TEXAS INSTRUMENTS

THE WORLD LEADER IN DSP SOLUTIONS

details on signal processing

JULY 1997 • ISSUE 48

inside

Plus...

Fast, Proven, Available, and Upgradeable

TMS320x2 modem chipset brings 56 Kbps to the end user

The explosive growth of digital data communications, especially with accessing the Internet and various networked applications, is expected to continue at an incredible rate. For these applications to remain valuable, users need ultra-fast data transmission. To answer this need, TI offers the TMS320x2 line

Continued on page 4

New development tools speed DMC development

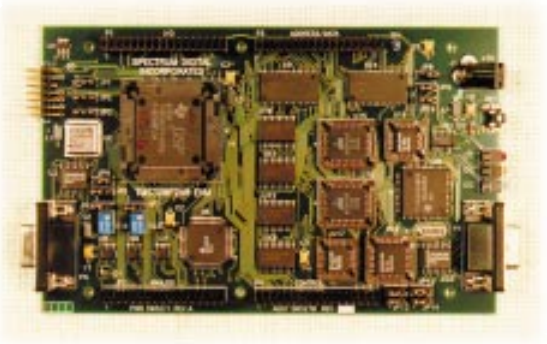
TI DSP third parties support 'C24x DSP controller

Control applications using DSP-based digital motor control (DMC) systems are steadily increasing each year due to many reasons, one being the motor-industry trend toward the use of brushless motors in a broad range of industrial products. Other reasons are the result of increasing government regulation on energy conservation and noise levels for all household white goods (appliances) and factory automation systems.

To meet these market needs, TI's TMS320C24x DSP controller features a 20-MIPS 'C2xx 16-bit, fixed-point core with a unique motor-control event manager whose features allow the device to perform advanced control tasks, including command generation, digital position, velocity, and current loops, digital commutation and additional system modeling, diagnostics, and communication. Completing the device are two serial interfaces, a pair of 10-bit A/D converters, 28 bits of digital I/O, a watchdog timer, and 16 kWords of ROM or 16 kWords of flash EPROM ('F240).

Based on the 'C24x devices, several TI DSP third parties have developed complete development packages for DMC applications.

Portescap, Inc. and Technosoft have introduced the MCK240 evaluation kit, which includes an 'F240 development board, a small brushless motor equipped with a high-resolution position encoder, and graphical motion-control software tools.



Spectrum Digital's EVM320F240 evaluation module

The board includes the 'F240, along with 32 kWords of RAM, an integrated three-phase PWM inverter with built-in current measurements, and a direct incremental encoder interface. A universal interface for connection to various external power amplifiers, such as IGBT inverter bridges, is also available for controlling larger motors.

The board can be connected to a PC via an RS-232 interface, allowing software downloading and debugging. The extended software provides ready- to-run examples for basic motion-control programs. During the run time, the main system variables such as position reference, motor position, speed, currents, and tracking error are saved in memory. The results can be uploaded and examined using the advanced graphical tools. Also, the MCK240 JTAG interface allows one to download, execute, and debug 'C240 programs using TI software.

Portescap's MCK240 development board

Spectrum Digital, Inc., has also introduced development tools for control applications. The EVM320F240 Evaluation Module is designed to quickly develop, debug, and prototype motor-control applications. It features a TMS320F240 DSP with 64 kWords of program and data memory. The program space also has 32 kWords of Flash ROM for embedded application code. An MP7680 DAC (4 channels, 12 bits) and additional UART are designed onboard for increased functionality. The module also supports the 'C2xx High Level Language (HLL) C Source Debugger, assembler/linker/compiler, and is compatible with TI's XDS510 emulator and Spectrum Digital's emulator, GO DSP's Code Composer™, and the Spectrum Digital RS-232 C Source Debugger.

Also from Spectrum Digital is the RS-232 HLL C Source Debugger, which supports the TMS320C203 and 'F240, and operates without an emulator. It provides the necessary tools for debugging DSP control algorithms and hardware. Also compatible with TI's HLL debugger, PC-resident debugger operates over an RS-232 cable with Spectrum Digital's EVM320C203 and EVM320F240 evaluation modules.

For pricing and availability on the MCK240, call Portescap at (516) 234-3900 in the U.S. or +41 (032) 925 6111 or see www.portescap.com. For more information on Spectrum Digital's DMC tools, call (281) 561-6500 or see www.spectrumdigital.com. To request TMS320C24x DSP controller information, use the enclosed reply card or call your regional literature response center.

