with a full ground plane. Designers can reflow the lower module with the electronics onto the pc board and test it, and then snap on the upper antenna module, which uses a plastic substrate. "Everyone has looked at integration of the baseband, transceiver, and RF sections, but nobody has looked at integration for the other end—the antenna and RF section," says Kingsley.

OEMs can optimize Antenova designs for bands in the 800-MHz to 6-GHz range, and, because the devices require no ground plane, designers can build a diversity antenna into the handset for

improved performance. Tests on actual units confirm the simulation results that show directivity of the design is strongly in the z axis (normal to the antenna plane). In a representative design, low-band (900-MHz) return loss was -21 dB, and high-band (1750- to 2000-MHz) return loss was -9 to -11 dB. Low- and high-band efficiency exceeded 50 and 55%, respectively, including balun loss. The Antenova module costs approximately \$5 (OEM quantities).

—by Bill Schweber

► **Antenova Ltd**, www.antenova.com.



Antenova's balanced high-dielectric antenna module represents a new approach to implementing an efficient and compact antenna for handheld devices. The device is largely decoupled from the underlying pc-board layout.

TINY DIODE YIELDS BIG SPECS

The basic two-terminal diode still plays a critical role in subsystem design. One such series of low-leakage, high-voltage diodes from Central Semiconductor offers specifications that yield high-efficiency, compact designs.

The CMDD3003, CMOD-3003, and CMLD3003DO, offering similar performance in differing sizes, tout maximum leakage of just 1 nA, with a 180V reverse voltage.

The first unit is available in a less-than-1-mm-high SOD-323 SMT case, and the second unit comes in a 0.08-mm-profile SOT-563. The third unit, a dual device with opposing diodes, comes in a 0.6-mm-high package. Prices range from 11 cents to 16 cents (3000-piece reel).

—by Bill Schweber

► **Central Semiconductor Inc**, www.centalsemi.com.

DILBERT By Scott Adams



► **Driven by strong sales in POE (power-over-Ethernet) ports, worldwide Ethernet-switch revenue increased by 24% in 2004, and Ethernet-port shipments grew 22%, according to Gartner.**

Network on chip replaces on-chip bus

FRENCH START-UP ARTERIS SA has released a speedy alternative to traditional on-chip bus systems, introducing an NOC (network-on-chip) system that accommodates multiple asynchronous clocking that many of today's complex SOC (system-on-chip) designs use. The NOC Solution

brings a networking method to on-chip communications and claims roughly a threefold performance increase over conventional bus systems. The SOC Solution will compete against proprietary on-chip bus architectures and commercial on-chip buses, such as ARM's (www.arm.com) AMBA (Advanced Microcontroller Bus Architecture) and Sonic's (www.sonicsinc.com) SiliconBackplane.

Philippe Martin, Arteris' vice president of marketing,

says that the NOC Solution applies a networking concept to on-chip communications. In much the same way a network links multiple computers, the NOC Solution links multiple distributed systems, such as individual IP (intellectual-property) blocks and clusters of functions, reducing the number of traces and, thus, the latency in a design. "There has been quite a bit of research going on in the area of NOC over the last few years, but it has been mostly ac-

ademic," says Martin. "We are now offering it commercially."

The product comprises the Danube NOC IP library, NOCexplorer for deriving an NOC architecture, and NOCcompiler for generating SystemC and synthesizable Verilog and VHDL. Martin says that the NOC Solution targets design groups implementing a synchronous-design methodologies using multiple clocks and hundreds of blocks of IP on a single-chip design. For this purpose, Arteris has developed the proprietary, on-chip, packet-based NTTP (NOC Transaction and Transport Protocol). The Danube library, which comprises NIUs (network-interface units), packet-transport units, and physical links, contains the elements for implementing that protocol.

