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leading edge

What's hot in the design community

Edited by Fran Granville

So long, CD; hello, Kazaa

"Five years from now, you'll see virtually no CD stores...Demand is shifting, and anyone who thinks it isn't going to happen hasn't paid attention to history."

–Mike Dreese, founder of Newbury Comics, the Northeast's largest music retail chain, in *The Boston Sunday Globe*, Feb 23, 2003

1.5-GHz ADC fits high-bandwidth VME applications

By Warren Webb

TARGETING SIGNAL INTELLIGENCE, laser ranging, and other high-bandwidth applications, Echotek's new 6U, single-slot VME 64X board features one or two channels of high-speed, 8-bit analog-to-digital conversion along with programmable gate arrays for user-specific signal-processing algorithms. The Maxim (www.maxim.com) MAX108 8-bit ADCs with 100-MHz to 1.5-GHz sample rates convert the ECAD-X-081500's analog inputs.



Echotek's dual-channel programmable A/D converter samples data at 1.5 GHz for high-speed, signal-processing tasks.

The A/D converters demonstrate spurious-free dynamic ranges greater than 45 dB at full scale. In addition, the converters support direct digitization for IFs as high as 1.4 GHz. Front-panel connectors capture analog-input, analog-to-digital-clock, synchronization, trigger, 128-bit-auxiliary-data, and LVDS-input signals. The device outputs converted data through dual Race++ interfaces, the LVDS output port, or the VME 64X interface. Each channel has a 4M-sample FIFO buffer along with as many as three dedicated FPGAs for user-programmable signal processing. Prices for the ECAD-X-081500 start at $13,000 (one).

▶**Echotek Corp**, 1-256-721-1911, www.echotek.com. Enter No. 352 at www.edn.com/info.

Switch RTOSs with no application-code changes

MQX is ARC's royalty-free real-time operating system for its series of ARCTangent configurable-processor cores and for other popular architectures, including ARM. If you are using MQX, OS Changer lets you reuse legacy code written for other operating systems, such as pSOS and VxWorks, without rewriting the application. OS Changer covers approximately 90% of the kernel APIs; the remaining 10% of APIs, ARC claims, are rarely used.

ARC calls this product a changer rather than a translator because it does more than provide a 1-to-1 mapping of system calls between operating systems, which can leave the need to change the source code of the application. The resulting code is always optimized for MQX because the mappings and changes occur at compilation. You can therefore reuse a code base to more quickly perform development and to ease the transition to a different OS.—by Graham Prophet

▶**ARC International**, +44 208 236 2800, www.arc.com. Enter No. 353 at www.edn.com.info.

PCI EXPRESS SHIFTS INTO GEAR

Several companies have recently announced product support for PCI Express. Nurlogic (www.nurlogic.com) is developing OpalLink, a 0.13-micron PCI Express "hard"-IP (intellectual-property) core operating at 2.5 Gbps/lane with a power consumption of less than 80 mW per lane. OpalLink will be available for licensing in the second quarter. PureSpec from Denali (www.denali.com) allows chip designers to model and verify presilicon compliance and interoperability for PCI Express designs. Two protocol analyzers are available: the PETracter from CATC (www.catc.com) and the Bus Doctor PCI Express from Data Transit (www.datatransit.com).

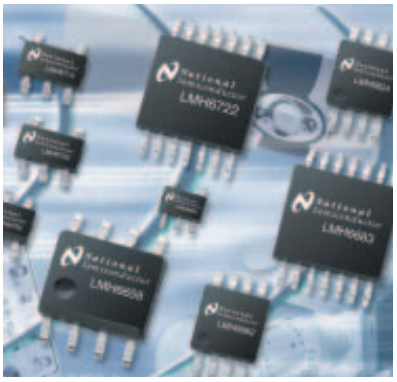
In another PCI development, Intel has published *Introduction to PCI Express: A Hardware and Software Developer's Guide*. The guide, by Intel engineers Justin Schade, Ron Thornburg, and Adam Wilen, is available at various computer stores or online at Amazon and Barnes and Noble.–by Nicholas Cravotta

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Low-noise amplifier tops 1.5-GHz gain bandwidth

National Semiconductor's VIP-10 complementary-bipolar trench-isolated silicon-on-insulator process produces high-speed circuits that demand comparatively modest supply currents.