DSP/BIOS Standard BIOS drives next-generation real-time DSP analysis tools

Programmable DSPs have evolved over the past decade from dedicated number crunchers into more universal embedded processors, performing system control and communication tasks normally relegated to general-purpose microcontrollers. This trend first became apparent in 32-bit DSPs, but a similar architectural evolution has begun to take hold in the TMS320C2xx, 'C5x, and 'C54x DSP generations.

As these 16-bit DSPs become pervasive in more sophisticated applications, software complexity is becoming increasingly challenging.

To help with this new code complexity, TI and Spectron Microsystems have announced a standard infrastructure to handle multitasking and I/O services for TI's 16-bit, fixed-point DSPs. At the heart of this initiative is DSP/BIOS, a small, scaleable firmware kernel with an open application program interface (API). Coupled with this DSP/BIOS are visual utilities for real-time program analysis that are on a functional par with those available for the broader embedded market, yet efficient enough to address the resource constraints of 16-bit DSP systems.

The DSP/BIOS kernel, which occupies less than 1 kWords of memory and consumes a fraction of one MIPS of DSP processing power while operating, provides basic run-time services to embedded application programs. The kernel supports real-time threads through its preemptive task scheduler, real-time I/O streams through core modules, that manage data flow, and real-time capture through functions that record information about the target program. The target application invokes BIOS services by making API calls that are embedded within the program source code.

In addition to simplifying application development and enhancing real-time response, BIOS tasking and I/O facilities drive a companion set of host-based analysis utilities known as BIOScope that can be used to augment the real-time capabilities of standard debuggers. BIOScope developed by Spectron Microsystems, works hand-in-hand with the target BIOS kernel, facilitates real-time program analysis by providing a set of visual capabilities that enable developers to trace, monitor, and probe a DSP application during its course of execution. In fact, BIOScope uses the same physical DSP JTAG connection already employed by the debugger.

Like a traditional debug monitor, the BIOS kernel manages real-time communications between the DSP target and the host-based BIOScope utilities. Unlike a monitor, however, the BIOS kernel provides run-time services as part of the application.

When used in tandem with a standard debugger during software development, BIOScope's real-time analysis capabilities provide critical visibility into target program behavior during program execution. Even after the debugger halts the program and assumes control of the target, information already captured by the BIOS kernel and transmitted to the BIOScope host utilities can provide invaluable insight into the sequence of events that led up to the current point of execution.

In addition to TI and Spectron, companies endorsing DSP/BIOS include leading DSP software and hardware third-parties DSP Research, DSP Software Engineering, GO DSP, HotHaus, Spectrum Signal Processing and White Mountain DSP. For more information on DSP/BIOS and supporting third-party products, see www.dspbios.com, use the enclosed reply card, or call your regional literature response center.

TI celebrates 15 years of DSP Solutions leadership

Fifteen years ago, TI introduced the first commercially available DSP—the TMS32010. At the time, it offered an astounding 5-MIPS performance in military and modem applications. Since that time, TMS320 DSPs have progressed, to say the least. With the announcement of the TMS320C6x DSP in February '97, applications can now benefit from 1,600-MIPS performance.

TI DSP SOLUTIONS

15 YEARS OF LEADERSHIP

From those early niche applications, TMS320 DSPs have moved into huge mainstream applications. Modems, wireless communications, hard-disk drives, speech recognition, audio-video and imaging, set-top boxes, automobiles, industrial control, and navigation systems are just a few.

Throughout 1997, TI will celebrate the 15th anniversary of TMS320 DSPs. Be sure to catch the next big event at DSP World on September 16 in San Diego, California. For more information, see the TMS320 15th anniversary website at www.ti.com/sc/15yrsofdsp.

