

EDN LEADING EDGE

WHAT'S HOT IN THE DESIGN COMMUNITY

EDITED BY FRAN GRANVILLE

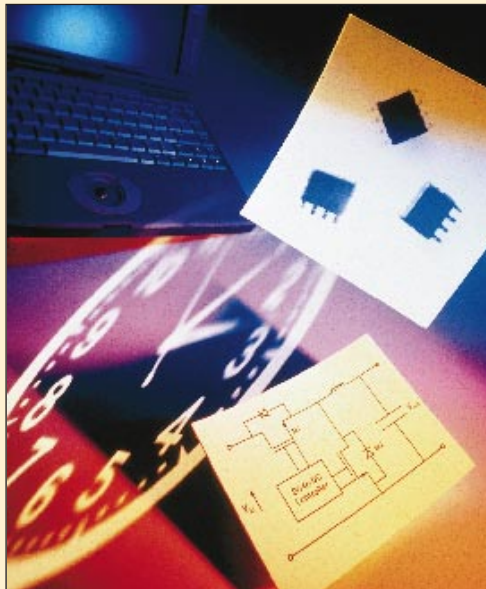
Dual-gate MOSFETs match gate drive to load level

When your MOSFET needs to drive a span of loads, you must size the device for the largest load and thus incur the penalty of a relatively large on-resistance and lower efficiency at lower load currents. The N-channel Si4806DY and complementary P-channel Si4807DY MOSFETs from Vishay-Siliconix each employ dual gates, so that you can match driven gate size—and thus on-resistance—to the load. At full capacity, both gates handle currents as high as 7.7A, with $R_{DS(ON)}$ of 0.022 Ω at V_{GS} of 10V; for loads as high as 2.2A, you drive just the smaller gate, which controls a smaller part of the MOSFET reaping $R_{DS(ON)}$ of 0.25 Ω . The SO-8 devices cost less than \$1.68 (100,000).

—by Bill Schweber

Vishay-Siliconix, Santa Clara, CA. 1-408-567-8220, fax 1-408-567-8995, www.siliconix.com.

Circle No. 385



By letting you control a MOSFET via one small gate or via the smaller gate plus a larger gate, the N-channel Si4806DY and P-channel Si4807DY provide low on-resistance and high efficiency over a wide load.

Test & Measurement World seeks editor

Test & Measurement World magazine has an opening for an electronic or electrical engineer. If you enjoy telling others about new technologies and can communicate well, we may have a place for you as a technical editor. You'll talk to key industry leaders and technologists. You'll write articles and work with contributors who submit articles.

This job requires at least a BSEE and two years of hands-on experience. Experience with ATE, wireless communications, or environmental testing is a plus. You need excellent written and oral communication skills and must be able to juggle several concurrent assignments. We pay engineering-level salaries commensurate with experience.

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Java customizes DSOs

For all of its promise, Java has so far been limited mainly to producing animated advertisements on Web pages. Now, Tektronix has come up with a more utilitarian application: customizing its digital oscilloscopes for applications such as disk-drive and power-supply testing. Although other scope manufacturers, such as LeCroy Corp (www.lecroy.com), have for several years offered application-specific scope enhancements, those other manufacturers have coded the enhancements in machine language.

The benefits of coding in Java will probably emerge soon, however, Tektronix says. Future versions of the Tek packages may accept user-designed customization to accommodate unique requirements.

Because of Java's portability, the packages will work with any scopes Tektronix develops in the future. Such scopes won't have to use a 68040 μ P—the type that the current TDS series uses. To adapt machine-language-coded packages to a different μ P, Tektronix would have to re-engi-

neer the packages. In addition, Tek feels that it can deliver Java-based packages more quickly than it could deliver machine-language packages.

