leading edge

What's hot in the design community

Edited by Fran Granville

The end of the bloat

"Power users are going to want 250 Gbytes of storage in their portable media centers. And most of that storage requirement will *not* be for our software. It'll be for data ... audio, pictures, video. Phew. Finally 'bloatware' will be off the radar screen."

–David Proctor, hardware lead engineer for portable media centers, Microsoft

Tiny modules cool PC/104-expansion woes

By Waren Webb

The new Xblok product family from Octagon Systems provides low-cost, energy-efficient peripheral expansion for PC/104 platforms. The tiny modules measure 1.65×3.55 in., less than half the size of a standard PC/104-expansion module. Designers can add one or two functional expansion modules to a PC/104 system, increasing the stack height by only 0.6 in. The Xbloks leave a 0.75-in. gap between opposing modules, allowing true conduction cooling and preventing the processor-induced hot spots that occur when heat becomes trapped under the first expansion module.

Xblok modules cut PC/104-expansion costs and reduce system-heat-buildup problems.

Currently available Xbloks include devices for 10/100BaseT Ethernet; quad USB 2.0; 48-line digital I/O; dual serial ports; and a battery-backed, static-RAM disk. Xbloks operate at −40 to +85°C and sell for $60 to $104.

▶**Octagon Systems**, www.octagonsystems.com.

High-reliability-qualified chip resistor doesn't resist

A 0Ω chip-resistor family from State of the Art targets high-reliability applications and provides engineers with more flexibility of board layout in challenging routing situations. These devices, the MIL-PRF-32159 series, are available in three test and assurance levels, per the US Department of Defense DSCC (Defense Supply Center Columbus) listing: Space Level T, Military Reliability Level M, or Industrial Level C. According to Engineering Manager Bob Sutterlin, engineers can use the jumper to jumper traces without the use of a multilayer pc board and to customize or alter the functions of a pc board.

Even a 0Ω device isn't perfect; it has some internal resistance, which causes dissipation and, thus, limits current. Power ratings for these resistors range from 35 mW to 1W, depending on model, equivalent to 1.1 to 6.3A. This range may differ for some of the 13 case sizes and termination choices, which include solderable, wire-bondable, and epoxy-bondable options. Further, because it's meaningless to specify accuracy and tolerance in terms of percentage of nominal value for a 0Ω device, the vendor instead specifies the maximum resistance. The actual resistance parameter varies with case size and termination material, but typical values are 60 to 150 mΩ. The devices sell for less than $1 (production quantities).

—by Bill Schweber

▶**State of the Art Inc**, www.resistor.com.

Books offer serious design help

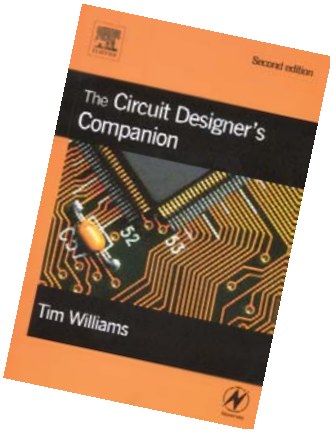
With the wide availability of vendor application notes, Web-based sources, reference designs, and EDA tools, books may seem to be outmoded information sources for engineers. But that's not at all the case. In the past few months, *EDN* has received the following noteworthy books:

The Data Conversion Handbook, edited by Walt Kester (Newnes/Elsevier, ISBN 075-0678410), in which Analog Devices' application guru tells you all about selecting, specifying, applying, and minimizing surprises when you use A/D and D/A converters.

Design and Development of Medical Electronic Instrumentation by David Prutchi and Michael Norris (Wiley-Interscience, ISBN 0471676233) details this application's unique requirements and constraints, exploring with general discussion, schematic diagrams, representative waveforms, and typical-design photos.

Advanced RF Engineering for Wireless Systems and Networks by Arshad Hussain (IEEE Press/Wiley-Interscience, ISBN 0471674214) covers all aspects of the subject from theory and equations through schematics of circuits.

