

EDN LEADING EDGE

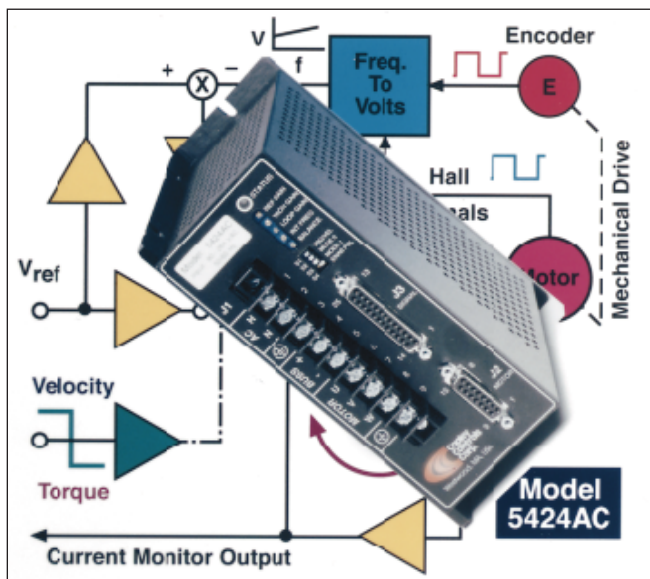
WHAT'S HOT IN THE DESIGN COMMUNITY

EDITED BY FRAN GRANVILLE

Servoamplifier makes for cheap and easy torque and speed

Micropower devices get lots of attention, but many situations require power levels that are many orders of magnitude greater. Filling that need is Copley Controls' Model 5425AC servoamplifier, which drives dc brushless motors with ratings as high as 2.5 hp directly from the ac line, requiring no additional power supply. You can establish a setpoint threshold, which causes the amp to switch from velocity mode to torque mode, useful for applications such as tensioning nuts on threaded fasteners, winding coils, and screwing on bottle tops.

The \$595 servoamp contains an internal F/V converter that eliminates the need for an external tachogenerator and features an adjustable soft-start capability that eliminates jerk (rate of change in acceleration) by smoothing changes in acceleration. By employing an advanced carrier-suppression modulation technique at its 12.5-kHz frequency, the servoamp has lower ripple current than comparable designs, and this ripple is twice the modulation frequency. In addition, ripple current is at its *minimum* at zero output voltage, which greatly reduces hysteresis heating of the motor compared with other techniques, which produce *maximum* ripple current at zero output. The 7.5×2.72×7-in. amplifier has a 3-kHz bandwidth and can drive motors of 0.4- to 40-mH inductance. Beyond the customary thermal-protection features, you can install fixed-value resistors that set maximum values for peak and continuous motor current and for peak-current duration.—by Bill Schweber



The Model 5425AC dc brushless motor servoamplifier from Copley Controls, powered directly from the ac line, lets you control velocity and torque of motors as powerful as 2.5 hp.

Copley Controls Corp, Westwood, MA. 1-781-329-8200, fax 1-781-329-4055, www.copleycontrols.com.

Circle No. 367

PCI card delivers RS-232C/422/485 channels

Designers that need more capable serial ports than those that PCs and single-board computers typically include can turn to the Sealevel Ultra-Comm+2. PCI. The dual-channel, plug-and-play, PCI card supports standard RS-232C signaling and works in RS-422 or -485 environments. The RS-422 mode can handle cable runs as long as 4000 ft, and the RS-485 mode supports as many as 31 devices on a multidrop cable. Regardless of the mode chosen, you can access the card using standard Windows COM port drivers. Available now,



the board costs \$279 to \$299, depending on whether you specify a standard UART or enhanced 16650 or 16750 UARTs with 32- and 64-byte FIFO

Standard Windows COM port drivers control the Sealevel Systems dual-channel, serial-interface board with support for RS-232C, -422, and -485 signaling modes.

buffers, respectively.—by Maury Wright
Sealevel Systems, Liberty, SC. 1-864-843-4343, www.sealevel.com.

