

89061493441  
89061493441A

# EDN<sup>®</sup>

THE DESIGN MAGAZINE OF THE ELECTRONICS INDUSTRY

SS,  
N  
RS  
ON?  
.....

SRAMs are here.  
transistors on a  
power-draining  
ates susceptibility  
82(max.) Pins/Package  
5 mA (L) 36/SOJ  
5 mA (L) 32/SOIC  
0 mA (L) 32/CSOJ  
cluding a sample  
n/sram.



KURT F. WENDT LIBR  
COLLEGE OF ENGINEER

MAR 12 1998

UW-MADISON, WI 53706

COVER STORY

## INTELLIGENT I/O:

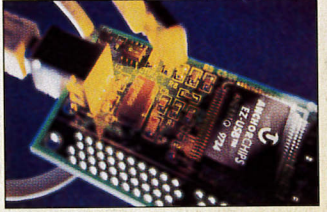
### DOES I<sub>2</sub>O HOLD H<sub>2</sub>O? pg 56

#BXNDNSK \*\*\*\*\* MIXED ADC 60821  
#000110815/20026# (19805 ) 900  
UNIV OF WISCONSIN 2679  
KURT F WENDT LIBR-ENGR  
215 N RANDALL AVE  
MADISON WI 53706



**EXHIBIT 2060**  
LG Elecs. v. Cypress Semiconductor  
IPR2014-01396, U.S. Pat. 6,249,825

MARCH 2, 1998  
www.ednmag.com



IC changes course of USB enumeration procedure pg11

Table of Contents pg 4

Leading Edge pg 11

Howard Johnson, PhD  
EMI-simulation tools pg 24

Microprocessor, DSP technologies unite for embedded applications pg 73

Frame grabbers get the picture when video cameras fall short pg 87

Design Ideas pg 99

Interfacing HDLs with conventional programming languages pg 117

DSP IC's clock oscillator uses inexpensive crystals pg 127

Designing with op amps pg 135

Components Showcase pg 143

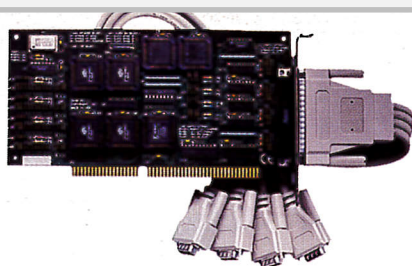
DILBERT<sup>®</sup> pg 12

A CAHNERS PUBLICATION

Exhibit 2060 - Page 01 of 03

**DOCKET ALARM**

Find authenticated court documents without watermarks at [docketalarm.com](http://docketalarm.com).



## Ensure Windows Compatibility with Sealevel ISA and PCI COM: Ports

Introducing the Ultra™ and COMM+™ series  
--The Ideal Windows COM: ports

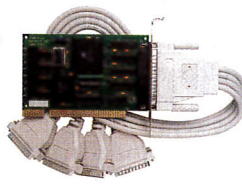
Sealevel, the leader in PC communications, now introduces two new lines of serial I/O cards for Windows. ISA and PCI Bus RS-232 and RS-485/422 products are available.



ULTRA COMM+2 PCI

**Features Include:**

- Multiport RS-232 and RS-422/485 Adapters
- Data Rates Supported up to 460K bps
- 10 Interrupts to Choose From
- Interrupt Status Port for Windows Flexibility
- 16550 UARTs Standard / 16650 Optional
- Includes Windows 95 INF Files, our Windows NT Configuration Utility and Help Files to Simplify Installation
- Excellent Technical Support
- Made in U.S.A.



VERSA COMM+4/EX



**Sealevel Systems, Inc.**  
P.O. Box 830 • Liberty, SC 29657  
864.843.4343 • [www.sealevel.com](http://www.sealevel.com)

All trademarks are the sole property of their respective owners.

CIRCLE NO. 4

**EDN.** 275 Washington St, Newton, MA 02158.  
**www.ednmag.com.** Phone 1-617-964-3030; fax 1-617-558-4470. **Address changes or subscription inquiries:** phone 1-303-470-4445; fax 1-303-470-4280; [cahners.subs@denver.cahners.com](mailto:cahners.subs@denver.cahners.com). Cahners Publishing, 8773 S Ridgeline Blvd, Highland Ranch, CO 80126. Include your mailing label.