Chip architects use the NOCexplorer tool to perform

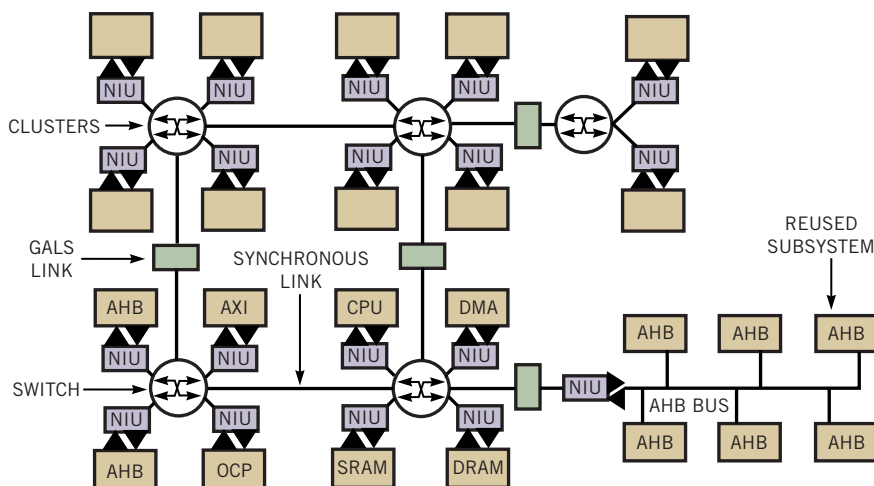
NOC-topology modeling and derive an NOC architecture. NOCexplorer users designate clusters of synchronous logic using a GALS (globally asynchronous, locally synchronous) methodology. The tool uses NIUs to connect the NOC to cores using on-chip socket standards, such as AMBA AHB (Advanced High-Performance Bus), AMBA AXI (Advanced Extensible Interface), and OCP (Open Core Protocol) 2.0.

Switches from the Danube library control synchronous links between clusters, and GALS units from Danube control asynchronous links. NOCexplorer models the system behavior with a data-flow-simulation engine. After chip architects derive the optimal NOC configuration for their designs, they use the NOCcompiler to generate synthesizable Verilog, VHDL, or SystemC to implement their designs through the traditional IC-design flow.

NOCcompiler has a rules-checking feature to ensure design consistency across multiple versions, and it also can estimate area at the presynthesis stage. It produces a data sheet of configured NOC units, including a register map. Martin says that STMicroelectronics (www.stmicroelectronics.com) implemented the first design using the NOC Solution. The NOC ran at an operating frequency of 750 MHz on a 90-nm TSMC silicon process, using Artisan libraries and off-the-shelf EDA tools. Prices for the NOC Solution start at \$350,000.

—by Michael Santarini

► Arteris, www.arteris.com.



NOTES:
 GALS= Globally Asynchronous, Locally Synchronous.
 NIU= Network-Interface Unit.
 AXI= Advanced Extensible Interface.
 AHB= Advanced High-Performance Bus.
 OCP= Open-Core Protocol.

Arteris applies the networking concept to on-chip communications.

► Nokia retained its number-one position in the cell-phone market in 2004, shipping 66.1 million cell phones in the period. Motorola had strong sequential growth, up 36%, but placed a distant second with 31.8 million phones, according to InStat/MDR.

Antenna diversity boosts cellular performance

AS ALL MOBILE-HANDSET users know, cellular networks are far from perfect. Every carrier has dead spots, and building cell sites is an expensive proposition. Start-up Magnolia Broadband, however, claims to have a magic potion for the

carriers: a way to boost performance within the confines of the standards. Multiple potential technologies, such as MIMO (multiple in, multiple out), may over time greatly improve cellular-network performance, but most require a base-station upgrade. Magnolia believes that designers can integrate its antenna-diversity technology into handsets at low cost without impacting the infrastructure.

Magnolia's president, Osmo

Hautanen, states, "All carriers have similar problems. They need to maximize capacity by using the spectrum as efficiently as possible. And they need to offer faster data rates and improve in-building coverage." Magnolia claims that its technology can double capacity and boost coverage area by 60%. Magnolia has just announced the Diversity-Plus architecture, which the company based on the MBJ-6502 baseband-support IC

and the MBJ6501 RF vector-modulator IC. The 6501 integrates dual modulators to support CDMA phones in both the 800- and the 1900-MHz bands. The two chips sit between the handset-radio chip and the antenna and work their magic with only minor changes in the handset design.