The packages run in TDS 700C-series Option 2M scopes that Tektronix shipped after the packages' introduction. These scopes include additional processor memory that the Java virtual machine requires. Scope prices remain the same as that of earlier versions of scopes having the same model and option numbers. Users load the packages via the scopes' flop-

py-disk drives. Thereafter, the packages reside on the scopes' hard-disk drives. The initial packages are an \$850 disk-drive application and a \$350 power-supply application. Users must also purchase a \$150-per-scope Java license. This license covers an unlimited number of applications installed on one scope. To demonstrate the concept, Tek offers an enhanced printing application as a free download under "application support files" at www.tek.com/Measurement/support. This application allows printing waveforms as deep as 8M samples at the horizontal resolution of your choice. Tek says that once users see the printing application in action, any concerns about Java operating slowly will disappear.—by Dan Strassberg

Tektronix Inc, Beaverton, OR, 1-800-426-2200, www.tek.com/Measurement.
Circle No. 386

FREE MODELER EASES PC-BOARD ANALYSIS

If you can use a Spice-to-IBIS (I/O Buffer Interface Specification) converter to help with your I/O-buffer modeling work, check out Cadence's web page for a free copy of the company's converter tool. You use IBIS models with some pc-board-analysis tools to represent board components at the pin level. If you have Spice models available for these components, Cadence's tool saves time in generating models for use with any simulators that can read IBIS-format files.—by Jim Lipman

Cadence Design Systems, San Jose, CA. 1-408-943-1234, fax 1-408-943-0513, www.cadence.com.
Circle No. 387

Clamping-diode ICs enhance safe signal I/O

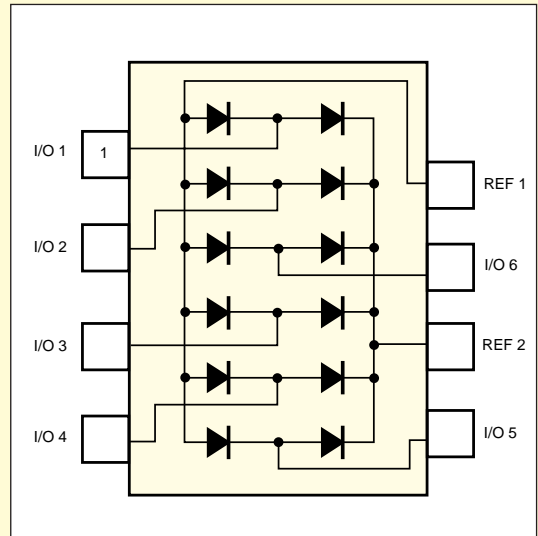
For designs in which signals face the real world, you're wise to implement protection against ESD voltage transients. The DALC112S1 from SGS-Thomson Microelectronics protects as many as six high-speed data lines via a pair of series-connected diodes per line that you can use to clamp signals to the V_{CC} rail; the 12 diodes come in an eight-lead SOIC package, thus requiring minimal space on a pc board. The 5-pf/diode capacitance makes this array

appropriate for high-speed applications, such as Ethernet, token ring, or ATM interfaces; set-top box connections; and PC graphics and video ports.

The diodes are suitable for nominal 5 and 12V systems, because they withstand peak reverse voltages as high as 18V; repetitive peak forward current is 12A maximum, and you can connect diodes in parallel to increase surge rating if you need a higher value. The IC, with leakage current guaranteed to be less than 2 μ A, costs \$0.28 (500,000).

—by Bill Schweber

SGS-Thomson Microelectronics Inc, Lincoln, MA. 1-781-259-0300, fax 1-781-259-4420, www.st.com.
Circle No. 388



With six pairs of series-connected diodes in the DALC112S1 eight-pin SOIC, you can protect six high-speed data lines from ESD transients.