**PUBLISHING DIRECTOR, EDN WORLDWIDE**

Tim Tobeck 1-617-558-4454; [ttobeck@edn.cahners.com](mailto:ttobeck@edn.cahners.com)

**EDITORIAL DIRECTOR, EDN WORLDWIDE**

Michael C Markowitz 1-617-558-4214;  
[ednmarkowitz@mcimail.com](mailto:ednmarkowitz@mcimail.com) or [m.markowitz@cahners.com](mailto:m.markowitz@cahners.com)

**EXECUTIVE EDITOR**

Gary Legg 1-617-558-4404; [gary.legg@edn.cahners.com](mailto:gary.legg@edn.cahners.com)

**MANAGING EDITOR**

Joan Lynch 1-617-558-4215; [jlynch@edn.cahners.com](mailto:jlynch@edn.cahners.com)

CONTACT FOR CONTRIBUTED TECHNICAL ARTICLES

**TEST & MEASUREMENT: DAN STRASSBERG, SENIOR TECHNICAL EDITOR**  
1-617-558-4205; fax: 1-617-558-4470; [ednstrassberg@cahners.com](mailto:ednstrassberg@cahners.com)

**COMPONENTS, INTERCONNECT & POWER SUPPLIES: BILL TRAVIS, SENIOR TECHNICAL EDITOR;** 1-617-558-4471; fax: 1-617-558-4470; [b.travis@cahners.com](mailto:b.travis@cahners.com)

**FPGAs, PLDs, MEMORIES: BRIAN DIPERT, TECHNICAL EDITOR**  
1-916-454-5242; fax: 1-916-454-5101; [edndipert@worldnet.att.net](mailto:edndipert@worldnet.att.net)

**DIGITAL ICs, COMMUNICATIONS: STEPHEN KEMPAINEN, TECHNICAL EDITOR;** 1-415-643-1760; fax: 1-415-643-9513; [ednkempainen@worldnet.att.net](mailto:ednkempainen@worldnet.att.net)

**MICROPROCESSORS, DSPs: MARKUS LEVY, TECHNICAL EDITOR**  
1-916-939-1642; fax: 1-916-939-1650; [markus.levy@worldnet.att.net](mailto:markus.levy@worldnet.att.net)

**EDA, ASICs: JIM LIPMAN, TECHNICAL EDITOR;** 1-510-606-1370; fax: 1-510-606-1563; [ednlipman@mcimail.com](mailto:ednlipman@mcimail.com)

**ANALOG & POWER ICs, RF COMMUNICATIONS: BILL SCHWEBER, TECHNICAL EDITOR;** 1-617-558-4484; fax: 1-617-558-4470; [bill.schweber@cahners.com](mailto:bill.schweber@cahners.com)

**EMBEDDED SYSTEMS: WARREN WEBB, TECHNICAL EDITOR**  
1-619-513-3713; fax: 1-619-486-3646; [www.webb@cts.com](http://www.webb@cts.com)

**COMPUTER DESIGN, PERIPHERALS: MAURY WRIGHT, TECHNICAL EDITOR**  
1-619-748-6785; fax: 1-619-679-1861; [mwright@abac.com](mailto:mwright@abac.com)

**LEADING EDGE: FRANCES T GRANVILLE, SENIOR ASSOCIATE EDITOR**  
1-617-558-4344; [f.granville@edn.cahners.com](mailto:f.granville@edn.cahners.com)

**ASK EDN, SIGNALS AND NOISE: BETH MORRISON, ASSOCIATE EDITOR**  
1-617-558-4333; [bmorrison@edn.cahners.com](mailto:bmorrison@edn.cahners.com)

**LITERATURE, CALENDAR: KASEY CLARK, ASSOCIATE EDITOR**  
1-617-558-4324; [kase@cahners.com](mailto:kase@cahners.com)

**EDITORIAL AND ART PRODUCTION**

Diane Malone, *Manager* 1-617-558-4303  
Ken Racicot, *Senior Art Director* 1-617-558-4708  
Chinsoo Chung, *Associate Art Director* 1-617-558-4446  
Patricia Shaughnessy, *Production Editor* 1-617-558-4206