x2 Modem

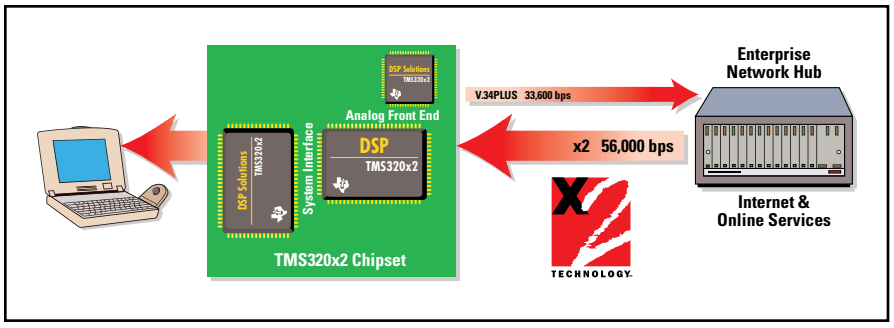
Continued from page 1

of modem reference designs that provide downstream transmission rates up to 56 Kbits per second (Kbps) with x2™ technology from U.S. Robotics® (USR). This technology gives modem makers a distinct competitive advantage by providing a proven chipset that is in full production, and facilitates a flexible software modem solution.

The TMS320x2 chipset consists of a programmable 'C5x DSP, along with a system interface application-specific integrated circuit (ASIC) and an analog front end. Designed to address a wide range of design requirements, the chipset is available in operating system-independent designs and Windows®-based designs. The O/S-independent designs provide a self-contained modem subsystem that operates without offloading any modem tasks to the host CPU. The Windows-based systems allow for cost-effective implementations that work with the host CPU for hardware cost reduction.

Since x2 technology was announced in October '96, TI DSP Solutions-based x2 modems have proliferated the high- speed modem marketplace. Along with USR, modem manufacturers such as Cardinal, Best Data, Global Village Communication, Practical Peripherals, and Logicode also use TMS320-based 56K technology. In the consumer PC™ market, PC OEMs such as Packard Bell/NEC, Gateway 2000, IBM (Thinkpad), and Dell are currently shipping TI/USR x2 modem-equipped PCs.

According to Richard Templeton, TI executive vice president and semiconductor group president, "The modems in Packard Bell and NEC systems will be based on TI's software-defined DSP, which provides flexibility and cost performance advantages over conventional modem chipsets. This technology protects the customer's investment by allowing them to upgrade their modems with software to comply with evolving technological advances."



The TMS320x2 chipset provides DSP performance, a system interface, and analog front end for a new level of Internet access.

Another area that is benefiting from TI's modem technology is internet service providers (ISPs). The top ISPs using TI/USR x2 technology are America Online, Compuserve, IBM Global Network, MCI, Mindspring, Netcom, and Prodigy. In total, over 375 ISPs in over 1,200 U.S. and Canadian cities now provide x2 access. This translates into more than 1.7 million ports offering 56-Kbps connections.

This proliferation is due in part to two reasons. Modem technology evolution is an inevitable part of the data communications industry, whose standards and protocols are constantly in a state of flux and improvement. The TI/USR platform is the only installed technology that can be software upgraded from V.34 to any 56K protocol and International Telecommunication Union (ITU) standards. This software reprogrammability both at the host level and at the DSP level protects end users against hardware obsolescence. For ISP customers, this means they can connect now, and stay connected in the future.

"... Based on TI's leading DSP technology, we will be able to upgrade many of our existing modem architectures without any hardware changes. This flexibility is key in bringing x2 to market quickly."

The second reason is the huge installed base of TMS320-based software-upgradeable modems already in place. Since late 1995, more than 20 million TMS320x2-based V.34 modems have been shipped, and as the world leader in DSP Solutions, TI has well-established capacity, distribution, and support capabilities to facilitate the rapid penetration of x2 on these same devices. Other 56K vendors cannot deploy as fast due to the need for hardware upgrades or replacement of current equipment.

According to Casey Cowell, chairman, CEO, and president of U.S. Robotics, "Based on TI's leading DSP technology, we will be able to upgrade many of our existing modem architectures without any hardware changes. This flexibility is key in bringing x2 to market quickly."

For future steps in data communications, TI and USR have announced a strategic initiative to deliver a family of affordable and upgradeable "hybrid" modems supporting both dial-up access x2 56 Kbps and rate-adaptive Asymmetric Digital Subscriber Line (ADSL). The product family will be called x2/DSL and will run on TI's TMS320C6x DSP. USR plans to introduce x2/DSL modems in the first half of 1998.

For more information, see www.ti.com/sc/x2, use the enclosed reply card, or call your regional literature response center.

Third-Party Program Competence Centers

Dates, topics set for European trade shows

TI has organized TI DSP Competence Centers in cooperation with several TMS320 third-party members. The Competence Centers are designed to feature TMS320 third-party products focused on various popular and emerging application areas, allowing attendees to gain insight into upcoming designs. To date, 34 companies will be participating at various locations.

