

leading edge

*What's hot
in the
design
community*

*Edited by
Fran Granville*

Share and share alike

"Companies willing to share their expertise and skills can find new ways to overcome roadblocks and help lead the industry to the next generation of technology advancements."

—Lisa Su of IBM on a recent collaboration with AMD for strained silicon, www.edn.com

4-Gbps FibreChannel test module generates traffic, performs protocol analysis

By Dan Strassberg

AGILENT TECHNOLOGIES' \$20,000 1735A test module for 1-, 2-, and 4-Gbps FibreChannel optical networks not only performs real-time protocol analysis, but also generates traffic to stimulate the network under test.

In combination with support for the new 4-Gbps data rate, the unit's dual-function capability reduces the number of modules and module types that developers of equipment for high-speed storage networks must stock. The mod-

ule also features a multilevel triggering sequencer, which enables users to quickly and easily define the events they wish to capture during component and subsystem testing.

The unit, which contains two independent, full-duplex, time-correlated analysis subsystems, can operate as an active or a passive tester. It is compatible with the manufacturer's 1730 series SAN (storage-area-network) test modules and plugs into the scalable, multiprotocol N2X chassis, of which the portable, two-slot version costs \$4151 and the stackable, four-slot version costs \$5219.

► **Agilent Technologies**, 1-800-829-4444, www.agilent.com.



The 1735A plugs into both a portable, two-slot chassis and a stackable, four-slot chassis.

Ultracapacitor-pack standardization reaches 15V

FOLLOWING ITS INTRODUCTION of an ultracapacitor in a standard D-cell form factor, Maxwell Technologies has put six of its Boostcap ultracapacitors into a single plug-and-play battery pack with nominal 15V output. The packs are available as basic shrink-wrapped packages or as rugged aluminum-chassis modules with screw terminals. Each configuration is available with active or passive cell balancing to provide engineers a choice in managing cells for maximum life versus cost and dissipation.

The packs comprise six BCAP0350 ultracapacitor cells in series; each 350F cell operates at 2.5V

and weighs 60g. According to Mike Everett, vice president of technical systems at Maxwell, "Everyone is overengineering the size of their ultracaps and underengineering their system requirements." By adding standard packs to the engineering mix of available sources, engineers can balance and optimize their approach to power and energy back-up, boost, recapture, or initial surge requirements. In lots of one to 15 units, The shrink-wrapped pack sells for \$127, and the more rugged module sells for \$200 (one to 15).—by Bill Schweber

► **Maxwell Technologies Inc**, 1-858-503-3300, www.maxwell.com.

Servoamp drive is small, versatile, powerful, and networked

THE ALL-DIGITAL Accelnet Micro servoamplifier from Copley Controls squeezes the physical envelope and expands the performance envelope.

The single-axis, 2.5×1.6-in., pc-board-mountable design can be part of the overall control, power-supply, or interface board. It includes low-cost, CANopen networking for multiaxis control. Applications include portable instruments, medical instrumentation, lab equipment, and even vending machines. The unit's size lets you put it near the motor for simplified wiring and reduced RFI output, which long cable runs can aggravate.

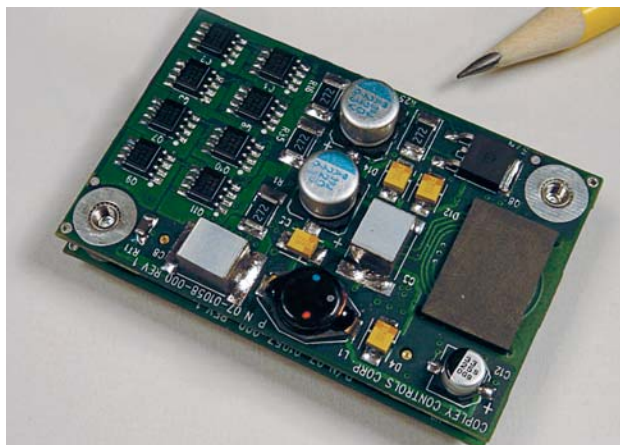
Output ranges are 20 to 55V at 3A continuous and 6A peak or 20 to 90V at 2A continuous and 4A peak. It accepts ±10V analog-control and digital-PWM signals. Further, depending on operating mode, it lets engineers replace stepper motors with faster, higher power brushless servomotors, because it accepts and translates stepper-control signals. For enhanced

performance, it applies field-oriented control algorithms.