The LMH6624 wideband amplifier adds ultralow noise to the product line's list of attributes. When you configure the device for a 10-dB gain with ±2.5V supplies, the 6624 offers a 90-MHz, −3-dB bandwidth and 300V/µsec slew rate. Its typical input-noise voltage is 0.95 nV/$\sqrt{Hz}$, and the noise current is 2.3 pA/$\sqrt{Hz}$, both measured in a 1-MHz bandwidth. The combination of wide bandwidth and low noise is attractive for sense amplifiers; ultrasound preamps; tape-head amplifiers; and other high-speed, small-amplitude signal-conditioning applications in communications, medical, instrumentation, and audio.



Among National Semiconductor's 10 new VIP-10 devices are the LMH7724 low-noise amplifier and the LMH6732 variable-bandwidth op amp.

The amplifier's second- and third-order harmonic distortion products are typically no greater than −60 and −78 dBc, respectively, measured with a 1-V p-p, 10-MHz carrier and a 100Ω load. The amplifier's maximum offset is less than 0.95 mV over temperature. The typical offset drift falls within 0.2 µV. National Semiconductor specifies the LMH6624 with ±2.5 and ±6V supplies. The maximum idle current is 18 mA over temperature in either case. The $1.67 (1000) amplifier is available in either SOT-23-5 or SOIC-8 packages.

National Semiconductor is also employing the VIP 10 process in fabricating nine other recently released high-speed op amps, including the $2.87 (1000) LMH6732 with a resistor-programmable bias that allows you to optimize the bandwidth/quiescent-current trade-off. The SOT-23-6-packaged device also provides a shutdown mode in which it draws 1 µA. You can get more information about all 10 of National's new high-speed op amps at www.national.com/appinfo/amps.

—by Joshua Israelsohn

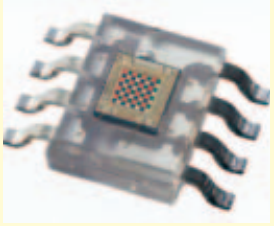
▶**National Semiconductor**, www.national.com. ◎Enter No. 354 at www.edn.com/info.

RGB SENSOR IC PROVIDES SERIAL OUTPUT

For color light-to-digital conversion, the TCS230 CMOS device from Texas Advanced Optoelectronic Solutions provides 10- to 12-bit resolution per color channel. The sensor targets medical diagnostic products, color-calibration units, and process-control applications.

Though not a full-image-capture device, the IC features a grid of 64 photodiodes divided by red, green, blue, and clear filters to assess primary color and overall intensity. Two programming pins let you identify which set of photodiodes report via the output pin. Dynamic range for light sensing is 250,000 -to1, and typical output range is 2 Hz to 500 kHz. You can pin-program scale factors of 2, 20, or 100%. The eight-pin SOIC sells for $2.67 (1000).—by Bill Schweber

▶**Texas Advanced Optoelectronic Solutions,** 1-972-673-0759, www.taosinc.com. ◎Enter No. 355 at www.edn.com/info.



The TCS230 color sensor integrates a 64-photodiode array with red, green, blue, and clear filters and an intensity-to-frequency converter to give you a small, low-cost color and intensity sensor with resolution as high as 12 bits.

DILBERT *By Scott Adams*



▶**Sony's music group lost $132 million during the first six months of its current fiscal year, EMI has cut 1800 positions worldwide, and the Warner Music Group reduced its staff by 1000 over the past two years.—*The Boston Sunday Globe*, Feb 23, 2003**

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Graphics flurry may leave you blurry

LAST FALL, Nvidia assured me that the bulk of its 0.13-micron-manufacturing woes were over and that I should expect a blizzard of GeForce FX proliferations in the coming months (see "Graphics tit for tat turns topsy-turvy," *EDN*, Dec 12, 2002, pg 20). Coincident with this month's Game Developer Forum in San Jose, CA, the company is following through on its promises.