DILBERT® by Scott Adams

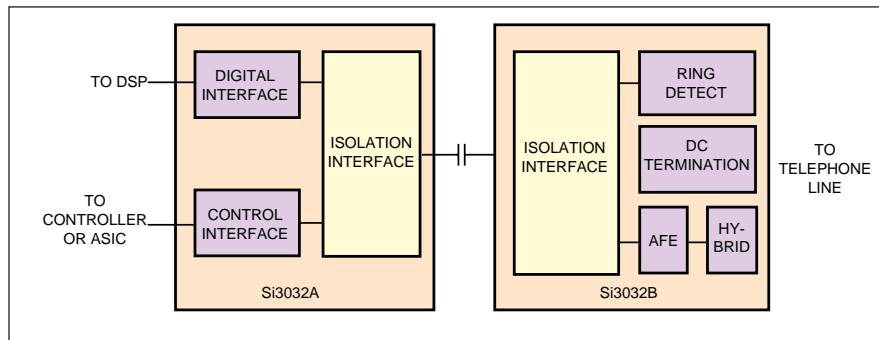
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EMAIL: scottadams@aol.com

Telephony DAA succumbs to silicon's spell

A two-IC data-access arrangement (DAA) from Silicon Laboratories significantly reduces pc-board area compared with traditional DAA implementations, which typically require a combination of transformers, relays, and optoisolators. The Si3032A and companion Si3032B Isolink implement a digital, solid-state DAA and include the analog front-end codec between the DAA and system DSP. The IC pair eliminates the need for an isolation transformer, relays, and the two-to-four-wire hybrid, and the ICs provide 2000V isolation. The result reduces pc-board area to 1 sq in. vs 2 to 3 sq in., roughly halves the number of associated passive components, and cuts power and cost compared with traditional transformer-based techniques. A low-cost, high-voltage capacitor isolates both the modem and the control signals, which share this same barrier, so an extra path is unnecessary. Available



The Si3032 IC pair lets you implement an all-solid-state telephony DAA and associated modem codec with less space and cost than traditional methods allow.

in 16-pin SOICs, the devices provide 90-dB dynamic range in both the transmitting and receiving paths and offers data rates compatible with 56-kbps modems. The DAA also supports caller-ID and line-current monitoring.

Operating voltage is 3 to 5V for this \$6.90 (10,000) pair, which meets US FCC requirements; the Si3034 varia-

tion is available for telephony standards outside North America.

—by Bill Schweber

Silicon Laboratories Inc, Austin, TX. 1-512-416-8500, fax 1-512-416-9669, www.silabs.com.

Circle No. 389

DSOs update 10 times as fast as leading competitors' units

When Hewlett-Packard announced its Infinium line of DSOs less than nine months ago, the company said that the scopes' Windows 95-based architecture would keep the product line a step ahead of its competition: The continual, rapid evolution of PC technology would enable quick upgrades. HP is now making good on that pledge. By replacing the scopes' original PC main board with a new board based on a 200-MHz AMD K6 μ P (www.amd.com/k6/) and using a 512-kbyte level-2 cache, HP has upped the display rate to 1750 waveforms/sec. HP claims that this rate is 10 times that of the line's major competitor—when the competitive scopes operate in a comparable display mode. The higher update rate increases the scopes' duty cycle and reduces the time needed to capture signal anomalies that occur infrequently and unpredictably.

Because the main board accepts PC plug-in boards, HP was also able to

add a 10-Mbps Ethernet interface. This interface, which is compatible with the most popular LAN standard, allows engineers to connect their DSOs to networked printers and to rapidly obtain high-quality printouts. In addition, HP has enhanced the scope firmware to allow users to enter meaningful signal names and other annotations on the waveforms displays.

Infinium prices begin at \$9995 for a two-channel, 500-MHz-bandwidth unit with an acquisition rate of 1G samples/sec/channel. The \$29,995 top-of-the-line unit offers 1.5-GHz bandwidth and takes 4G samples/sec/channel when all four channels are operating or an industry-leading (among general-purpose scopes) 8G samples/sec/channel when two channels are in use.—by Dan Strassberg

Hewlett-Packard Co, Santa Clara, CA. 1-800-452-4844, ext 5788, www.hp.com/go/tmdir.

Circle No. 390

Specialty EPROM removes the glue

Atmel's AT27C520 512-kbit, one-time-programmable ROM integrates an 8-bit address latch and provides a direct interface to 8051-series μ Cs, which multiplex lower-order address bits on the eight data lines. Operating at 5V, the AT27C520 specifies a typical operating current of 8 mA.