Circle No. 368

Shareware boosts CD-ROM performance, tells time

CD-Quick, new shareware from Circuit Systems, expands on Windows 95's CD-ROM caching and provides impressive results (Table 1). The benchmarks in the table use the company's CDtest utility with the Microsoft Office 97 Professional CD on my Pentium-133 desktop PC with 64 Mbytes of DRAM; a 2.1-Gbyte, enhanced-IDE hard drive; and a 2× CD-ROM drive. New CD-ROM drives spin the motor more quickly to improve the burst transfer rate but only marginally improve the random-access time. That's where caching comes in, just as with hard drives and DRAM. CD-Quick allows you to set up a RAM cache (ideal for notebook PCs) as large as 16 Mbytes or a hard-drive cache as large as 128 Mbytes. In comparison, the Windows 95-supplied, RAM-only cache tops out at 1 Mbyte. CD-Quick's caching is also persistent and uses dynamic read-ahead buffering techniques. Special settings for video clips allow you to set the maximum cached file size to avoid excessive cache thrashing.

Another interesting shareware product, AtomTime 95, is

for people like me who have a dozen or so clocks scattered through the house, all displaying a different time (and some just blinking 00:00). AtomTime95 ends the debate over which is the *real* time. When you run this utility on a PC with a "live" Internet connection, AtomTime95 automatically accesses the Atomic Clock time server in Boulder, CO; converts the results for your time zone; displays the difference from the currently set PC time; and, if you desire, resets the PC clock. Unfortunately, you then have to manually set your microwave oven, wristwatch, VCR, wall and alarm clocks...

You can evaluate CD-Quick for free for as long as 30 days, after

which the utility costs \$29. Circuit Systems also offers a version for Windows 3.1, using as much as 10 Mbytes of system RAM. AtomTime95 version 1.4 is free-ware; version 1.5 offers improved documentation and proxy server support and costs \$5. You can download both utilities from a number of shareware sites on the Web (try searching with Yahoo) or directly from the manufacturers.—by Brian Dipert

Circuit Systems, Sicklerville, NJ, circuitsys@compuserve.com, ourworld.compuserve.com/homepages/circuitsys.

Circle No. 369

AtomTime 95, BADelsman@aol.com, www.wavefront.com/~badelsman/Software.

Circle No. 370

TABLE 1—CDTEST BENCHMARK RESULTS

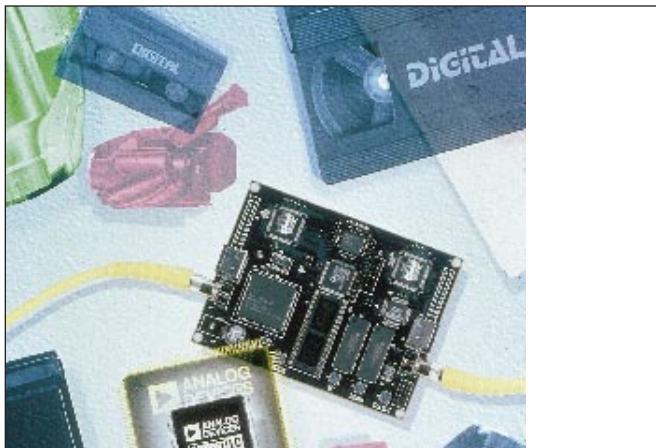
Test (sec)	Description	Time without CD-Quick (sec)	Time with CD-Quick
1	Directory structure walk	14.71	10.24
2	Largest file sequential read (512 blocks, 1024 kbytes)	4.1	3.6
	Largest file random read (256 blocks, 512 kbytes)	62.03	60.26
3	Largest file sequential read (512 blocks, 1024 kbytes)	4.05	0.25
	Largest file random read (256 blocks, 512 kbytes)	61.53	0.17
4	Largest file sequential read (512 blocks, 1024 kbytes)	4.11	0.25
	Largest file random read (256 blocks, 512 kbytes)	62.41	0.17
Total		212.94	74.94

SOT23 package adds pin, cuts size of analog functional blocks

The ubiquitous five-pin SOT23 package, which designers have long used for basic analog functions, such as single op amps and references, is seeing new roles with the addition of more pins. (See "Op amp squeezes two devices into one-device package," *EDN*, Dec 4, 1997, pg 11.) You can now get DACs and voltage converters in six-pin versions of the SOT23.