A higher yielding and, therefore, lower priced variant has joined the 500-MHz GeForce FX, which now sports a clarifying 5800 Ultra moniker. The non-Ultra GeForce FX 5800 runs on 400-MHz core and memory clocks. Nvidia estimates that 128-Mbyte boards based on the non-Ultra GeForce FX 5800 will cost $299.

With the GeForce FX 5600 Ultra, Nvidia chops the number of rendering pipelines from eight in the GeForce FX 5800 to four and the number of pixel shaders from eight to six. The chip integrates a TV encoder, a DVI transmitter, and dual 400-MHz RAMDACs, and Nvidia estimates that 128-Mbyte boards will cost $199 when they appear early next month. The increasingly comprehensive MPEG-2 codec includes several features that its GeForce 4 predecessors lacked, including support for overlay gamma, adaptive deinterlacing, HDTV resolutions, video antialiasing, and encoding assistance, and its hardware-centric characteristics lower energy consumption. This attribute is particularly beneficial in the GeForce FX Go5600 mobile-PC variant, which replaces the DVI transmitter with an LVDS transmitter and targets systems costing $2000 to $3000. Both the GeForce FX 5600 Ultra and the GeForce FX Go5600 employ 350-MHz core and memory clocks.

For the GeForce FX 5200, Nvidia has revisited the tried and true, previous-generation, 0.15-micron process, and the desktop Ultra version of the chip runs at 350-MHz core- and memory-clock rates. Nvidia has further reduced the number of pixel-shader pipelines from six in the 5600 to four in the 5200, and the company has also eliminated Z-buffer and color-compression support. As a result, 128-Mbyte graphics boards based on the GeForce FX 5200 Ultra will cost approximately $149 when they arrive in late April. The mobile-PC-targeted GeForce FX Go5200, intended for systems costing approximately $1500, runs at 300-MHz core and memory speeds. All GeForce FX proliferations include 128-bit memory interfaces and support DDR SDRAM and the AGP 8× bus.

—by Brian Dipert

▶**Nvidia**, 1-408-486-2000, www.nvidia.com.◎Enter No. 356 at www.edn.com/info.

Database structure targets nanometer-scale chip design

FOLLOWING THE ACQUISITION of Avanti, Synopsys has announced the Galaxy platform for advanced system-on-chip designs, which combines tools from the Synopsys offering, such as Design Compiler and PrimeTime, with back-end tools from the Avanti stable. The company has also unified its tool chain around the Milkyway database and made that database an open-software offering. Use of the Milkyway database allows consistent timing descriptions, common libraries, delay calculations, and constraints throughout the design cycle to reside in a single format.

A pressing need exists in nanometer-scale design for all data to be available to the entire tool chain in a consistent form. However, Synopsys claims significant gains result by simply avoiding constant translation among data formats. Different levels of access to the database structure depend on the agreement in place between users and Synopsys. These levels range from industry-standard formats, such as EDIF and LEF/DEF; through access by scripting language, such as Scheme and TCL; to the most direct interface via a C-based API. The access program will be available to all Synopsys partners and other EDA vendors.—by Graham Prophet

▶**Synopsys**, www synopsys.com.◎Enter No. 357 at www.edn.com/info.

SINGLE-USE FUSE STILL HAS ROLE TO PLAY

Despite the availability of more complex circuit-protection devices, a basic single-use fuse is sometimes what an application or an industry standard requires. The FT600



Put a fuse in it and get single-use protection for space-limited circuit layouts with the FT600 series.

series of fuses from the Raychem unit of Tyco Electronics is well-suited for crowded, height- and space-constrained pc boards. To prevent any damage to your underlying pc-board traces or layers, the fuses feature low temperature rise, and they are rated for 0.5, 1.25, or 2A. Meeting Telcordia and UL specifications, these devices sell for 40 cents (100,000).