Latched EPROMs offer lower chip count and board space than the alternative design with a standard EPROM and a separate latch, assuming you don't also need the latch for other external memory-mapped peripherals.

The AT27C520's 64 kbytes consume the entire external-address space of standard 8051 processors. SGS-Thomson's 256-kbit M87C257, a lower density alternative, comes in 28-pin DIPs and 32-lead PLCCs. Waferscale Integration's PSD devices reconstruct port pins a design loses when you create the controller's address and data buses and also include user-programmable logic. The AT27C520 costs \$2.35 (1000) for the 90-nsec version.—by Brian Dipert

Atmel Corp, San Jose, CA. 1-408-441-0311, www.atmel.com.

Circle No. 391

Help arrives for chip verification and test

Two new tools help you verify your chips. The first, Simucad's Verilog-based Silos HyperFault system, reduces digital-chip fault-simulation runtimes. With HyperFault, you do fault simulation at the behavioral level of your design, as well as at RTL and gate level. The ability to simulate part of your design at the behavioral level reduces the simulation time over simulating the design at the RTL or gate level. You also can do either functional simulation or check timing within the fault simulation using back-annotated delays in Standard Delay Format.

HyperFault simplifies fault simulation and reduces the time it takes to make simulation runs. The tool uses a hypertrophic fault-simulation technique, which flags faults as detected when they create enough differences from the fault-free reference circuit. By eliminating these hypertrophic faults from further fault simulation, Simucad claims a two- to three-times reduction in fault-simulation times. To further reduce fault-simulation runtime, you can use the tool in a networked multi-processor configuration with one master copy and a number of slave copies of HyperFault. HyperFault controls fault simulation according to the capability of each processor in the system, based on CPU speed and a memory limit that you define for each processor. The tool adjusts the number of passes it needs for the fault simulation based on the memory you've specified, minimizing memory swapping.

HyperFault runs on Unix or Windows NT. When you run the tool on a processor network, you can use either a Unix- or NT-based machine, but not both. Master configurations of HyperFault cost \$24,000 for Unix and \$18,000 for NT. Slave configurations are one-half the cost of master configurations.

LogicVision offers its latest product, icBIST 3.0, for at-speed testing and diagnosing digital- and mixed-signal chips. Although the company describes the product as an "embedded automated-test-equipment solution," the tool suite appears to be a compilation of previously released digital logic, memory, and analog-block built-in self-test

(BIST) and logic-scan tools with a few enhancements. The enhancements include legacy intellectual-property (IP)-core support, improved at-speed test of high-speed logic, and improved logic- and memory-BIST diagnostics.

You use icBIST for functional testing of your system-on-chip design. The tool produces Verilog or VHDL RTL soft cores that reside on a chip, typically taking 2000 to 10,000 gates of logic. These cores implement BIST logic for at-speed testing of digital-logic, SRAM, DRAM, and ROM blocks along with analog-logic PLL and ADC blocks. The tool assembles the test blocks into a scan chain that you access with 1149.1 boundary scan. The icBIST tool also does at-speed testing of board-level SRAM and DRAM chips along with board-level interconnects.

Available in July, icBIST 3.0 will become LogicVision's only product and will be available on a per-chip-design basis with prices starting at \$30,000. The price includes logic BIST, 1149.1 boundary scan, and full-scan automatic test-pattern-generation (ATPG). Your icBIST cost can increase substantially based on how extensive a set of tests and diagnostics you want. For example, ADC and PLL BIST cost \$15,000 each, as does testing of board-level memory chips or board-level

interconnects. Legacy-IP-test support costs \$6000, and on-chip memory BIST costs \$6000 for ROM and SRAM together and \$10,000 for DRAM. For an additional cost, you can also work with LogicVision to include testing of other types of memories and analog circuitry.—by Jim Lipman