RF Engineering for Wireless Networks by Daniel Dobkin (Newnes/Elsevier, ISBN 075-0678739), spans hardware, antennas, and propagation from basics onward. It covers indoor and outdoor networks, system test and measurement, and standards.



The Circuit Designer's Companion, Second Edition by Tim Williams (Newnes/Elsevier), ISBN 0750663707) is not a simplistic cookbook of circuits, but an examination of design issues and practical concerns from the perspective of an experienced engineer. This broad-ranging book teaches considerations you wish you knew about when you finished school and had a real project to work on but doesn't assume a simplistic problem-solution approach. It explains factors to watch out for and the choices you have in design decisions, as well as providing component data and specifics.

—by Bill Schweber

DEVICES EXTEND THE REACH OF 8-BIT PROCESSING

Microchip has added four new devices to its PIC18F family of 8-bit microcontrollers. The devices operate as fast as 40 MHz and include 96 and 128 kbytes of self-reprogrammable, high-endurance flash memory and can operate over 2 to 5.5V. The PIC18F8722 series devices provide linear access, requiring no memory-paging schemes up to as much as 2 Mbytes of memory, and maintain code and tool compatibility with other Microchip microcontrollers.

These devices feature 4 kbytes of RAM and 1 kbyte of EEPROM; a 16-channel, 10-bit ADC; two analog comparators; four serial interfaces; a watchdog timer with prescalar options; and an 8-MHz internal oscillator block. All of the devices feature Microchip's nanoWatt Technology for low-power design.

The devices are now available for general sampling in 64- and 80-pin TQFPs for $6.81 to $8.23 (10,000). The demonstration board will be available in February. Microchip's MPLAB integrated development environment, MPLAB C18 C compiler, MPLAB ICD 2 in-circuit debugger, and MPLAB ICE 2000/4000 in-circuit emulators support development for these systems.

—by Robert Cravotta

▶**Microchip**, 1-480-792-7200, www.microchip.com.

DILBERT *By Scott Adams*

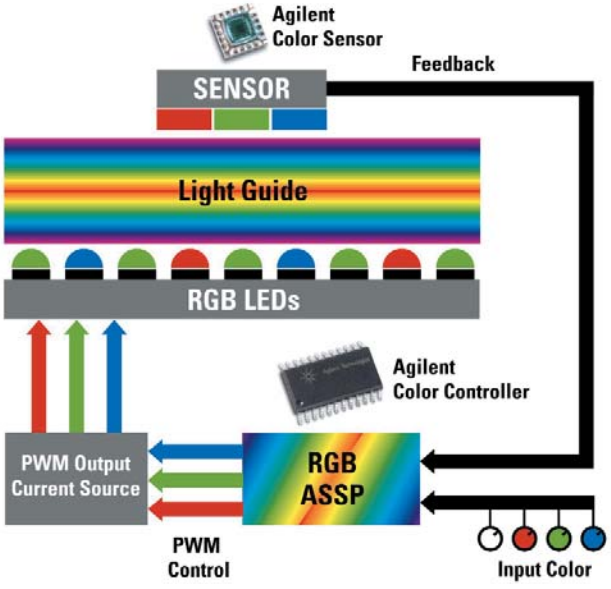
▶**Laptop makers equipped some 79% of their products sold in 2004 with built-in wireless connections, and that number will rise to nearly 100% this year, according to InStat/MDR.**

Color your world with superior LED backlighting

Agilent's new HDJD-JB01 illumination- and color-management system seeks to darken the prospects of the CCFLs (cold-cathode fluorescent lamps) that LCD-TV backlighting currently uses. Key to the design is a color-sensor IC, which controls a corresponding PWM current source for the RGB LED array. The system employs high-intensity Luxeon LEDs from Lumileds Lighting (www.lumileds.com), a joint venture between Agilent and Philips Electronics. The vendor claims that using an LED backlight is preferable for deep, realistic color imaging because it can provide a color gamut than spans 104% of the NTSC (National Television System Committee)-defined chromaticity space, whereas CCFLs cover only 75% of that space. According to Soo-Ghee Lee, vice president and general manager for the Optoelectronic Products Division in Agilent's Semiconductor Products Group, "Now, consumers watching flat-panel TVs will be able to see all of the rainbow brighter and more clearly for a more exciting viewing experience."