–by Bill Schweber

▶**Raychem Circuit Protection Unit, Tyco Electronics**, 1-800-227-7040, www.tycopower-components.com.◎Enter No. 358 at www.edn.com/info.

▶**Consumers spent about 4% less on recorded music in 2001 than they did in 2000, according to the Recording Industry of America.**

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Software, silicon acceleration brew a stronger Java

Although I recently decided that an advanced cell phone couldn't replace my computer, I'm still experimenting to see if I can disprove my past conclusions (see "All-in-one cell phones: *not* a one-for-all panacea," *EDN*, Oct 31, 2002, pg 67). The e-mail and Web-browsing capabilities in my latest Samsung SPH-N400 CDMA phone *are* more robust than those of its Ericsson GSM predecessors, but I still find them to be incomplete. They don't let me view graphical and richly formatted HTML-encoded e-mail, for example, or deal with MIME (multipurpose-Internet-mail-extensions)-encoded file attachments. And, after becoming used to viewing HTML-encoded Web pages, WAP (Wireless Application Protocol)-encoded counterparts are a constrained substitute.

Third-party-software provider Reqwireless bridges these functional gaps with its Mobile Java J2ME (Java 2 Micro Edition)-powered EmailViewer and WebViewer, each $16.99. The company also offers the ReqwirelessWeb development-tool kit, enabling Mobile Java applications to fetch, post, manipulate, and display HTML content; ReqwirelessEmail, which enables Mobile Java applications to send, receive, and display e-mail content; and ReqwirelessDB, a JDBC (Java Database Connectivity) driver and driver manager, enabling Mobile Java applications to exchange real-time information with any back-end database using the java.sql.* interface.

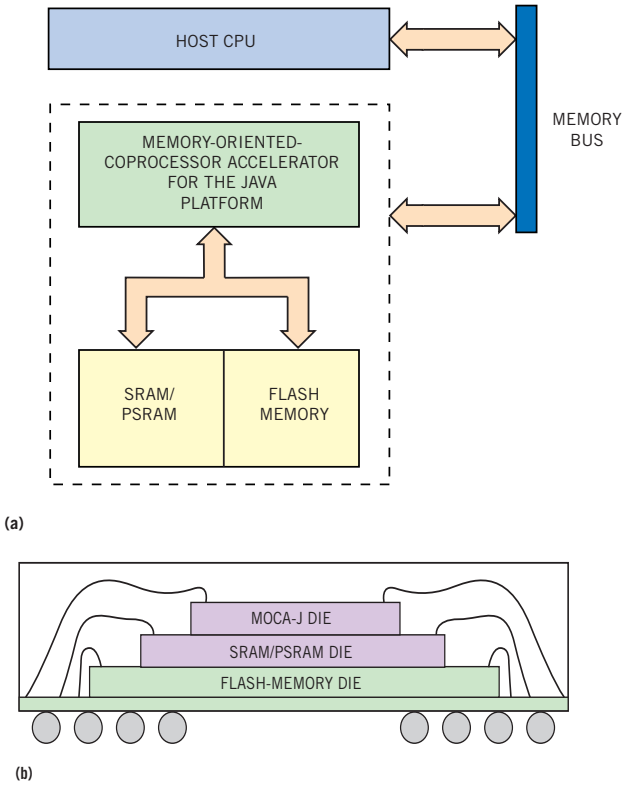
EmailViewer and WebViewer do an impressive job of rendering even complex HTML, as long as it doesn't require support for JavaScript, Java applets, Macromedia flash, or CSS (cascading style sheets). At 56 and 47 kbytes, respectively, the programs also have impressively small memory footprints. Reqwireless plays some interesting tricks to boost apparent performance, such as displaying the first few lines of text before rendering the remainder, as well as displaying all of the text before rendering embedded images. But, being Java-based, and running on a low-power-consuming—that is, slow—processor, the programs are still more sluggish than e-mail and Web-browser clients running on a notebook PC.