Analog Devices has introduced a family of D/A converters in the six-pin SOT23. The AD5300 family comprises 8-, 10-, and 12-bit pin-compatible devices, complete with internal reference as well as an output buffer amplifier for rail-to-rail output swing. The converters power up at 0V and settle in less than 5 μ sec. Operating from single 2.7 to 5.5V supplies, the devices dissipate less than 0.4 mW at 3V and 0.6 mW at 5V. Nonlinearity for the \$1.25 (1000) 8-bit; \$1.70 10-bit; and \$2.50 12-bit converters is ± 0.25 , 0.5, and 1 LSB, respectively.

Also in six-pin SOT23s are National Semiconductor's

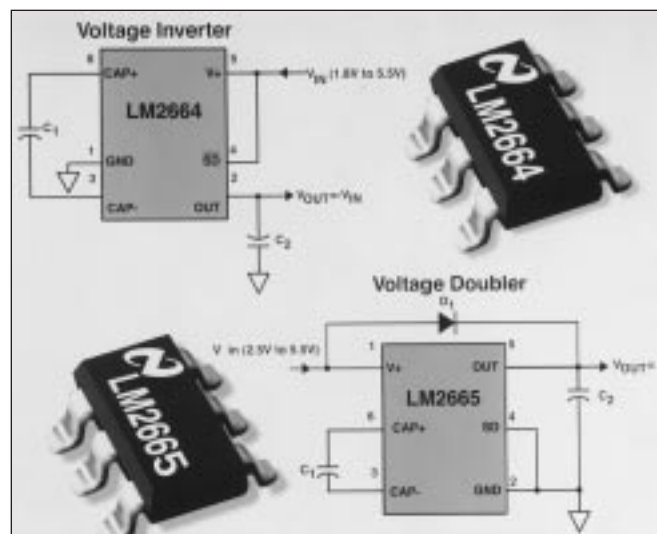


You can get your choice of 8-, 10-, or 12-bit DACs in an SOT23-6 package, with Analog Devices' AD5300 family.

LM2664 and LM2665. For inverting a positive voltage ranging from 1.8 to 5.5 to its corresponding negative value, you use the LM2664; the LM2665 provides voltage doubling for supplies spanning 2.5 to 5.5V and can also act as a divider, halving a 1.8 to 11V voltage. The converters operate at 160 kHz and require a pair of low-ESR, 1- to 9- μ F capacitors. They guarantee a minimum output current of 40 mA, with corresponding efficiency of 91%, and voltage droop is less than 0.60V at 50 mA because of the devices' 12 Ω output impedance. Operating current is 220 μ A, and shutdown current is 1 μ A for these \$0.85 (1000) devices.—by Bill Schweber

Analog Devices Inc, Norwood, MA. 1-781-937-1428, fax 1-781-821-4273, www.analog.com. **Circle No. 371**

National Semiconductor Corp, Santa Clara, CA. 1-408-721-5000, www.national.com. **Circle No. 372**



With the switched-capacitor LM2664 voltage inverter and LM2665 voltage doubler from National Semiconductor, you can achieve voltage conversion with 50-mA output in a space-saving SOT23-6 package.

Big storage comes in a small size

Kingston Technology's DataPak 520 provides a high-performance, cost-effective, 1.8-in. hard-disk-drive alternative to flash-memory cards and other magnetic media for high-density, portable mass storage. It delivers 520 Mbytes of uncompressed capacity and more than 1 Gbyte with compression in a 0.41 \times 2.1 \times 3.3-in. package. The PCMCIA interface and Type III form factor simplify system

hookup, enabling hot-swapping and use of a standard IDE/ATA software driver.