Using LEDs for LCD backlighting sounds conceptually straightforward, but practical issues have slowed their use. First, with LEDs, it is nearly impossible to maintain a fixed "color point" because the red, green, and blue LEDs degrade at different rates. Also, the wavelengths of the LEDs shift as temperature changes. It is also difficult for LEDs to hit standard setpoints in the color space, and manufacturers have to sort and bin LEDs for matching output, which adds to cost. Moreover, an overall ready-to-go system design has not yet been available.

The Agilent approach has five functional elements. It is a closed-loop electrical and optical system that captures and mixes the output of the bright LEDs in a light guide, which then directs this output to a sensor IC. The sensor, in turn, provides color feedback to the controller IC, which drives the LEDs and maintains stability. Users can define the desired color setpoint, or "white point," and brightness; those preferences go to the controller. (Note that US studio monitors and European TVs typically use a 6500K color temperature, whereas US TVs use a bluer color temperature of 7100K, and Japanese TVs use an even-bluer 9300K, as do most computer monitors worldwide.) As an additional benefit, the architecture greatly reduces motion blue because the system can pulse the LED backlight at the frame rate and go dark between frames, reminiscent of a movie-film projector's shuttering between film-image frames.



Use tricolor LED backlighting instead of CCFLs for LED displays. The HDJD-JB01 closed-loop illumination and color-management system strives to overcome the problems of using LEDs in this situation.

The HDJD-S831-QT333 RGB-color-sensor IC combines a 12×12 photodiode array with a trio of transimpedance amplifiers and converts light intensity to three analog outputs, corresponding to the RGB primary colors. Its spectral sensitivity matches the LED-backlight application. The analog signals go to the HDJD-J822-SCR00 color-controller IC, which includes an A/D converter, a data-processing-logic core, a 12-bit PWM output generator, and an I^2C serial interface.

The Agilent backlighting system can find use in applications other than LCD-TV displays, although that is the initial and best-fit application. Designers can also employ it in variable-color automotive-panel lighting, architectural lighting, and other embedded LCDs that require a backlight function. The system sells for less than $35 (low volumes).—by Bill Schweber

▶**Agilent Technologies Inc**, www.agilent.com.

Video-receiver IC spans analog present, digital future

Add Analog Devices to the list of companies supply ing chips compatible with the fast growing HDMI (high-definition-multimedia-interface) standard (see "Video processor embraces high-speed A/V link," *EDN*, Jan 20, 2005, pg 14). ADI puts a unique—at least for now—spin on the concept, embedding both analog and digital interfaces on the single-chip AD9880. Both interfaces operate at rates as high as 165 MHz and, therefore, are compatible with 1080p and UXGA display resolutions, and the analog receiver accepts both YPrPb (component-video) and RGB inputs.

The company has been publicly shopping the device around since last spring, but the product recently passed HDMI Version 1.1-compliance testing. Now available in sample quantities, the AD9880 is scheduled to enter volume production in the second quarter at $10.95 (1000). A lower resolution, 100-MHz variant costs $9.45; both versions come in 100-lead TQFPs.—by Brian Dipert

▶**Analog Devices**, 1-781-329-4700, www.analog.com.

Programmable-logic successors focus on cost, capacity, feature enhancements

Actel admits that its eight-year-old ProASIC FPGA line was a slow starter, but the company happily reports that its flash-based devices, which it inherited through an acquisition of Gatefield and then refined, have now hit full stride. The products' single-chip combination of nonvolatility and in-system upgradability—versus antifuse- and SRAM-based FPGA counterparts—has always been novel. Thanks to the conversion from trailing-edge, 0.22-micron to leading-edge, 0.13-micron processes that the latest generation ProASIC3 devices exemplify, you can add high density and low cost per bit to the equation. And, unlike competitor Altera and Lattice's flash-based programmable-logic chips, Actel claims that it directly uses the flash-memory transistor as the "pass" element for routing configuration, an approach that improves silicon efficiency.