NanoAmp Solutions, a company to date best known for its ultra-low-power SRAMs, tackles the Java-performance problem with its less than-$5 MOCA-J (Memory Oriented Coprocessor Accelerator-Java). Intended to accompany a flash memory, and an SRAM or PSRAM (pseudo SRAM), in a multidie, stacked package, MOCA-J accelerates 206 of the 227 byte codes that the Java-virtual-machine specification defines, executing many of them within a single clock (see "Silicon contends with stuffed and shrinking packages," *EDN*, June 13, 2002, pg 49). Estimated boosts in performance range from 20 times, measured on an overall geometric mean of ECM (Embedded CaffeineMark) benchmark scores as well as across various J2ME and MIDP (Mobile Information Device Profile) applications, to 100 times on individual ECM tests, algorithms, and code loops.

Faster execution through hardware acceleration also likely leads to much lower energy consumption than the software-centric alternative. NanoAmp Solutions is shipping samples to potential packaging partners to support high-volume designs, and production is scheduled for the end of the second quarter. The company is also considering offering MOCA-J in its own multidie, stacked products to serve lower volume applications.—by Brian Dipert

▶**NanoAmp Solutions**, 1-408-573-8878, www.nanoamp.com. Enter No. 359 at www.edn.com/info.

▶**Reqwireless**, 1-519-743-8549, www.reqwireless.com. Enter No. 360 at www.edn.com/info.



MOCA-J's memorylike, 16-bit asynchronous interface (a) enables its inclusion, along with nonvolatile and volatile memories, in a multidie package (b).

▶**By 2007, Internet users will daily access, download, and share more than 64,000 times the information equivalent of the entire Library of Congress, according to an IDC estimate.**

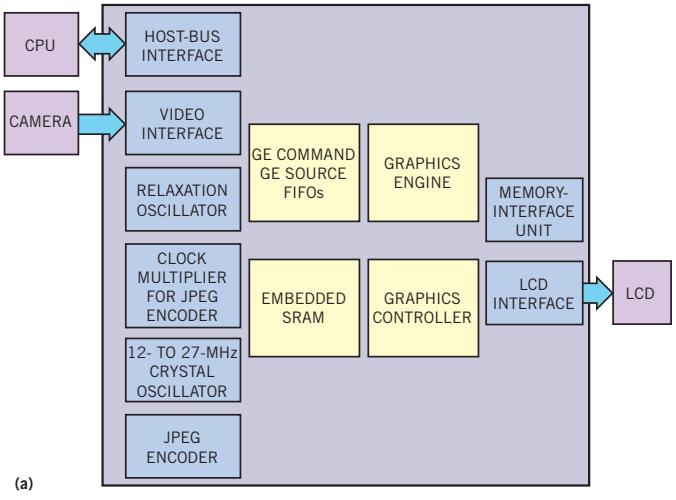
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Accelerator makes cell phones snappy

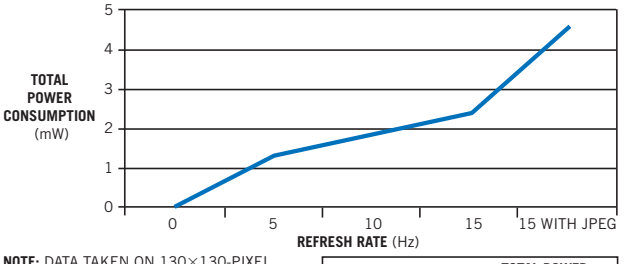
Judging from the JPEG encoder built into the MediaQ MQ2100, the company buys into market-analyst predictions that lots of folks will soon replace their cell phones with units containing built-in digital still cameras and videocameras. The chip is an upgrade of the MQ2074, and it includes a 2-D-graphics accelerator functionally identical to the one in the MQ1188 and handy for handheld gaming, mapping, and other visual applications (see "Power-stingy peripheral chips provide partitioning options," *EDN*, Nov 28, 2002, pg 14). It also incorporates a CCIR656-compliant camera interface with support for YUV422-to-RGB565 conversion, horizontal decimation with pixel averaging and programmable lowpass filtering, and vertical decimation. Reflecting its phone, not PDA, focus, the MQ2100 embeds a smaller, 160-kbyte SRAM buffer than the one in the MQ1188. This buffer provides 176×220-pixel resolution at 16-bit-per-pixel color depth (double-buffered) or 240×320-pixel—that is, QVGA—resolution at 16 bit-per-pixel color depth (single-buffered).