For more information on the TI DSP Third-Party Competence Centers in Europe, send an e-mail to b-geisberger@ti.com or fax at +49 8161 80 4841.

Conference/Location	Focus
Telecom Interactive Geneva, Switzerland Sept. 8–14	Telecommunications
DSP '97 Paris, France Sept. 7–19	General DSP applications
DSP '97 Munich, Germany Sept. 30–Oct. 1	General DSP applications
Systems Munich, Germany Oct. 27–31	High-end multimedia
DSP '97 Milano, Italy Nov. 26–27	General DSP applications
DSP '97 London, U.K. Dec. 3–4	General DSP applications

DSP Solutions Fest '97

On July 31–August 2, 1997, TI will host the DSP Solutions Fest '97 in Houston, Texas. The DSPS Fest is an annual meeting for TI DSP educators and third-party companies who actively support TI DSP Solutions.

Highlights of the event will include the new 'C5x DSP Teaching Kit workshop, the TMS320C3x DSP Starter Kit workshop, and TI Technical Training Mini-Workshops on the 'C6x and 'C54x DSPs. Other topics will be covered in the Application Symposium, such as telecom, DMC, and video/imaging. TMS320 third parties also have the opportunity to demonstrate their products.

Don't miss this opportunity to talk one-on-one with TI DSP engineers, educators, and third-party companies!

For complete event and hotel information, as well as workshop registration, see http://www.ti.com/sc/dspsfest

NSF supported workshops on DSP and applications

Roger Williams University (Bristol, Rhode Island, USA), with support from the National Science Foundation, is holding two week-long workshops on DSP and application development for full-time university professors and faculty members. The workshops, which run August 4–8 and August 11–15, emphasize hands-on laboratory work. The workshops, directed by Dr. Rulph Chassaing, also address the need to integrate DSP techniques into undergraduate curriculum.

The workshop demonstrations are based on TI hardware tools such as the TMS320C3x DSP Starter Kit (DSK), as well as the 'C30 evaluation module. Oscilloscopes, function generators, and signal/spectrum analyzers will also be available. Each participant will be given a 'C3x DSK, donated by TI, which includes software tools.

Cost for the workshop, including room and board on-campus, are covered by the NSF. Cost of transportation is the participant's responsibility. For more information, contact Dr. Chassaing at (401) 254-3041 or (401) 254-3314 or by email: rulph@alpha.rwu.edu.

Embedded test bus controller

Makes IEEE JTAG affordable for system-level test

One of the growing applications for the IEEE 1149.1 (JTAG) standard is embedded system-level test architectures. To take advantage of 1149.1 test structures for these applications, a test controller with interface capabilities to embedded DSPs, microcontrollers, and microprocessors must be designed into the end equipment to manipulate and control serial scan data.

The TI SN74LVT8980 test-bus controller (TBC) solution makes embedded TBC applications affordable to a wide range of systems with a lower price, increased ease-of-use, reduced size, and low-voltage (3.3 V) power.

The 'LVT8980 provides system-level built-in test, in-system emulation, and in-system programming functions which execute as high-level code on the embedded host CPU.

The new device controls low-level test bus operations, enabling the host to use higher-level abstraction such as:

- Moving from test access port (TAP) state to TAP state
- Scanning instruction register or data register, including pre/post-scan state movements
- Running built-in system test operations in the Runtest/Idle state for a fixed number of clocks.

It also provides the flexibility of operating with a free-running or gated test clock.

The 'LVT8980 is available from TI and authorized distributors. For pricing information, please contact your local TI sales office. For more product information, see www.ti.com/sc/msp, use the enclosed reply card, or call your regional literature response center.

DSP Solutions
Texas Instruments
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This section features new development and application support available through TMS320 Third Parties

'C82 Software Development Kit

Precision Digital Images (PDI) has announced the 'C82 Software Development Kit, which features a 'C82-based PCI card and a high-level language (HLL) C Source Debugger. The card integrates image capture, processing, and display in a single-slot Windows NT solution for the PCI bus. It also has real-time audio and video channels to enable developers to easily incorporate audio, speech, and video functions into the system. Software support includes Windows NT, processor and host drivers, and an API. A sample application program is also included to help demonstrate the board's capabilities. It is also compatible with TI's 'C8x software development tools. Contact PDI for pricing.