The Magnolia technology works only on the upstream side of the cellular link. Starting approximately 18 months ago, designers began adding dual antennas for the downlink. Qualcomm's 6500 chip uses antenna diversity on the downlink. But more data-centric applications require symmetric performance in both directions, and Magnolia claims to deliver that capability.

The company claims that South Korea's SK Telecom (www.sktelecom.com) is developing the first handset using Magnolia's technology. Magnolia officials also believe that carriers will drive adoption of the technology in other regions. They predict that three to four major OEMs will sign on by midyear. The current chips target use in 1×EVDO (evolution-data-optimized) CDMA handsets and add only \$3 to \$6 to the cost of the handset. The company expects the technology to later migrate into baseband chips and expects to license the technology to handset-chip vendors.

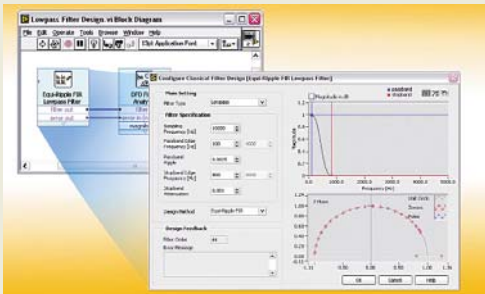
—by Maury Wright

► **Magnolia Broadband**,
1-908-735-0372, www.magnoliabroadband.com.

Software toolkit simplifies using LabView for digital-filter design

TO EFFICIENTLY DESIGN digital filters, engineers rely on a variety of software tools for iterative design, optimization, and implementation. National Instruments' \$995 LabView Digital-Filter-Design Toolkit Version 7.5 provides a single graphical-software tool that engineers can use throughout the design process to quickly and interactively design custom filters for such tasks as noise reduction, signal extraction, antialiasing, and resampling on FPGA devices in the manufacturer's PCI and PXI plug-in modules and CompactRIO embedded-system platforms. The toolkit also generates ANSI C code for use on fixed- and floating-point DSP targets.

The package, which includes four new Express VIs (virtual instruments) for interactive configuration and provides many standard digital-filter-design algorithms for fine-tun-



The LabView digital-filter-design toolkit's interactive user interface shows you how design changes affect a filter's response. The package also tells you when increasing a filter's complexity requires implementation on a more powerful target DSP or FPGA.

ing of specifications, features state-of-the-art algorithms such as the Remez exchange method and the least Pth norm method for advanced applications, telecommunications, and electronics design. Engineers who lack sufficient signal-processing experience can access nearly 50 sample VIs to speed their path up the learning curve.

Says Shawn McCaslin, senior R&D group manager for signal processing and math at NI, "The toolkit's combination of comprehensive filter-design tools and easy-to-use LabView Express technology makes it a quick and accurate tool to guide engineers and students from theory to implementation without requiring multiple software platforms."—by Dan Strassberg

► **National Instruments**, 1-800-258-7022, www.ni.com/toolkits.

► **Market researcher IDC estimates that manufacturers worldwide this year will ship 27.7 million wireless-network devices, up 44% from 19.2 million last year—and a big jump from just 4.5 million in 2002.**

InfiniBand lives—and even thrives—in storage and clustering

PERHAPS INFINIBAND WAS SLOW to mature, and it appeared at times ready to die, but now the high-speed interconnect is finding wide usage in connecting clusters of servers and as a SAN

(storage-area-networking) technology. Indeed, server and storage vendors, including IBM, Hewlett-Packard, Dell, Sun, and others now offer InfiniBand-enabled systems. Long-time InfiniBand proponent Mellanox has offered dual-port, 10- and 20-Gbps chips at prices upward of \$200. And now, the company has driven down cost and power consumption in the new single-port InfinHost

III Lx that goes for \$69 (high volumes) and draws only 2W. The company will also offer a PCI Express InfiniBand adapter card.

“With InfiniBand’s industry-leading scalability and performance, solutions such as 10-Gbps adapter cards coming from a number of companies, including Mellanox, will help drive down the cost per node of 10-Gbps enabled servers,” says Jim Pappas, di-

rector of initiative marketing for Intel’s Digital Enterprise Group. “This broad growth of products will have a positive effect on the proliferation of 10-Gbps clusters in performance business and technical-computing applications.”