Simucad, Union City, CA. 1-510-487-9700, fax 1-510-487-9721, www.simucad.com. **Circle No. 392**

LogicVision, San Jose, CA. 1-408-453-0146, fax 1-408-467-1180, www.logicvision.com. **Circle No. 393**

Calendar

May 17 to 22

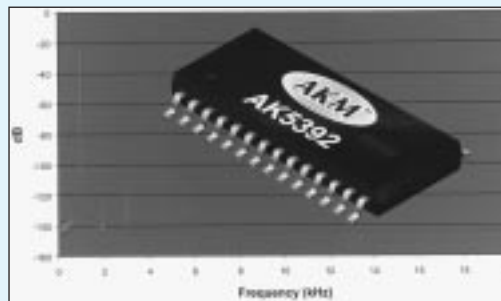
Society for Information Display Show, Anaheim, CA, focuses on advances in display products, technology, systems, applications, manufacturing, testing, and human factors. Palisades Institute for Research Services, New York, NY. 1-212-620-3380.

May 18 to 22

PC Developers' Expo and Conferences, San Jose, CA, incorporates the PCI Plus conference, as well as the new I₂O Plus and USB Plus conferences. The show covers USB, I₂O, PCI, Windows CE, IEEE 1394, PC/104+, Windows 98/NT, embedded applications, PLDs, and CardBus. Annabooks Conferences, San Diego, CA. 1-619-673-0870.

Stereo converter with 24-bit resolution challenges even golden ears

The audio market is striving toward higher resolution in its A/D and D/A converters. Typical of this trend is the AK5392 from AKM Semiconductor, a 24-bit stereo A/D converter, which achieves a typical dynamic range of 116 dB and an SNR of 105 dB. The monolithic sigma-delta device operates from a 5V supply, or you can use dual-voltage supplies (5V for analog, 3V for digital) to reduce power consumption to less than 500 mW. Available in a 28-lead SOP package, the IC costs \$19.95 (5000). —by Bill Schweber



FFT results for a 1-kHz sine wave input demonstrate the dynamic range and SNR of the AKM5392 24-bit stereo A/D converter.

AKM Semiconductor Inc., San Jose, CA. 1-408-436-8580, fax 1-408-436-7591, www.akm.com.

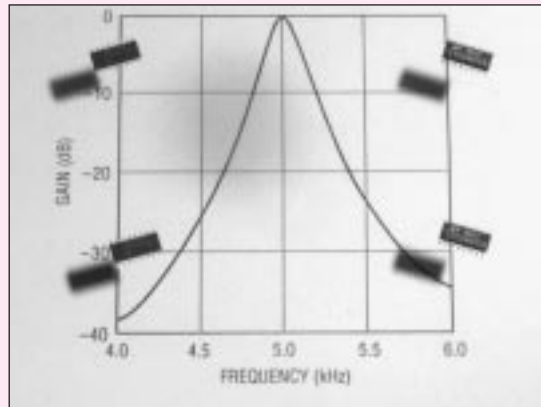
Circle No. 394

You never outgrow the need for analog filters—even in the digital world

Digital may be the trend, but Nyquist shows that you still need analog filters for antialiasing and reconstruction. Linear Technology's LTC1067 universal-filter building-block IC consists of a pair of identical second-order filter sections. The 16-pin, narrow-SSOP device lets you build bandpass-, lowpass-, highpass-, notch-, and allpass-response filters by adding a few resistors. You set the corner frequency for this switched-capacitor configuration by varying the applied clock, and you can achieve an 80-dB dynamic range from a 3.3V supply, although the filter can operate with supplies as high as $\pm 5V$. Maximum clock frequency is 250 kHz, and clock-to-center-frequency ratio is 100- or 50-to-1, depending on which of two versions you select. LTC offers filter-design software to let you select com-

ponent and clock values to achieve your desired cutoff frequency, ripple, and stopband attenuation for this \$3.50 (1000) IC.