"Our ProASIC customers are fundamentally price-motivated. They tell us, 'How many features can you give me for $4.95?'" says Marketing Vice President Dennis Kish. With those stringent cost requirements in mind, Actel was still able to advance the ProASIC3 feature set beyond that of prior generation product families. A tweaked logic-cell structure delivers as much as 20% more packing density and combines with routing enhancements to enable as much as 95% logic-usage capability. The parts contain 1 kbit of user-configurable "generic" flash memory, subdivided into eight 128-bit pages and accessible via JTAG or through the FPGA fabric, and they support as many as 19 I/O standards on highest density chips.

All but the smallest ProASIC3 device also contain a hardware-AES decryption engine for secure configuration; once you program the AES key into the device, you can provide an encrypted file to your manufacturing subcontractor or safely reconfigure the device over a public network. Except for the smallest device, standard parts contain a single PLL; Actel ships "E" variants with six PLLs, which also offer Schmitt-trigger-input support. Commensurate with the process migration, ProASIC3 parts also run faster and cooler than predecessors.

The new devices feature a 350-MHz-maximum internal clock with a 1.5V core voltage and on-chip charge pumps and bank-selectable 1.5, 1.8, 2.5, and 3.3V I/O-voltage options. The ProASIC3E 600 is now available in sample quantities and is scheduled to go into production in the fourth quarter. The lowest density device in the ProASIC3 family will cost $1.50 (250,000); seven of the 10 family members will sell for less than $10. Version 6.1 of the Libero design-tool suite supports ProASIC3, and a $249 starter kit containing the Libero Gold edition, a device programmer and an evaluation board will be available early next quarter.

Altera has also undertaken a lithography reduction—in this case, to 90 nm—in implementing its conversion to the HardCopy II structured-ASIC product line (see "Silicon segmentation," *EDN*, Sept 18, 2004, pg 57). Although the family of five devices won't begin to emerge until the third quarter, you can in some cases begin your design, prototyping, and even limited production now with Version 4.2 of the Quartus design suite, along with Stratix II devices that have comparable I/O counts, logic densities, or other attributes. Note, however, no 1-to-1 Stratix II-to-HardCopy II device match-up encompasses *all* of these characteristics. Note too that the prototype-with-FPGA strategy won't work if you expect to achieve higher-than-FPGA speeds or lower-than-FPGA power consumption from your final structured-ASIC design; in these cases, you have to wait for Quartus Version 5, which is scheduled for late-April general availability, and the results from Altera's design services group, which tackles the HardCopy place-and-route tasks. However, for those of you who don't plan to push your design beyond the FPGA's capabilities, Alain Bismuth, vice president of the HardCopy business unit, claims, "We guarantee that HardCopy II will be fully compatible with the FPGA prototype."

In earlier generation HardCopy devices, Altera achieved its FPGA-to-ASIC speed, power, and area-efficiency improvements by eliminating programmable interconnect resources from the die and, with HardCopy Stratix, optimizing the layout of "hard"-IP (intellectual-property) circuits. With HardCopy II, the company takes silicon slimming to the next level by converting each of the FPGA's LUT (look-up-table)-based ALMs (adaptive-logic modules) to a collection of finer grained, claimed function-compatible HCells. This transition is potentially a risky move, but company officials feel that Altera's robust simulation research—with each ALM having more than 20,000 possible configurations—confirms the approach's validity. The HC210W will cost $15 (100,000), and NRE (nonrecurring-engineering) charges will start at $225,000 for a full turnkey FPGA-to-ASIC migration, including fully tested HardCopy II prototypes.

—by Brian Dipert

▶**Actel**, 1-650-318-4200, www.actel.com.

▶**Altera**, 1-408-544-7000, www.altera.com.

▶In late 2004, AOL blocked half as much spam at the front door of its network as it blocked in the worst point of 2003, when it stopped about 2.4 billion e-mails a day, according to the company. And the number of messages diverted to members' "spam folders" fell 60% to 40 million a day in November 2004 compared with a year earlier. The drop in spam helped reduce AOL's overall e-mail load by 22%, AOL says.