In fact, InfiniBand is one of a handful of potential technologies whose time has come from a performance perspective and that is symbiotic with the capabilities of PCI Express and the demands of the market. PCI Express provides a scalable interconnect to the latest processors that starts at 2.5 Gbps and goes up in multiples as designers add “lanes,” or additional serial interfaces. To ef-

fectively connect such systems into clusters, designers need a low-latency interface that’s capable of 10- or 20-Gbps rates. Of course, 10-GbE (Gigabit Ethernet) is also a player as an interconnect, but Mellanox officials believe that TCP/IP adds too much overhead for Ethernet to be effective as a storage or server interconnect. Ethernet fans claim that TCP/IP offload engines can overcome any limitation inherent in Ethernet. Later this year, *EDN* will take a detailed look at the server and storage interconnect space.—by Maury Wright

► **Mellanox Technologies**, 1-408-970-3400, www.mellanox.com.

Accurate, versatile, isolated-input DMM/digitizer fits into PXI format

YOU CAN NOW MAKE ohmically isolated measurements from picoamps to kilovolts with 7½-digit (26-bit) resolution using National Instruments PXI-4071 FlexDMM, a multi-function PXI instrument that incorporates a DMM (digital multimeter) and a 1.8M-sample/sec isolated digitizer. The unit measures voltage from ±10 nV to ±1 kV and resistance from 10 μΩ to 5 GΩ. A solid-state current shunt makes possible eight dc-current ranges from 1 μA to 3A and six rms-ac-current ranges from 100 μA to 3A, giving the instrument the ability, flexibility, resolution, and isolation for such applications as fuel-cell testing, leakage measurements, IV-curve tracing, and data-converter-linearity testing.

According to NI, if you operate the FlexDMM at a dc-reading rate of 7 samples/sec and resolution of 7½ digits, it is the most accurate DMM in the PXI format. For higher throughputs, the unit offers a maximum dc-reading rate of 10k samples/sec at 4½ digits, five times as fast as traditional IEEE 488-controlled DMMs. In the isolated-digitizer

mode, the unit acquires dc-coupled waveforms in all voltage and current ranges at a maximum rate of 1.8M samples/sec. With the built-in isolation, the unit can measure differential waveforms at common-mode voltages as high as 500V, making it useful for fuel-cell-stack testing. By changing the sampling rate, you can vary the digitizer’s resolution from 10 to 23 bits. Using the manufacturer’s LabView software, you can analyze transients, fly-back signals, and other aperiodic, high-voltage ac waveforms in both the time and the frequency domains.

You can increase the unit’s channel count into the thousands by integrating it with switch modules, such as the high-density, 512-crosspoint matrix NI PXI-2532 under the control of the manufacturer’s Switch Executive switch-management software. The \$2495 NI PXI-4071 FlexDMM includes driver software for LabView, NI Lab Windows/CVI, and Microsoft (www.microsoft.com) Visual Studio.NET.—by Dan Strassberg

► **National Instruments**, 1-800-258-7022, www.ni.com/multimeters.



The isolated-input, 7½-digit PXI-4071 DMM (dc/true-rms-ac, V/I/Ω) and high-speed digitizer in PXI format takes seven dc readings/sec at full resolution and 10k samples/sec at 4½-digit resolution. The module also operates as an isolated digitizer with a maximum acquisition rate of 1.8M samples/sec and a maximum resolution of 23 bits.

Communications module packs in 16 serial channels

TEW'S TECHNOLOGIES recently announced an asynchronous, serial-PMS (PCI Mezzanine Card) for applications in transportation, military/aerospace, communications, and process

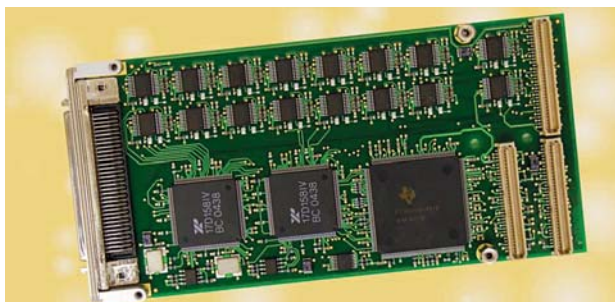
control. The high-density TPMC460 is available with 16 RS-232, RS-422, or mixed RS-232/422 channels. Each RS-232 channel supports received-data, transmitted-data, and hardware-handshaking signals, and the RS-422 channels provide bidirectional, differential data. All versions offer front-panel I/O with an HD68 connector and P14 I/O.