For filtering digital video wave-



You can achieve a narrow-bandwidth, fourth-order bandpass filter, as well as other filter configurations and specifications, by cascading the two independent filter sections in the Linear Technology LTC1067.

forms after they pass through their reconstruction DACs, the Micro Linear Corp ML6428 active-filter IC eliminates as many as 16 discrete components as well as the aggravation associated with filter design and implementation. The \$1.50 (1000), eight-lead SOIC accepts $1V_{pp}$ Y and C video inputs (known as S-video), and its outputs include amplified, filtered Y and C signals as well as composite video formed by summing the Y and C signals. The S-video outputs can drive $2V_{pp}$ into a 150Ω load, and the composite output can drive a 75Ω load to the same amplitude span; internal gain for the filter is $\times 2$ for all outputs—by Bill Schweber

Linear Technology Corp., Milpitas, CA, 1-408-432-1900, fax 1-408-434-6441, www.linear-tech.com. **Circle No. 395**

Micro Linear Corp., San Jose, CA, 1-408-433-5200, www.microlinear.com. **Circle No. 396**

ANTENNA COMPLETES THE SIGNAL PATH FOR DUAL-BAND PCS SYSTEMS



The last or first step in the RF channel, the 859/1920-MHz helical stub antenna targets dual-band cellular phones and PCS devices.

With all the fanfare surrounding the latest ICs and active discrete components for cell phones and other Personal Communications Service devices, it's easy to forget that the antenna—a passive device—is a critical element of the signal path. The HAS047 from Toko America is a helical stub antenna that supports frequency bands centered at both 859 and 1920 MHz, suitable for the dual-band wireless phones that are now becoming available. The 33.5-mm (1.31-in.)-long, 9.4-mm (0.37-in.)-diameter antenna has 50Ω impedance and 2.1 maximum VSWR; bandwidth is ± 35 MHz for the lower band and ± 70 MHz for the upper one. A flexible elastomeric cover protects the \$2 (10,000) unit, which comes with a choice of standard connector options.—by Bill Schweber

Toko America Inc., Mount Prospect, IL, 1-847-297-0070, fax 847-699-1194, www.tokoam.com. **Circle No. 397**

Hot PDA market drives μP and OS interest

Spurred by the success of the 3Com (www.palmpilot.com) Palm Pilot, both μP and operating-system vendors are showing renewed interest in palmtop systems and personal digital assistants (PDAs). Moreover, the contenders aren't limited to behemoths like Microsoft (www.microsoft.com). For example, real-time OS vendor QNX Software Systems has developed the In-Hand software tool kit that's targeted at handheld applications—especially those with real-time requirements.

Available now for the AMD (www.amd.com) Elan SC400 microcontroller, the software suite includes a real-time kernel, a Web browser, an e-mail client, a text editor, a spreadsheet, a contact manager, a personal scheduler, PC Card support, and sever-

al games. QNX plans to ship the tool kit during the next quarter for \$19,995 and allow system vendors to quickly bring handhelds and other small systems to market. The company will also negotiate prices on a royalty basis.

QNX and even Microsoft with Windows CE, however, face a tough challenge in the handheld market. The Palm Pilot has garnered the attention of more than 5000 software developers, and even staid IBM (www.ibm.com) has licensed and is selling a version of it.—by Maury Wright

QNX Software Systems, Kanata, ON, Canada. 1-613-591-0931, www.qnx.com. **Circle No. 398**

Small digital-radio module fits surveillance applications

Spectrum Signal Processing's latest digital radio, the TIM-SDR, combines an A/D converter, a digital downconverter, a C44 DSP processor, and a D/A converter into a single-width mezzanine module. Digital implementation of downconversion, filtering, and demodulation improves filter characteristics, precision, and stability over analog circuitry. The receiver module targets commercial and military surveillance applications, spectrum monitoring, cellular fraud detection, software radio communications, and wireless base stations. A typical implementation incorporates an RF translator that brings the antenna signal down into the TIM-SDR's 20-kHz to 30-

MHz IF input range. Spectrum's SoftRadio software library then allows users to quickly implement a multichannel radio receiver by providing C functions for frequency tuning, digital demodulation, automatic gain control, and data transfers.