DataPak 520 integrates a 128-kbyte dual-ported FIFO cache that results in a 12-msec average seek time and 20-Mbyte/sec burst transfer rate. Shock resistance ratings are 200 (operational) and 750g (non-operational), and the operating-temperature range is 0 to 55 $^{\circ}$ C and -40 to +70 $^{\circ}$ C (nonoperational). The drive draws 730 mA maximum during spin-up, 410 mA when active, 170 mA in idle mode, and only 10

mA in standby and sleep.

Kingston claims reliability greater than 150,000 hours MTBF and 300,000 minimum start/stop cycles. The DataPak 520's suggested retail price is \$549; contact the manufacturer for larger quantity pricing. Kingston Technology anticipates delivering even higher density DataPak versions by year's end.

—by Brian Dipert

Kingston Technology Co, Fountain Valley, CA. 1-714-437-3334, fax 1-714-438-1820, www.kingston.com. **Circle No. 373**

PC-based plug-in lets you evaluate analog phone lines

Everything may be going digital, but local phone loops are still analog. The PC-based Rochelle 3410 is an analog services telephone-line simulator (ASTLS) system. It lets you develop, test, and optimize telecomm functions, such as caller ID, answering machines, fax machines, and low-speed modems, as well as mandatory telephone features, such as line ringing and battery feed. With this simulator, which supports the requirements of many countries, you can generate required calling and signal patterns, plus essential line tones, to take your equipment through its operational steps.

You can program the frequencies, levels, and SNRs of the various tones with 1-Hz/1-dB precision, and generate line impairments, such as white noise, loop-length variations, and variable line-current feed, to determine your system's performance under less-than-nominal conditions. The full-sized ISA plug-in board with associated simulation-management and data-analysis software runs on Windows 95 or DOS-based PCs. The Rochelle 3410-ASTLS, priced at \$8950, also includes a proprietary scripting language that eases automated testing.—by Bill Schweber

Rochelle Communications Inc, Austin, TX. 1-512-339-8188, fax 1-512-339-1299, www.rochelle.com. **Circle No. 374**



To test analog phone lines for basic operation plus caller ID, fax, and modem functions, the PC-based model 3410-ASTLS simulates a variety of nominal and corrupted signal patterns for United States and international standards.

BOARD-LEVEL INTERCONNECT TEST HITS THE FAST LANE

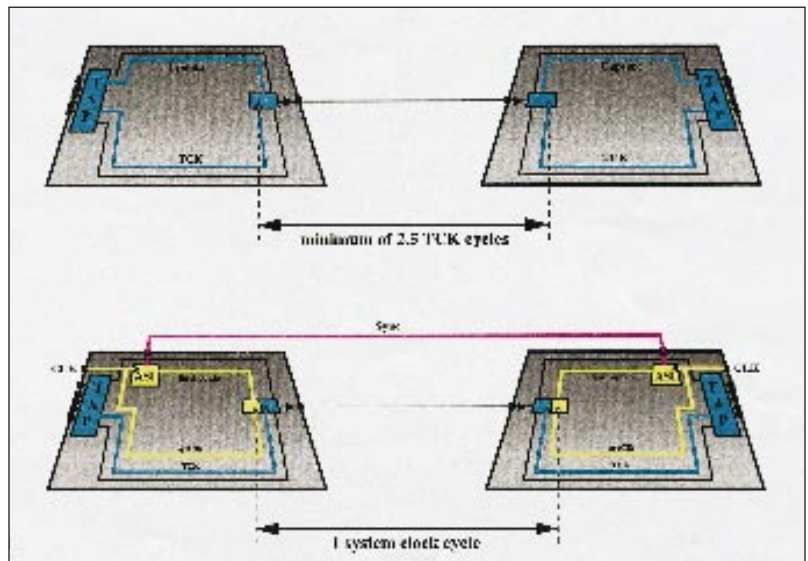
LogicVision's jtag-XLi, a complement to other 1149.1 test hardware and techniques, lets you raise board-interconnect test rates to your system clock rates. The product resolves the speed problem of the popular 1149.1 boundary-scan standard for testing pc-board chips and interconnects, which pervades the electronics industry. Typical 1149.1 test-clock frequencies of 20 to 40 MHz limit the speed of interconnect testing to 8 to 16 MHz, significantly lower than the greater-than-100-MHz clock speeds of many pc-board designs.