A 32-bit, 66-MHz PCI-to-PCI bridge provides access to two Exar (www.exar.com) XR17D158 octal PCI-UARTs. To offload host-CPU processing, each channel has 64-byte

transmitting and receiving FIFOs with programmable trigger levels. Designers can program individual baud rates at rates as high as 921.6 kbps for

RS-232 channels and 5.5296 Mbps for RS-422 channels. Tews Technologies provides software support for major operating systems, such as Windows, Linux, VxWorks, and QNX. The TPMC460 is available now with single-unit prices starting at \$790.

—by Warren Webb
►Tews Technologies GmbH, www.tews.com.



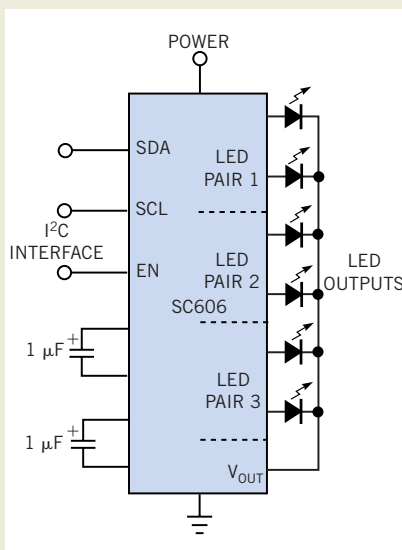
The new TPMC460 asynchronous communication module features 16 RS-232 or RS-422 serial channels on a single PCI Mezzanine Card.

Driver pushes white LEDs where they need to go

WHITE LEDs offer numerous application benefits, but they need controlled current drive for effective operation, and many vendors are offering requisite drivers. The SC606 from Semtech is a charge pump for white or colored LEDs that handles six of these devices. With this IC, designers can program the six LEDs as three pairs, driving each LED pair with 0 to 32 mA in 500- μ A-resolution steps. The interface to the controlling processor is via the I²C serial bus.

Overall current accuracy is $\pm 6.5\%$ over the drive range, with typical accuracy of $\pm 2\%$; drive-matching tolerance is $\pm 3.5\%$ over input voltage and temperature range and 1% at room temperature. The vendor claims that the product has efficiency greater than 90%, due to a self-regulating feature that automatically switches conversion modes depending on supply voltage and demand. The 4 \times 4-mm MLP-16 IC operates at 250 kHz or 1.33 MHz and sells for \$1.30 (1000).—by Bill Schweber

►Semtech Corp, www.semtech.com.



Drive six LEDs as three independent pairs with controlled 0 to 32 mA of current per pair using the SC606 high-efficiency driver.

MINIATURE MOTHERBOARD EXTENDS EMBEDDED-SYSTEM LIFETIMES

Recognizing the unique requirements of embedded-system designers, Ampro Computers recently introduced an x86-based motherboard in the mini-ITX form factor. The 6.75 \times 6.75-in. MightyBoard 800 gives designers access to thousands of low-cost PCI-bus I/O cards and compatibility with off-the-shelf ATX enclosures.

Depending on the Pentium M or Celeron M processor the designer selects, the MightyBoard 800 operates in the 600-MHz to 1.4-GHz range. All models support as much as 1 Gbyte of DDR DIMM and include four USB 2.0 ports, one 10/100BaseT Ethernet port, one Gigabit Ethernet port, four serial ports, AC'97 audio, and both CRT and LVDS flat panels. All boards offer fanless operation at 0 to 60°C. The MightyBoard 800 will become available at prices starting at less than \$700 (production quantities).

—by Warren Webb
►Ampro Computers Inc, www.ampro.com.



Addressing the short product life of desktop products, the new MightyBoard 800 offers a small, x86-based motherboard that complies with embedded-system industry standards.