MediaQ estimates that, in typical operating modes at refresh rates as fast as 15 frames/sec, the MQ2100 will draw less than 5 mW of power; various chip subsystems operate at 1.5, 1.8, and 2.5V. The hardware JPEG-baseline-encoder core employs fixed Huffman tables, can operate as fast as 30 frames/sec, and supports resolutions as high as VGA: 640×480 pixels. It also includes a 4:2:2-to-4:2:0 input chroma filter and supports black-level and contrast correction, input scaling, a scaled preview image, and floating-point quantization. The MQ2100 supports a range of STN (supertwist-nematic) and TFT (thin-film-transistor) color LCDs, including LTPS (low-temperature-polysilicon) and Sharp's ULC (ultra-low-power-consumption) variants, and it comprehends NEC's Mobile current-mode-advanced-differential-signaling serial interface. It offers 16-level frame-rate control and as much as 4-bit spatial dithering on STNs, with error diffusion. Partial display-update mode, power-sequencing support in hardware, and PWM outputs for brightness and contrast control complete the picture. The MQ2100 costs $5.75 (10,000) in a 144-bump BGA package and is in production.—by Brian Dipert

▶**MediaQ**, 1-408-733-0088, www.mediaq.com. Enter No. 361 at www.edn.com/info.



(a)



NOTE: DATA TAKEN ON 130×130-PIXEL C-STN WITH VGA CAMERA INPUT AT 15 FRAMES/SEC.

(b)

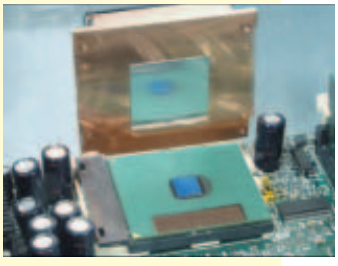
REFRESH RATE (Hz)	TOTAL POWER CONSUMPTION (mW)
STANDBY	0.011
5	1.45
10	1.9
15	2.4
15 WITH JPEG	4.6

The MQ2100 embeds a JPEG encoder, a camera input, and a flexible display output (a), and its power-stinginess extends battery life (b).

THERMAL-INTERFACE MATERIAL CHANGES PHASE TO SMOOTH HEAT FLOW

Bergquist's new compliant material ensures low thermal impedance between hot ICs and their heat sinks and avoids messy "bleeding" of the adhesive. The Hi-Flow 225UF comprises a 3-mil (0.076-mm)-thick adhesive phase-change material with a 1-mil (0.025-mm)-thick foil coating to ease all-too-common rework. Overall thermal impedance of 0.69W/m-K. The material is available in kiss-cut sheet form and standard squares and rectangles; the vendor also offers custom sizes and shapes. Hi-Flow 225UF costs 15 cents/sq in. (2.3 cents/sq cm).

—by Bill Schweber



Minimize the thermal impedance between your hot IC and its lifesaving heat sink and facilitate removal and rework with the Hi-Flow 225UF phase-change adhesive and foil backing.

▶**Bergquist Co**, 1-800-347-4572, www.bergquistcompany.com. Enter No. 362 at www.edn.com/info.

▶**According to a study from Ipsos-Reid, 38% of US adults are familiar with Wi-Fi, and 3% have a Wi-Fi installed at home.**

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Integrate dual-role USB with 16-bit processing

Cypress' EZ-Host CY-7C67300 and EZ-OTG CY7C67200 are dual-role USB devices that comply with the USB 2.0 specification, support both full- and low-speed traffic, and are fully compatible with the USB-OTG (On-the-Go) Supplement. The 16-bit RISC microcontroller devices include 16 kbytes of RAM; BIOS to handle a portion of the USB-processing, enabling them to operate as hosts or peripherals; and a configurable I/O block supporting HSS (high-speed-serial) interfaces, SPIs (system-packet interfaces), and HPIs (host-port interfaces).