The jtag-XLi product has software to create Verilog or VHDL descriptions of at-speed-interconnect (ASI) controller blocks that you embed into your onboard chips. The ASI blocks, comprising fewer than 200 gates each, provide update and capture signals to send test data from one chip to another. One chip's ASI controller acts as a master, synchronizing the ASI blocks on the other chips on the pc board. The ASI blocks complement

1149.1 scan cells on the chips, speeding test-data transfer from 2.5 times the 1149.1 test-clock period to one cycle of the potentially much faster board's system clock. This test-cycle-time reduction lets you find and analyze board-interconnect defects, such as high-resistance solder joints or via problems, that you might overlook with 1149.1 testing alone. Such problems are also difficult or sometimes even impossible to locate using traditional "bed-of-nails" test-bed approaches.

Besides generating the ASI blocks, jtag-XLi helps with board test by generating an RTL test-bench and synthesis scripts for Synopsys' (Mountain View, CA) Design Compiler gate-synthesis tool. The jtag-XLi product also creates the 1149.1 test-access-port (TAP) controller, which still controls the boundary-scan cells on a common chip, and assembles the TAP, ASI controllers, and scan cells in your chip design. If you have a chip with multiple clock domains, you need a separate ASI controller for each domain.

The product is compatible with conventional test-generation and



Standard 1149.1 boundary-scan testing (top) requires at least 2.5 cycles of the test clock (TCK), which may also be much slower than the system clock. With jtag-XLi (bottom), you can send test data from one onboard chip to another within one system clock (SysClk) cycle.

diagnostic software. It also lets you combine ASI-enhanced chips with chips containing conventional 1149.1 scan cells and test the combination with a 1149.1 test methodology. The jtag-XLI product, which will be available in the second quarter, costs \$25,000 per chip design. If you buy the product as an option to LogicVision's logic-BIST synthesis product, the price is \$15,000 per chip design.—by Jim Lipman

LogicVision, San Jose, CA. 1-408-453-0146, fax 1-408-467-1180, www.lvision.com. **Circle No. 375**

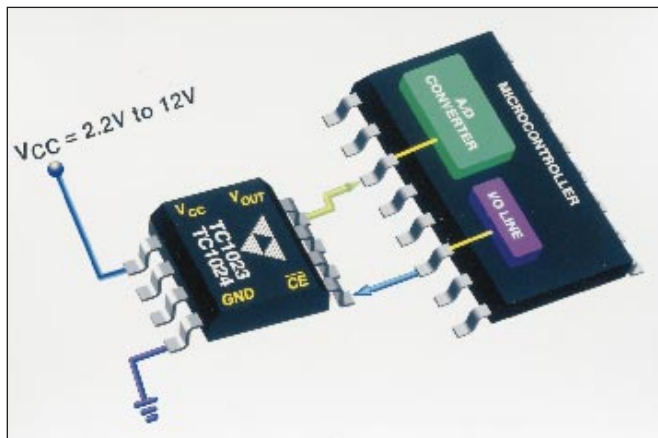
Silicon sensor endures wide temperature range

In the world of CPUs faster than 200 MHz and with 1-Gbps data rates, the measurement of a slow variable, such as temperature, seems so minor. But it's not, as the abundance of available temperature sensors demonstrates (see "Stay off the hot seat when choosing temperature sensors," *EDN*, Sept 1, 1997, pg 77). Telcom Semiconductor's TC1023 sensor provides linear output of 10 mV/°C over the -40 to +100°C range; the similar TC1024 provides the same linear output at -40 to +125°C. Accuracy is ±2°C at 25°C. The ICs have a chip-enable input that you can use to force shutdown, thus dropping the supply current

to 1 µA for the devices, which require a 2.2 to 12V supply. In shutdown mode, the sensor output goes to a high-impedance state; you can thus achieve multizone sensing by connecting multiple TC1023s or TC1024s to an analog line with the desired unit selected by your processor's digital outputs. The devices come in eight-pin SOICs and MSOPs; prices begin at \$0.54 (10,000) for the 100°C device and \$0.57 for the 125°C device.—by Bill Schweber

Telcom Semiconductor Inc, Mountain View, CA. 1-415-968-9241, fax 1-415-967-1590, www.telcomsemi.com.