Using the built-in software, you can create, via Java scripts, a sequence of automatic motions as a series of commands with special velocity, position, and acceleration profiles for each, and then store these scripts in the amplifier's flash memory for autonomous op-

eration. You can also instruct the system to change basic parameters, such as amplifier gain, to match sudden changes in load or situation. The servo loop is reasonably fast, with 2.5-kHz current-loop bandwidth, 14-kHz current-loop update rate, and 3.5-kHz position- and velocity-loop update rate. Prices for the Accelnet Micro networking servoamp begin at \$298 (one to nine).—by Bill Schweber

► **Copley Controls Corp**, 1-781-828-8090, www.copleycontrols.com.



Drop the Accelnet Micro networked servo amp on your pc board and minimize many of your brushless and stepper-motor-control issues.

DILBERT By Scott Adams



► **Blog creators add about 12,000 new Web logs to the Internet each day, or about one every 7.4 seconds, for a total of 4.8 million blogs.**—*Business Week*, Dec 13, 2004.

HOST CONTROLLER POWERS USB STORAGE DEVICES

The USB104+, a new four-port USB 2.0 host controller from Parvus, can directly power attached devices and delivers transfer rates 40 times faster than legacy USB 1.1 products. This 3.55×3.775-in. PC/104-Plus-form-factor module provides four downstream ports, two supplying as much as 500 mA of drive and two enhanced ports supporting as much as 2A of drive. The board's high-performance PCI-bus USB-controller chip supports all high-speed USB transfer-speed modes: 480-Mbps High Speed, 12-Mbps Full Speed, and 1.5-Mbps Low Speed. All four downstream ports allow mixed, simultaneous connections of USB 2.0, 1.1, or both types of devices at different speeds.

Typical applications for the USB104+ board include use with removable or fixed mass-storage media; USB memory keys; printers; cameras; CD drives; and high-speed, 2.5-in. USB hard drives. The board supports hot insertion and is compatible with Windows XP Embedded, Windows CE, Linux, QNX, and other real-time operating systems. The USB104+ sells for \$230 (100) and will become available during the first quarter of this year.

—by Warren Webb

► **Parvus Corp**, 1-801-483-1533, www.parvus.com.



The four-port USB104+ PC/104-Plus USB 2.0 host controller delivers high current drive and can power external USB mass-storage devices.

Format-tuned codec, encoder contend for relevance

PROTCOM HAS CHOSEN to hard-wire the video and ADPCM (adaptive-differential pulse-code-modulation) audio-encoding capabilities of its \$19 (100,000) GoldenReel PR828 device, along with the incremental full-duplex video and ADPCM decoding functions in its \$22 PR818S codec. In making this determination, Protocom has rejected the more common approach of implementing these capabilities in software running on a DSP core. The company's decision is encouraging for the MPEG-4 Advanced Simple Profile format that the chips support (to D1 resolutions and 30-frame/sec rates); it indicates that MPEG-4 AS *finally* is sufficiently mature to be "frozen" in dedicated circuitry. And hard-wired approaches tend, all other factors being equal,

to deliver higher throughput per megahertz and lower power draw per megahertz than firmware-centric alternatives. With all functions enabled, the estimated power draw of the PR828 is 400 mW; that of the PR818S is 550 mW.