The EZ-Host targets non-handheld USB applications and can operate as a stand-alone processor, such as for a host storage device, or it can operate as a USB coprocessor that can perform some independent functions. It includes



Two new USB devices from Cypress are fully OTG-compliant.

two USB serial-interface engines each with two ports supporting as many as four downstream ports in host mode, one or two upstream ports in peripheral mode, or one upstream and two downstream ports for dual mode. EZ-OTG is a subset of the EZ-Host and targets mobile devices that need USB-OTG support with a power-boost circuit that operates as low as 2.7V. It also includes two USB serial-interface engines but with one port each supporting a total of one or two downstream or upstream ports.

Cypress' development support includes programming tools, Linux operating system and drivers, host/peripheral stacks, functional examples, and framework firmware. The functional examples illustrate USB-OTG, SPI and HPI, multiport hosting, and simultaneous host and peripheral operation. The framework firmware accommodates host, peripheral, and OTG support for stand-alone and coprocessor configurations. General sampling of the EZ-Host and EZ-OTG begins in April. The early-release version of the development kit will be available in May. The EZ-Host is available in a 100-pin TQFP for $4.99 (10,000), and the EZ-OTG comes in a 48-ball FBGA for $3.99 (10,000).

—by Robert Cravotta

▶**Cypress**, 1-408-943-2600, www.cypress.com. Enter No. 363 at www.edn.com/info.

Timing analyzer is always a critic

Most design teams currently rely on static-timing analysis to ensure timing closure for their designs. Yet, many of the effects that impact signal propagation are dynamic or result from dynamic behavior. To ensure that a circuit works, static-timing models must be pessimistic, so that the static-timing-analysis tools cover the dynamic behavior. This approach often results in safe and conservative but not optimal implementations. Once designers use 130-nm or smaller process technologies, such approximations become unacceptable. You instead have to use some form of dynamic analysis. Although transistor-level tools, such as Spice and its fast-Spice variants, have been around for years, the new designs' sizes exceed the computing capabilities of these tools.

To address this problem Nassda has released Critic, a full-chip critical timing analyzer for postlayout verification of cell-based digital ICs, including their associated clock networks. The product complements static-timing-analysis-verification methods. For analysis of the system clock, Critic automatically identifies the clock net from the device pins, back-annotates the clock net with interconnect RC parasitics, and sets control signals to sensitize the clock paths. The tool then simulates the clock nets with the Spice model for each cell, including precise fan-out loading. Finally, it compares the clock-pin delays with those that a static-analysis tool reports. Critic also automatically analyzes critical paths that the chip designer chooses, usually from a report that the static-timing tool generates.

After a designer invokes analysis, Critic automatically handles the subsequent steps, including back-annotation of postlayout parasitics, which can dramatically affect the timing of critical paths in nanometer designs. Additionally, Critic can automatically include secondary loads to these paths to account for capacitance and other loading effects. After analyzing the design, Critic tests the side-branch values to enable or sensitize the critical paths and creates input patterns for dynamic simulation of the paths.

Unlike approaches that require a Spice simulation run for each path to be analyzed, Critic simultaneously simulates all paths, reducing the number of simulation licenses you need for analysis. During this simulation, Critic uses the Spice model for each cell in each simulated path. Finally, Critic compares the path delays with those reported by a static-analysis tool and provides the designer with a detailed report on timing differences between those results and Critic's results. Using this data, designers can fix timing problems and selectively optimize signal or clock nets for maximum performance.

The tool runs on Sun Solaris, HP-UX, Windows XP/NT/2000, and Linux platforms. The price for a time-based license starts at $65,000.—by Gabe Moretti

▶**Nassda Corp**, 1-408-562-9168, www.nassda.com. Enter No. 364 at www.edn.com/info.

▶**China led the world in the purchase of pirated CDs in 2001, having purchased 90% of all such disks, representing $400 million, according to the International Federation of the Phonographic Industry.**

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