Circle No. 376



The TC1023 or TC1024 temperature-to-linear-voltage sensor lets you easily measure temperatures as high as 100 or 125°C, respectively, and set up multiple sensors for multizone readings on one analog line.

Single-chip baseband processor targets GSM

The GSM (Global System for Mobile communications) baseband processor (GBP) from LSI Logic integrates mixed-signal and digital baseband-processor functions. The GBP architecture provides GSM-handset designers with an off-the-shelf standard product or a custom ASIC based on LSI Logic CoreWare cores for GSM baseband processing. The standard product and cores contain the baseband processing logic for a GSM900 mobile terminal and related DCS1800 and PCS1900 mobile equipment. Designers can validate product features in a RAM-based prototype before beginning volume production in a pin- and -package-compatible ROM-based chip. A development system is also available for rapid prototyping on virtual target hardware.

The CoreWare-compatible design includes digital and mixed-signal cores for low power consumption. LSI Logic's Oak DSPCore and TinyRISC CPU digital baseband cores are industry-standard processors with development and debugging tools. The GBP integrates mixed-signal cores for voice-codec; modem; and analog functions, such as ADC and DAC; and analog interfaces for audio. The GBP controls power management on-chip and results in a typical active-mode power consumption of 63 mA at 3V and standby-mode power consumption of 1.5 mA at 3V.

The GBP needs only an RF module, a display, and a keypad for a complete handset. Along with the GBP, LSI Logic provides DSP algorithms, an RF reference design, low-level hardware drivers, and the GSM protocol-stack software from Optimay GmbH, (Munich, Germany). The GBP architecture is ready for Type Approval with software for Protocol Stack GSM900 and RTOS from third-party developers.

The single-chip baseband processor comes in a 208-lead plastic miniBGA package. It is now available for \$15 (high volumes).

—by Stephen Kempainen
LSI Logic, Milpitas, CA. 1-800-935-5150, fax 1-617-574-4286, www.lsilogic.com. **Circle No. 377**

Surf at top speed for free or low cost

If you spend lots of time researching projects on the Internet from your Windows 95-based PC, you've probably experienced frustration while waiting for slow downloads to complete. The free SeeConnect shareware and \$12.50/copy TweakDun provide a cheaper alternative to upgrading your analog modem or paying for cable, digital-subscriber-loop, or integrated-services-digital-network Internet access. First, point your browser to Microsoft's (Redmond, WA) Web site, URL www.microsoft.com/windows95/info/updates.htm. Download and install the winsock and Dial-Up Networking Version 1.2b updates. While there,

download the re-released RegClean utility at <ftp://ftp.microsoft.com/softlib/MSLFILES/regcln41.exe>. Next, get the freeware SeeConnect program from Skyland Systems. SeeConnect can remind you when you're online by automatically changing the Windows desktop background color. It can also blink a button in the task bar or an icon in the system tray.

Next, check out the Web site for Patterson Design Systems or NetPro NorthWest. Download and install the Microsoft Visual Basic 5.0 runtime files, followed by the TweakDun Version 1.2 utility. TweakDun enables you to easily adjust several key TCP/IP Registry settings, including MaxMTU (maximum transmission unit), RWIN (TCP receive window), and TTL (time to live). The Windows defaults, although appropriate for LANs, can cause excessive packet fragmentation over dial-up Internet connections. The site offers suggestions for additional adjustments of MTU autodeTECT, MTU black-hole-detection, and session-keep-alive settings in the readme file.