But where are the noteworthy applications? Certainly, a closed-loop architecture, such as a video-security system or a service-provider-proprietary video-on-cell-phone service, is a candidate. But anyone attempting to migrate MPEG-4 AS content to the PC or the living room will quickly run into roadblocks. Windows Media Player doesn't support MPEG-4, Quicktime Version 6 supports only low-quality Simple Profile. (The Version 6 beta implemented some AS functions, which Apple disabled when it released the final version of the pro-

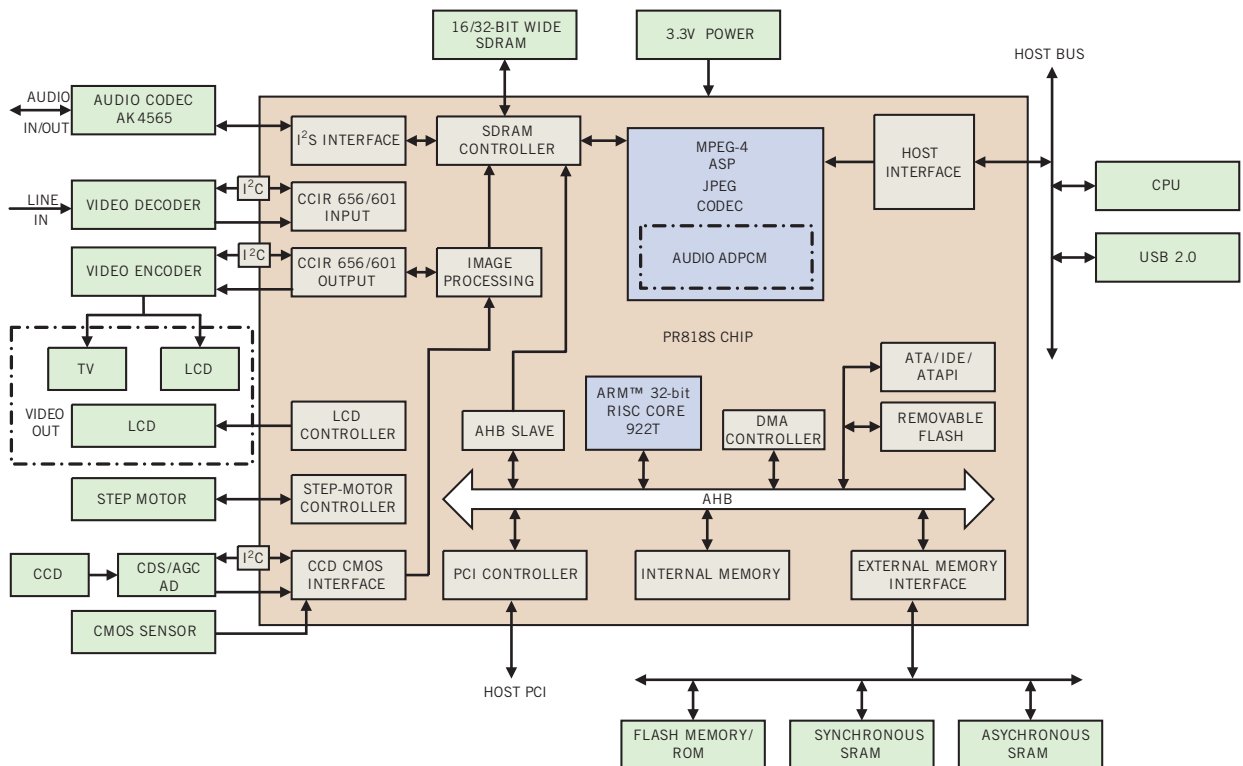
gram.) And the DivX Player and Nero Media Player aren't pervasive on PCs and Macs, except perhaps in college dorms (see "Video characterization creates hands-on headaches," *EDN*, July 25, 2002, pg 53). DivX implements a subset of, along with proprietary extensions to, the MPEG-4 AS specification, so DivX-compliant DVD players aren't guaranteed to play MPEG-4 AS content.

Because of the high quality and consequent success of proprietary codes, such as RealVideo, On2's VP6, and Microsoft's Windows Media Version 9, MPEG-aligned companies, including Protocom, are working as quickly as possible to finalize and roll out the follow-on MPEG-4 part 10 (also known as H.264 or MPEG-4 AVC) codec. So, it's unclear how long

MPEG-4 AS will live. Nonetheless, the PR818S and PR828 also include a hard-wired JPEG codec and a 160-MHz ARM922T core. The core tackles multimedia-content multiplexing and demultiplexing; the encoding and decoding of other audio formats, such as MP3, AAC, and WMA; image processing; Linux-operating-system execution; and other functions. (The company also plans support for Windows CE, Vx-Works, and other operating systems.) The chips also transcode between MPEG-2 (ML@MP) and MPEG-4. Both devices are now available; the company also offers the Emerge engineering-development platform.