Precision Digital Images

- Phone: (800) 678-6505
- e-mail: info@precisionimages.com
- www.precisionimages.com

New 'C6x development platform

The new PCI/C6200, from Loughborough Sound Images, combines the processing power of the 'C6x with extensive I/O facilities and support software. Designed for use in embedded DSP and telecommunications environments, the board features a single 'C6201 DSP and 8 Mbytes of SDRAM and 128 or 256 kBytes of SBSRAM. It also has a site for LSI's off-the-shelf analog I/O modules. The board provides a 132-Mbyte/sec PCI host interface, as well as SCbus and MVIP interfaces. A full software suite from LSI is also available for host communication providing control, download and data transfer, DMA, signals, and mailboxes. Contact LSI for the latest pricing information.

Loughborough Sound Images

- Phone: +44 (0) 1509 634300
- e-mail: sales@lsi-dsp.co.uk
- www.lsi-dsp.co.uk

DSP library supports 'C6x

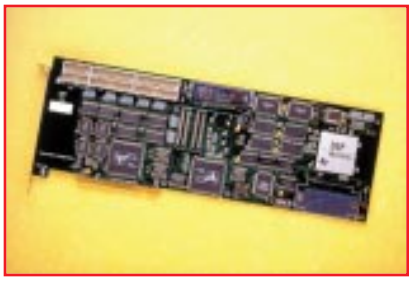
Numerix Ltd. has announced a new version of SigLib, the ANSI-C source DSP library, that supports the TMS320C6x generation. The latest version includes functionality for discrete cosine transforms (DCTs) for image compression, as well as arbitrary-length FFTs and additional communications functions. Other functions include spectrum analysis, windowing, signal generation, statistical and regression analysis, digital effects, vectors, control, and host functions. Also, the library allows for easy integration with other libraries for application-specific or time-critical applications. Pricing information is available directly from Numerix.

Numerix Ltd.

- Phone: +44 (0) 1509 413195
- e-mail: info@numerix.co.uk
- www.numerix.co.uk

'C6x DSP coprocessor card

Innovative Integration, Inc. has announced the PCI6201, a DSP coprocessor card for telecom communications and data acquisition applications. The card features the 'C6201, and up to 32 Mbytes of SDRAM/1 Mbyte Sync Burst SRAM, 132 Mbyte/sec PCI host interface, and dual 132 Mbyte/sec PMC module sites for I/O expansion. A complete software development system is also available including the TI 'C6x C compiler, Code Composer, JTAG-based emulation hardware, sample programs and libraries, and Windows device drivers. The PCI6201 will be available in June '97. Contact Innovative Integration for pricing.

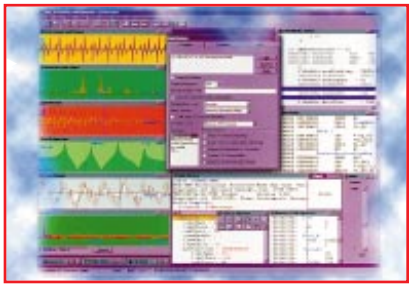


Innovative Integration, Inc.

- Phone: (818) 865-6150
- Fax: (818) 879-1770
- e-mail: techsprt@innovative-dsp.com

Code Composer supports 'C54x, Windows NT

GO DSP has announced the next release of Code Composer, which brings Windows NT and debug support for the TMS320C54x DSP generation to its advanced, fully-integrated DSP software development environment. Other new features include an on-the-fly patch assembler that allows developers to modify opcodes during animation, assembly source level debugging for 'C2xx and 'C5x DSPs with TI's fixed-point assembly tools, Quick Watch functionality, algebraic disassembly for 'C54x, drag and drop from the Microsoft file manager, and improved multiprocessor setup. Code Composer is available now from GO DSP, TI authorized distributors, and from authorized TMS320 third-party hardware vendors. A free upgrade to Code Composer version 2.0 is available to all qualified users.