After installing TweakDun, my system's average transfer rate almost doubled, both when accessing e-mail and lightly loaded Web servers. Some users report similar performance improvements when using America Online. You might not see any improvement, though, at peak Internet-usage time or when accessing a heavily hit site, such as Microsoft, Netscape, or Yahoo. In this case, the server, not your system, is the bottleneck.—by Brian Dipert

NetPro Northwest, Lake Oswego, OR. 1-503-699-0463, fax 1-503-699-9744, netpro@sns-access.com, www.sns-access.com/~netpro.

Circle No. 378

Patterson Design Systems, Robertsdale, AL. pattersc@gulftel.com, www.gulftel.com/~pattersc.

Circle No. 379

Skyland Systems, Los Gatos, CA. 1-408-353-4685, seeconnect@busam.com, www.busam.com/skyland.

Circle No. 380

Regulator driver lets you supply amps with low dropout voltage

Using the LT1573 regulator-driver IC from Linear Technology and an external pnp transistor, you can build a low-cost, low-dropout supply with fast transient response, thus reducing the bulk-storage capacitor requirements in your design. The device targets applications requiring supply values lower than 10V; if you



Transient response time of the LT1573 is approximately 10 μ sec for a 0.2 to 5A load step.

\$1.75 (1000) LT1573 requires no external current-sense resistor, because it uses a time-delayed, latching-current-protection technique to protect the regulator from continuous short circuits.—by Bill Schweber

Linear Technology Corp, Milpitas, CA. 1-408-432-1900, fax 1-408-434-6441, www.linear-tech.com.

Circle No. 387

CALENDAR

March 1 to 5

Nepcon West '98, Anaheim, CA, targets engineers and managers who design, manufacture, test, and service electronic products. Special technology areas on the show floor include a chip-scale-packaging forum, a pc-board forum, an environmental-issues clinic, and a test center. The sponsors expect more than 30,000 participants in more than 120 application-oriented sessions. Reed Exhibition Companies, Norwalk, CT. 1-203-840-5856.

March 3 to 5

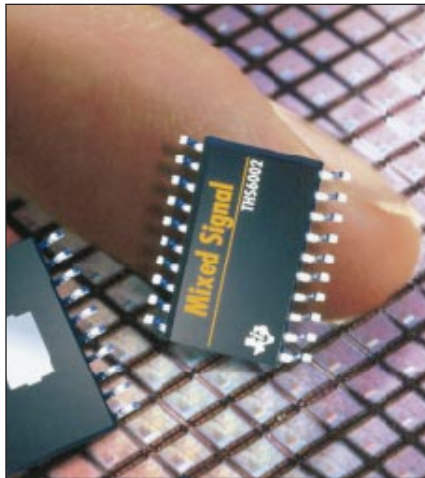
Computer Telephony Expo '98, Los Angeles, offers more than 60 sessions that provide call-center tutorials, intranet- and Internet-telephony information, technical tutorials, and enterprise-productivity workshops. The expo features 209 speakers, 106 product demonstrations, and more than 600 exhibitors. Registration costs \$895. Computer Telephony Expo, New York, NY. 1-212-691-8215.

March 9 to 10

Understanding ATM technology and network design, Madison, WI, explains asynchronous-transfer mode (ATM) and addresses implementation issues and strategies. The course teaches characteristics of ATM, mapping of various services to ATM, implementation case studies, and more. The University of Wisconsin—Madison, Department of Engineering Professional Development, Madison, WI. 1-608-262-2061.

ADSL driver/receiver pumps up the current with fast-slewing drive

Successful ADSL deployment requires a DSP, a codec, and a physical-line interface, and this interface has some aggressive current-drive and slewing requirements. The THS6002 line driver/receiver from Texas Instruments fulfills this requirement in ADSL and other line-interface and communication applications. Featuring two drivers and two receivers, the IC has a 200-MHz driver bandwidth and 1000V/ μ sec slew rate at gain of 2. It can drive a 50 Ω load with a peak current as high as 400 mA and supports a differential output voltage as high as 40V. On the receiving side, bandwidth and slew rate are the same as for the drivers, and THD is -70 dB at 1 MHz.