**WEBMASTER**

Millie Gutierrez; [millie@edn.cahners.com](mailto:millie@edn.cahners.com)

**CONTRIBUTING TECHNICAL EDITORS**

David Brubaker, Jack Ganssle, Debora Grosse, Clive Maxfield,  
Robert Pease, Anne Watson Swager, Ron Mancini, Wolfram Blume,  
Howard Johnson, PhD

**ASSISTANT TO EDITORIAL DIRECTOR, EDN WORLDWIDE**  
Kathy Leonard 1-617-558-4405; [kathy.leonard@edn.cahners.com](mailto:kathy.leonard@edn.cahners.com)

**EDITORIAL SECRETARY**

Cathy Greland 1-617-558-4681; [cgreland@edn.cahners.com](mailto:cgreland@edn.cahners.com)

**PRODUCTION**

Andrew Jantz, *Group Manager* 1-617-558-4372  
Karen Banks, *Production Manager* 1-617-558-4441  
Christian Adanalian, *Production Assistant* 1-617-558-4601

**EDN EUROPE**

Brian Kerridge, *Editor*, PO Box 377, Norwich NR14 6UQ, UK; +44 1508-528435; fax +44 1508-528430; [ednkerridge@mcimail.com](mailto:ednkerridge@mcimail.com)

**EDN ASIA/EDN CHINA**

Cahners Asia Ltd, 19th Floor, Eight Commercial Tower, 8 Sun Yip St,  
Chai Wan, Hong Kong, Phone +852 2965-1555; fax +852 2976-0706.  
Chris Everett, *Publisher/Editor in Chief, EDN Asia*, [chriseverett@rebi.com.hk](mailto:chriseverett@rebi.com.hk)  
Simon Lian, *Assistant Technical Editor, EDN China*, [simonlian@rebi.com.hk](mailto:simonlian@rebi.com.hk)

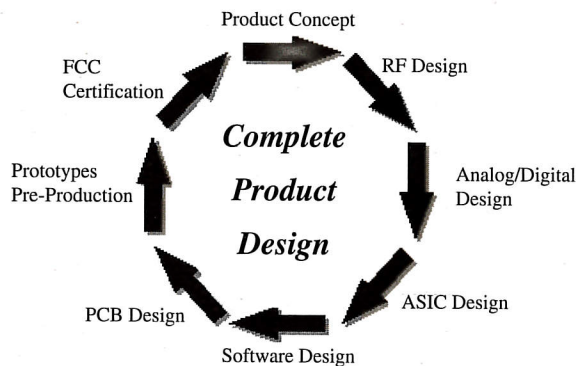
A member of the Reed Elsevier group

**L.S. RESEARCH, INC.**  
HIGH TECHNOLOGY ELECTRONIC CONSULTANTS

**L.S. COMPLIANCE, INC.**  
COMPREHENSIVE EMC TESTING AND CONSULTATION

### JOIN THE WIRELESS REVOLUTION!

- ✓ 900 MHz & 2.4 GHz Spread Spectrum Design
- ✓ RF ASIC Development
- ✓ FCC Certified 3M Chamber and 10M OATS
- ✓ European EMC Testing / CE Mark Approval



CALL

Email: [eng@lsr.com](mailto:eng@lsr.com) URL: [www.lsr.com](http://www.lsr.com)