—by Brian Dipert

► **Protocom Technology**,
1-408-343-0976, www.protocomtech.com.



Protocom's PR828 is a notable exercise in engineering integration and trade-off optimization, albeit with an unclear market fit.

Media, chip set address portable systems' requirements

SAMSUNG HAS SHOEHORNEA a 1.5-Gbyte Cornice Storage Element into its latest model—SPH V5400 cell phone, a trendsetting first step in

a bigger picture flash-to-hard-disk-drive shift that *EDN* predicted after last year's Storage Visions Conference at the Consumer Electronics Show (see "Harnessing the hard-drive metamorphosis," *EDN*, July 8, 2004, pg 28). The concept has a lot of merit, as cell phones increasingly stretch beyond their communications roots and become media-rich, including audio, graphics, and still and video images; recording; and playback platforms. A quick—show of hands, though: How many of you have ever dropped a cell phone? Traditional ruggedness-boosting approaches, such as shock absorption within the drive and of the drive subsystem; motion-sensor-instigated, aggressive "parking" of drive heads; and spindown of platters, may be insufficient in this new class of small, portable, and casually handled devices.

Cornice's latest single-head, \$63 (1000), 3-Gbyte drive takes media protection to the next level with a sensor- or motor-controller-driven crash-guard active latch that, when the system properly implements it, enables the drive to survive a 1.5m fall. The Storage Element claims a 5-Mbyte/sec typical transfer rate, weighs 14.5g, and measures 42.8×36.4×5 mm. Power consumption of 3.3V reflects system buffering, consequently enabling aggressive spindown power manage-

ment; Cornice estimates 4.5-mW average power consumption at 3.3V during typical audio playback, 23 mW average during typical video playback, and 85 mW average during typical video recording. These power-consumption approximations reflect system buffering, consequently enabling aggressive spindown power management.

The new fast-growing breed of 0.85-, 1-, and 1.8-in. hard-disk drives consists of more than a platter, motor, actuator, and head. They also have a motor controller and preamplifier within the drive, plus hard-disk control, interface control, and read-channel encoding and decoding functions variably partitioned between the system and the drive. Agere's \$10 (100) TrueStore CE chip set for small-form-factor drives consists of the RC1100 read-channel device, which also integrates hard-disk-drive- and interface-control functions, the PA1100 preamplifier IC, and the MC1100 motor controller. "Agere has long been the signal-to-noise leader," claims Strategic Marketing Manager Jeff Janukowicz; accurately placing and extracting the data signal is key to squeezing maximum storage capacity from minuscule disk platters.

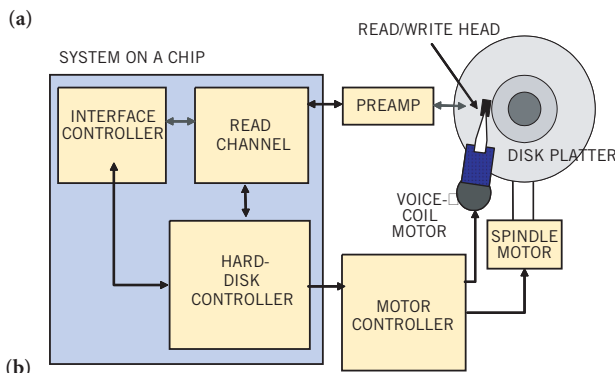
Power consumption is another key consideration; Agere claims that a combination of a low-leakage process and a power-cognizant chip

design enables the RC1100 to consume 70% less power in deep-sleep mode than functionally equivalent devices targeting 2.5-in. drives. The PA1100, similarly, consumes as little as one-third the power of chips supporting 2.5-in. drives. Addressing reliability, the MC1100's emergency-retraction feature parks the drive heads within a drive-dependent few milliseconds upon sensing physical shock or power loss. And regarding performance, the company claims that the chip set can deliver read and write speeds to and from the buffer mem-

ory. (These speeds reach 3 Mbits on die, split between buffer- and code-shadowing functions; you can implement additional buffer memory in-system or using a multidiode package.) The chip set can also deliver rotating magnetic media that top 350-Mbyte/sec speeds. The RC1100 is now available in sample quantities; the PA1100 will appear by the end of this quarter with the MC1100 following next quarter.—by Brian Dipert

► **Agere Systems**, 1-610-712-4323, www.agere.com.