The THS6002 dual-line driver/receiver for ADSL applications drives 400-mA peak current and supports 200-MHz bandwidth in a 20-pin SOIC package with a thermal slug for improved heat transfer to its pc board.

—by Bill Schweber

Texas Instruments Inc, Dallas, TX. 1-800-477-8924 ext 4500, www.ti.com. **Circle No. 388**

REACH US VIA E-MAIL

MICHAEL C MARKOWITZ,
EDITOR IN CHIEF
EDNMARKOWITZ@MCIMAIL.COM

GARY LEGG, EXECUTIVE EDITOR
GARY.LEGG@EDN.CAHNERS.COM

JOAN LYNCH,
CONTRIBUTED ARTICLES
JLYNCH@EDN.CAHNERS.COM

BRIAN DIPERT, FPGAs, PLDs, MEMORIES
ENDDIPERT@WORLDNET.ATT.NET

STEPHEN KEMPAINEN, DIGITAL ICs
EDNKEMPAINEN@WORLDNET.ATT.NET

MARKUS LEVY
MICROPROCESSORS, MEMORIES
MARKUSLEVY@AOL.COM

JIM LIPMAN, EDA, ASICs
EDNLIPMAN@MCIMAIL.COM

BILL SCHWEBER, ANALOG ICs
BILL.SCHWEBER@CAHNERS.COM

DAN STRASSBERG,
TEST AND MEASUREMENT
EDNSTRASSBERG@CAHNERS.COM

BILL TRAVIS,
COMPONENTS, POWER SUPPLIES
B.TRAVIS@CAHNERS.COM

WARREN WEBB, EMBEDDED SYSTEMS
WWWWEBB@CTS.COM

MAURY WRIGHT,
COMPUTERS, PERIPHERALS
MWRIGHT@ABAC.COM

FRAN GRANVILLE, LEADING EDGE
F.GRANVILLE@EDN.CAHNERS.COM

KASEY CLARK,
LITERATURE, CALENDAR
KASE@CAHNERS.COM

Video codec embeds wavelet algorithms for variable compression and image quality

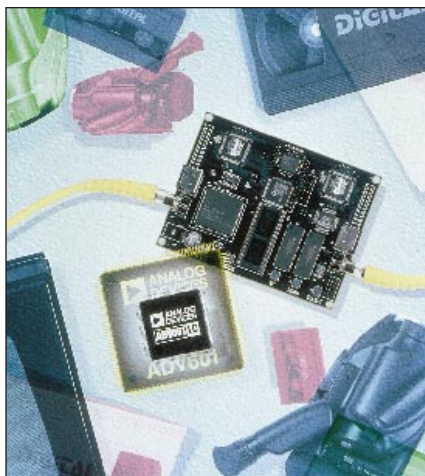
Designed for applications spanning digital VCRs, set-top boxes, and even basic low-performance surveillance, the ADV601LC video codec from Analog Devices offers compression ratios from a virtually lossless 4-to-1 to a lossy but still useful 350-to-1. The 120-pin TQFP IC includes both compression circuitry for encoding the video bit stream and decompression circuitry for complementary decoding.

A type of Fourier-transform, wavelet-signal-processing—like the discrete cosine transform (DCT) that MPEG compression uses—strives to reduce the number of bits the device needs to capture and re-create video images. However, you can more easily scale wavelet-based techniques, and you can edit them on the fly for viewing at whatever resolution and frame rate the receiving end allows. Wavelet-based techniques are also more error-tolerant and degrade more gracefully than does MPEG compression. The ADV601LC conforms to CCIR-601 (the international standard for studio-quality digitized video) and costs \$14.95 (10,000). A \$200 3×5-in. evaluation board, the Videopipe, lets you check out the IC performing simultaneous real-time compression and decompression.

—by Bill Schweber

Analog Devices Inc, Norwood, MA. 1-800-262-5643, fax 1-800-446-6212, www.analog.com.

Circle No. 389



Implementing wavelet-based encoding and decoding of video signals, the ADV601LC features a span of compression ratios commensurate with high-quality professional video as well as lower quality, less-demanding applications.