414-375-4400

CIRCLE NO. 5

Win  
Dee  
Mult  
High  
High  
Run



Tel: 800-567-  
From outside the

# EDN LEADING EDGE

WHAT'S HOT IN THE DESIGN COMMUNITY

EDITED BY FRAN GRANVILLE

## IC changes course of USB enumeration procedure



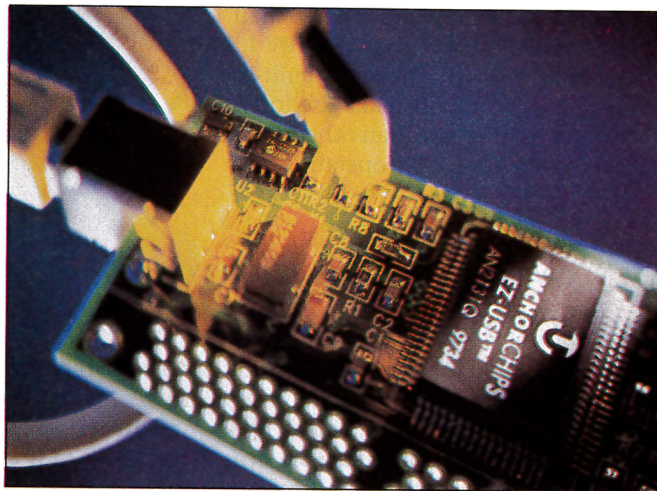
The EZ-USB family of ICs from Anchor Chips integrates a high-performance microcontroller, includes hardware support for low-level USB signaling, and takes a new tack to maximize flexibility in the USB enumeration procedure. These features differentiate

Anchor's ICs from most other USB ICs and provide a single-chip USB implementation that can serve in applications ranging from cost-sensitive peripherals, such as pointing devices, to high-end devices, such as scanners.

The IC incorporates an 8051-compatible core with support from a legion of software-development tools from multiple vendors. Moreover, the core offers a fivefold boost in performance over off-the-shelf 8051 ICs. In addition, although most manufacturers minimize prices by using the microcontroller to handle low-level signal handshakes, the EZ-USB ICs include state machines that offload these task from the microcontroller. The hardware signaling leaves the microcontroller free to handle more peripheral functions and, therefore, allows designers to use the IC in more complex devices.

The ICs also use an enumeration scheme to maximize flexibility in peripherals via downloadable control firmware. The USB standard specifies that a peripheral must go through an enumeration procedure whenever the peripheral connects to the bus. During this procedure, the host assigns the peripheral a unique ID, and the peripheral provides the host with device descriptors that indicate the peripheral's capabilities.

In contrast, the EZ-USB ICs go through this enumeration procedure and establish a baseline configuration. The ICs then download new firmware from the host, simulate a disconnect/reconnect cycle, and repeat the enumeration, providing updated descriptors to the host. This software-based configuration scheme offers several advantages. For example, it simplifies software updates to peripherals, a feature that can be important in a new interface, such as USB. The



**The EZ-USB family of ICs integrates an 8051 microcontroller with a USB interface that's handles all USB signaling. The IC supports postage-stamp-sized designs.**

software-based configuration also enables you to develop multifunction peripherals. A DSP-based peripheral could take on the role of a modem during one session, for example, and an audio synthesizer during another session.

The company offers three versions of the EZ-USB. The AN2131S integrates 8 kbytes of RAM and 16 I/O lines and costs \$6.36 (10,000). The AN2131Q adds eight more I/O lines and costs \$7.31 (10,000), and the AN2141Q increases memory to 16 kbytes of RAM for \$8.72 (10,000). Anchor also offers an EZ-USB Xcelerator development kit for \$495. The kit includes a development board, an 8051 compiler, a general-purpose USB device driver, and sample firmware and driver code.—by Maury Wright

**Anchor Chips**, San Diego, CA. 1-619-613-7900, [www.anchorchips.com](http://www.anchorchips.com). **Circle No. 520**

## Firewire VXI slot-zero controller is first, fast, and low-cost

Hewlett-Packard's C-size E8491A slot-zero controller and host-computer interface may be the first IEEE 1394 (Firewire) test-and-measurement hard-

ware. The device transfers data bursts at 400 Mbps (50 Mbytes/sec). This speed accommodates the VXI bus' 40-Mbyte/sec transfer rate. Although observers call Firewire fast and elegant but costly, the E8491A costs only \$2500. HP claims that the E8491A makes the cost of Firewire only \$300 higher than that of products employ-

ing IEEE 488, whose transfer rate is less than 2% that of Firewire's. Compared with the MXI bus, which has become the standard for linking VXI cages to external host PCs, Firewire is both less expensive (the savings over HP's MXI interface can exceed \$3500) and faster (50 vs 32 Mbytes/sec).

Cabling is another advantage of the