► **Cornice**, 1-303-651-7291, www.corniceco.com.



Cornice's 3-Gbyte Storage Element contains a shock-resisting active latch (a); Agere's chip set addresses small-form-factor drive power, performance, and ruggedness requirements (b).

► **The number of households in the United States with four or more TVs grew to 25.2 million, an increase of more than 4 million since 2003, according to Nielsen Media Research.**

MEMS technology builds faster smart power chips

By *Graham Prophet*

Cambridge Semiconductor is a UK-based start-up that plans to bring a new generation of "smart" power switch devices, for use in off-line

converters and power supplies, to market in the first half of 2005. The technology merges aspects of MEMS fabrication with power device technology to produce a significant incremental improvement in device characteristics, that will enable higher densities and efficiencies, through the use of higher switching speeds, than is possible with today's FETs and other switches.

PowerBrane devices will combine a lateral insulated gate bipolar transistor (LIGBT) together with gate drivers and control and protection circuitry, on a single die. The LIGBT itself is expected to deliver today's current densities, at 30 A/cm², and switching speeds of up to

10× today's values. LIGBTs offer a potential way to improve on the performance of the MOSFETs commonly used at present, but have been limited by issues of isolation and low breakdown voltage. In CamSemi's process, the silicon wafer is back-etched under the buried-oxide in the drift region of the LIGBT. The wafer is thinned until the (conductive) silicon is removed from the underside of the oxide leaving just a membrane - from which the device name is derived. Although the technique is derived from MEMS processing, there are no moving parts. LIGBTs suffer low breakdown voltages because the conducting silicon under the drift region causes compression of the

electric field lines as they pass through the active region of the device, leading to high field strengths and punch-through. With no silicon, there is much reduced field strength and the breakdown voltage can be increased 20× to 650V, suitable for off-line switching. The device also switches off in 40-50 nsec (at 400V and 0.5A) due to reduced capacitances, which CamSemi's co-founder Dr. Florian Udrea says is faster than MOSFETs, and allows a switching speed of 500 kHz to be used. The process is completely CMOS-compatible, and can host high gate counts of logic alongside the power switch. This will enable complex devices such as lighting controllers to be built on one chip. CamSemi will introduce a range of switches for use in the range 1 - 1000W.

► **Cambridge Semiconductor**,
+44 1223 446450,
www.camsemi.com

Catch software run-time errors at compile time

PolySpace Technologies develops software for automatic detection of run-time errors in mission-critical code; it is now expanding its interests into the general embedded programming world. Its products examine and analyse source

code in C, C++ or Ada. The strategy is called static data flow analysis (as opposed to functional testing): using a technique called Abstract Interpretation, the software follows data flow in the code under test.

In a simplified view, each time the code performs a data manipulation, the software sets out the various ways that computation could go wrong (divide by zero, overflow errors, and so on). It then creates a listing of all the data values that could lead to those errors and examines the flow of data to check if, and under what conditions, those conditions can ever be met. It also makes a number of other checks on the code, such as unreachable statements. Code

is classified as green (good), orange (potentially hazardous), red (hazardous) or grey (not executed), the color coding being applied directly back to on-screen source code listing. The software is relatively run-time intensive, taking approximately 1 hour to examine 5000 lines. It comes in two packages; "verfier" and "desktop". The latter is one that would be used by every software coder, and is priced at £ [UKP] 3000. Verifier, a batch product, is an enterprise-level package priced at £18,000. Code developers should achieve better quality and productivity; with no test cases to write, the tool is used just like a compiler. PolySpace says that the software will catch bugs that would have

been found in any case, only earlier; bugs that would not normally be tested for; and bugs that, although a test might be written, would be "symptom-free". The extracted behavior of the data from the analysis product can be used to model the behaviour of blocks of code in hierarchical models - but without any timing data, as there is no knowledge of implementation platform.