You can plug the TIM-SDR TIM-40 form factor module into Spectrum's carrier boards for the PCI, VME, or VXI buses. The base price for the TIM-SDR single-channel radio-receiver module and initial software is \$5000.—by Warren Webb

Spectrum Signal Processing, Burnaby, BC, Canada. 1-604-421-5422, fax 1-604-421-1764 www.spectrumsignal.com.

Circle No. 399

Chip set gives cordless phones advanced attributes and performance

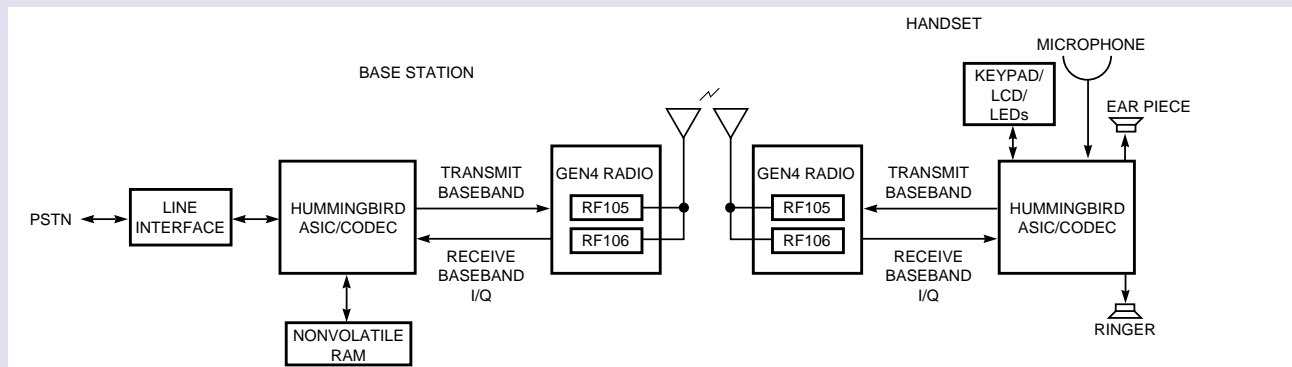
It's not just those glitzy cellular phones that are using advanced communications technologies; the ubiquitous home cordless phone is adapting them as well. Rockwell Semiconductor's Hummingbird chip set extends the 900-MHz direct-sequence spread-spectrum (DSSS) technique of its predecessor chip set to provide more integration, better performance, and a two- rather than four-layer pc board. You can use the chip set for a basic, low-cost cordless phone or use an expanded version to include features such as caller ID, speakerphone, or two-line operation. With a 3.6V battery pack and 100-mV output, a cordless phone using these devices provides a standby time of approximately 21 days and a talk time of 5½ hours.

For the non-RF functions, the baseband IC comprises two devices in one package. These devices contain audio-

codec, DSSS-baseband-modem, audio-modem, and microcontroller-core functions. Separately, the RF105 transceiver provides transmitting, receiving, and frequency-synthesis functions using a direct-conversion architecture, along with low-noise amplifier, mixers, filters, and variable-gain amplifiers. The RF106 power amplifier supplies as much as 100 mW of transmitting power output. Note that you can use the same devices for either the base-station or the handset design. The chip set incorporates a smart hopping algorithm to quickly move the DSSS output past any interference-prone channels. The chip set costs \$15 (50,000).—by Bill Schweber

Rockwell Semiconductor Systems, Newport Beach, CA. 1-714-221-6996, www.rss.rockwell.com.