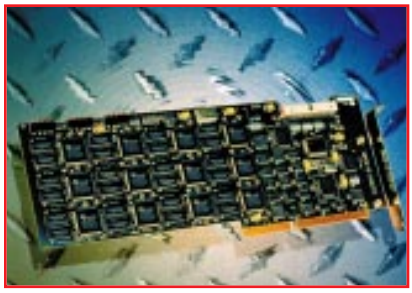
GO DSP

- Phone: (416) 599-6868, ext. 1
- e-mail: sales@go-dsp.com
- www.go-dsp.com

'C542 development board, DSP/BIOS support

DSP Research has released the VIPER-12 542/PC, a high-density DSP resource board featuring 12 TMS320C542 DSPs and an MVIP bus interface. The board, designed for applications such as wireless and cellular base stations, remote access servers, and voice/modem/facsimile, can support up to 24 IS-136 digital cellular vocoders including line echo cancellation. In addition to IS-136, the board supports IS-641, IS-95, and RCR-27 (Japanese Digital Cellular). Host APIs, the QuickSTART DSP operating environment, along with the TI C compiler/assembler/linker, a DSP program loader, and GO DSP's Code Composer complete the development package. The VIPER-12 starts at US $4,995.

Also released from DSP Research is Spectron Microsystems BIOStation for the TIGER 542/PC, a single 'C542 DSP development system. BIOStation is based on the TI DSP/BIOS API standard, and consists of DSP software that runs on the TIGER 542/PC as well as software for the host PC. The DSP-resident kernel implements the API functions while a suite of visual host-based real-time analysis, monitoring, and capture tools leverage the kernel services on the board. BIOStation provides other services such as pre-emptive multitasking, I/O, capture, and statistics. Complete development packages including BIOStation and the TIGER 542/PC start at US $2,595.



DSP Research

- Phone: (408) 773-1042
- e-mail: info@dspr.com
- www.dspr.com

Universal fixed-point evaluation module

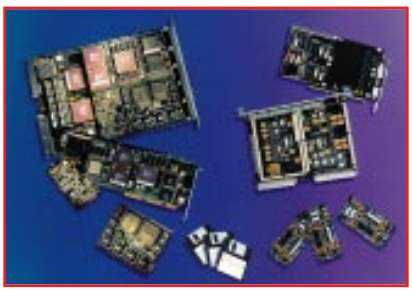
White Mountain DSP has announced the industry's first universal evaluation module for TI's TMS320C2xx including the 'C24x, 'C5x, and 'C54x generations. The Mountain-Universal EVM (Uevm) allows engineers to evaluate different fixed-point DSPs with interchangeable Mountain-Pak modules. The Uevm features include half-size PC-AT plug-in card, FCC-approved telephone Data Access Arrangement (DAA), 16-bit stereo audio interface CODEC, daughter card site, and debug via on-card and off-card emulation. The Mountain-Uevm is priced at US $995, with Mountain-Pak modules for the various DSP generations available for US $495 each.

White Mountain DSP

- Phone: (603) 882-2655
- e-mail: info@wmdsp.com

'C4x-based digital radio receiver

Spectrum Signal Processing has announced a flexible multi-platform digital radio solution with interoperability with VXI, ISA, PCI, and VME™ platforms. The system is based on Spectrum's DDR product family consisting of the MDC44DDC 50-MHz TIM module, MD70MAI 70 MS/s A/D converter TIM module, 50-kHz analog daughter module, and a DDR cable kit. US pricing for the components are: $7,000 for the MDC44DDC-50 1-Mbyte TIM module ($8,000 for the 4-Mbyte version) and $2,900 for the MD70MAI A/D converter module. Development kits for both TIM modules and DDR cable kits are also available.



Spectrum Signal Processing

- Phone: (604) 421-5422
- Fax: (604) 421-1764
- www.spectrumsignal.com

Multi-DSP development platform

Syntech has released DUO QUATUOR, a dual or quad TMS320C44-based PCI bus development board providing up to 240 MFLOPS. Features include up to 16 Mbytes of shared EDRAM, local DSP SRAM, and 2 Mbytes of Flash. It also has an entirely reprogrammable 32-bit peripheral bus. The main board is easily equipped with application-specific daughter boards, and multiple boards can be interconnected. Contact Syntech for pricing for your particular requirements.

Syntech S.A.

- Phone: +33 (04) 93 65 28 66
- Fax: +33 (04) 93 65 22 93
- e-mail: syntech@wanadoo.fr

'C3x PCI-bus evaluation board

Sheldon Instruments has announced the SI-C32DSP-PCI, a 'C31-based DSP evaluation card for the PCI bus, fully integrating software development as well as connectivity for custom prototyping and external daughter modules.