The latest release of the product, version 2.5, is now qualified for the aerospace standard DO-178B.- by Graham Prophet

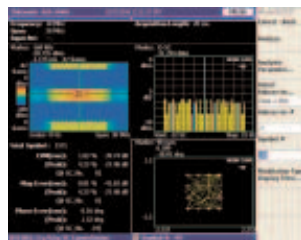
► **PolySpace;**
+44 1494 616051,
www.polyspace.com

Signal analyser peers deeper into spectral data

Tektronix has extended the performance of its real-time signal analyser with the RSA3408A, which can view (up to) a 36-MHz wide bandwidth in the DC to 8 GHz range. It samples, captures and digitizes the complete sample bandwidth continuously,

performs FFTs on the data, and presents data in a variety of formats including spectrograms. Compared to its predecessor, it has twice the sample bandwidth due to a faster ADC; 4 dB more dynamic range; but an increased resolution of 2000×.

This figure is achieved because the previous instrument



This screen shot from the RSA3408A shows a spectrogram of an OFDM signal, with the channel content and a constellation diagram for the same signal

collected 1024 samples, performed an FFT, and repeated the exercise. FFT results were stored, but not the samples. The 3408A has much more memory; it stores the samples for post-processing and is equipped with complex triggering so that pre- and post-trigger display can be obtained with spectral data. It also has much more processing power; the post-processing can be set to perform overlapped FFTs, with a user-selectable degree of overlap. Previously, the instrument performed an FFT on samples 1 - 1024 of sample set 1; then repeated the process on sample set 2, and so on. Now, at maximum resolution, it will perform an FFT on samples 1 - 1024 of sample set 1; then it will begin at sample 2 of sam-

ple set 1 and use the 1024 samples through to sample 1 of set 2; and so on, "walking through" the successive sample sets. The point of this exercise is that it reveals data that is latent in the sample sets, but is not revealed by simple successive FFTs. In a demonstration using a frequency-hopping signal, with a power ramp, the trigger can be set at the point where the power ramps up. Using pre-trigger and a spectrogram display, the display shows the frequency of the signal track in from its previous hop channel, settle to the target channel, and (by use of color to represent power) ramp up in power. It is the extraction of the latent data that underlies the claim of 2000× resolution gain. The instrument can be equipped with signal masks for all commonly used digital radio standards and modulation types, and can be used for EMI, RFID, chirped radar and spectral monitoring tasks. - by Graham Prophet

► **Tektronix**,
+44 1344 392000,
www.tektronix.com

Is anybody there?

A group of information theory researchers from the University of Michigan and the Max Planck Institute in Leipzig may have dealt a blow to searchers for signals from extra-terrestrial civilisations. The best-known of these efforts is probably SETI (Search for Extra-Terrestrial Intelligence); readers may even have hosted some of its signal processing algorithms on their own PCs, as part of its distributed processing program. (That web-based program is an interesting exercise in its own right, currently running as the equivalent of a machine of over 60 TeraFLOPS; see <http://setiathome.ssl.berkeley.edu>.) However, the new research* calls into question whether, should we receive such a signal, we would recognize it for what it is. The paper extends Claude Shannon's classic information theory; according to Shannon, information coded at maximum efficiency is indistinguishable from random noise if you don't know the coding scheme. The new paper extends this principle and shows that the same result is true for RF transmissions; with no knowledge of the modulation or coding that is being used, a maximally-efficient signal will look just like thermal noise. So, if a radio astronomer does intercept a message from an efficiently-coded source, it will look just like a faint star. If ET is out there, our best hope may be that he skipped the class on Shannon's theories.

**"The Physical Limits of Communication, or Why any sufficiently advanced technology is indistinguishable from noise." American Journal of Physics, November 2004*