Circle No. 400

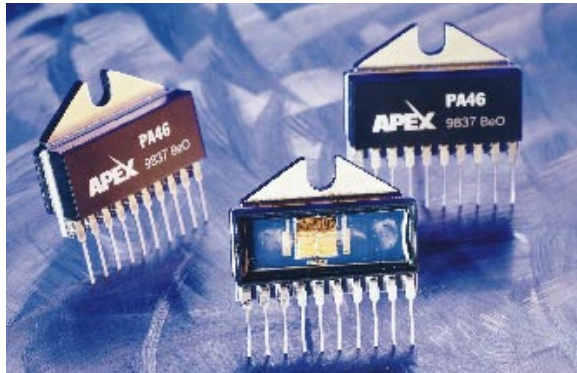


You can use the Hummingbird chip set to build a basic 900-MHz spread-spectrum cordless phone (shown) or enhance it with additional user telephony functions by adding more interfaces and memory.

Package squeezes still smaller power amplifiers

Designs for applications requiring op amps with significant power output rather than just analog-signal-handling ability have difficulty handling dissipation in low-cost, efficient, easy-to-handle packages. Apex Microelectronics, a vendor of linear and PWM power amplifiers, finds that the best approach is homemade: a power SIP package that you can through-hole or surface mount and that dissipates as much as 100W with less than 1 in.² of board space. Apex based the package on a nickel-plated steel tab, with a beryllium-oxide ceramic base substrate, which acts as an insulating but thermally conductive layer. To provide this plastic-lidded device with protection nearly equivalent to that of a hermetically sealed package, the company filled the cavity housing the die with silicon sealant before epoxy-sealing the lid.

The first amplifier from Apex using this 10-pin package is the PA46, a class-C unit which provides as much as 5A continuous output and as much as 85W dissipation, using the



By developing a proprietary SIP power package, Apex Microelectronics' lets its PA46 power amplifier put more power in a smaller space—and with additional functional pins—than the through-hole-only TO-3 package allows.

gain and bandwidth to your load and system dynamics. As is often unfortunately necessary for power devices driving pesky real-world loads, the PA46 has thermal, input, and output overload protection; you can also shut down its output stage to minimize power consumption.—by Bill Schweber

Apex Microelectronics Corp, Tucson, AZ. 1-520-690-8618, fax 1-408-730-3788, www.apexmicrotech.com.

Circle No. 401

IC's dual-supply management solves not-so-simple problem

It should be straightforward in principle to manage switchover when you have two dc supplies that can source your rail: Just use a series diode for each so the supply at higher potential supply is active. But when you look at the details and drawbacks of this simple technique, you soon find that you need a more complex circuit to do the job correctly. The LT1579 from Linear Technology Corp eases the challenge, though. This 16-lead IC accepts two dc inputs; provides uninterrupted output between the two with smooth switching action, even if you suddenly remove one supply; pro-

jects against reverse battery installation; and includes comparators and flag bits to monitor and indicate the status of each supply. The device can source as much as 300-mA output current with a dropout voltage of 0.5V and 3% output-voltage tolerance over line, load, and temperature variations. The IC is available with fixed 3, 3.3, and 5V outputs and a variable 1.5 to 20V version is also available for this \$3.40 (1000) IC.

—by Bill Schweber

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

Circle No. 402

Core packs "megamemory"

Atmel is employing its AVR core in the megaAVR family of large-memory microcontrollers. The family contains the same basic core as Atmel's original AVR whose properties include a 16-bit, fixed-length instruction, a load/store architecture, and 32 general-purpose registers. AVR can execute an instruction every clock by prefetching an instruction during the previous instruction execution. As part of the evolution toward the use of higher level languages, AVR also includes special instructions that support C programming.

The first two members of the megaAVR family, the ATmega103 and ATmega603, have 128 and 64 kbytes of flash and 4 and 2 kbytes of EEPROM, respectively. Both devices also have 4 kbytes of SRAM; a 10-bit, eight-channel ADC; a real-time clock; full-duplex UART; and an SPI port. The 103 and 603 operate as fast as 8 MHz at 2.7 and 5V and come in 64-pin TQFPs. The 103 and 603 cost \$15 and \$11 (10,000), respectively.

—by Markus Levy

Atmel Corp, San Jose, CA. 1-408-441-0311, www.atmel.com.

Circle No. 403