Hardware features include up to 60-MFLOPS performance, expansion connectors, and dual-access zero-wait-state SRAM expandable from 128k × 32 to 768k × 32 words. All communication between the host and DSP are through the PCI bus, where large blocks of data can be transferred via a bidirectional FIFO.

Additionally, several daughter modules are available incorporating up to 64 channels of analog I/O, digital I/O, and connectivity to other data-acquisition systems. Software development tools including drivers, analysis libraries, examples, and tutors are also available.

The SI-C32DSP-PCI is available for US $975 with a minimum configuration of a 40-MHz 'C31 and 128k × 32 SRAM.

Sheldon Instruments

- Phone: (800) SHELDON or (801) 377-2525
- e-mail: info@sheldoninst.com
- www.sheldoninst.com

16-bit sigma delta AIC

The TLC320AD50 16-bit analog interface circuit (AIC) is a versatile analog front end for business audio and modem applications. It provides high-resolution signal conversion and provides internal 64 × oversampling on the ADC and 256 × oversampling on the DAC.

The device provides a glueless interface via serial port to TMS320 DSPs, and offers options such as selectable conversion rate, reset, power-down, communications protocol, serial clock rate, gain control, and system test mode. The device, available in a 28-pin SOIC and 48-pin TQFP, has a typical signal-to-total harmonic distortion (THD) of 90 dB and 89 dB typical signal-to-noise ratio (SNR) on the ADC and DAC.

For more information, see www.ti.com/sc/msp, use the enclosed reply card, or call your regional literature response center.

TMS320 DEVELOPMENT TOOLS

Device	Development Tool	Platform	Current Rev Level
TMS320C1x	Simulator	PC	2.00
TMS320C1x	EVM	PC	1.00
TMS320C2x/'C2xx/'C5x	COMP/ASM/LNK	PC/SPARC™	6.60
TMS320 Fixed-pt	ASM/LNK ('C1x/2x/2xx/5x)	PC	6.60
TMS320C2x	Simulator	PC/SPARC	3.00
TMS320C2x	EVM	PC	6.40
TMS320C2xx	Simulator	PC/SPARC	1.30
TMS320C2xx	XDS510/EPK	PC/SPARC	1.00
TMS320C3x/'C4x	COMP/ASM/LNK	PC/SPARC	5.00
TMS320C3x/'C4x	ASM/LNK	PC	5.00
TMS320C3x	Simulator	PC/SPARC	2.20
TMS320C3x	XDS510/EPK	PC/SPARC	5.20
TMS320C30	EVM	PC	5.00
TMS320C4x	Simulator	PC/SPARC	1.30/1.31
TMS320C4x	XDS510/EPK	PC/SPARC	2.40
TMS320C5x	XDS510/EPK	PC/SPARC	7.40
TMS320C5x	EVM	PC	7.20
TMS320C5x	Simulator	PC/SPARC	1.30
TMS320C54x	COMP/ASM/LNK	PC/SPARC	1.10
TMS320C54x	ASM/LNK	PC	1.10
TMS320C54x	XDS510	PC/SPARC	1.00
TMS320C54x	EVM	PC	1.30
TMS320C8x	COMP/ASM/LNK/SIM	PC/SPARC	2.00
TMS320C8x	XDS510/EPK	PC/SPARC	2.00
TMS320C8x	Software Development Board	PC	1.20

Read Details online at www.ti.com/sc/details

FOR MORE INFO

Details on Signal Processing is published quarterly by TI DSP. For more information about the newsletter or its contents, contact:

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TI PRODUCT INFORMATION

Product Information Center	(972) 644-5580
Product Information Center WWW Site	www.ti.com/sc/docs/pic/home.htm
TMS320 WWW Site	www.ti.com/dsps

USA PRODUCT INFORMATION

TI Literature Response Center USA	(800) 477-8924
TMS320 Hotline	(281) 274-2320
TMS320 Hotline Fax	(281) 274-2324
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TMS320 email address	dsph@ti.com
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Korea DSP BBS	+82 2 551 2914
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JAPAN PRODUCT INFORMATION

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Product Information Center Fax	0120-81-0036 (in Japan) or call 03-3457-1259 or (INTL) 813-3457-1259
DSP Hotline	03-3769-8735 (INTL) 813-3769-8735
DSP Hotline Fax	03-3457-7071 (INTL) 813-3457-7071
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