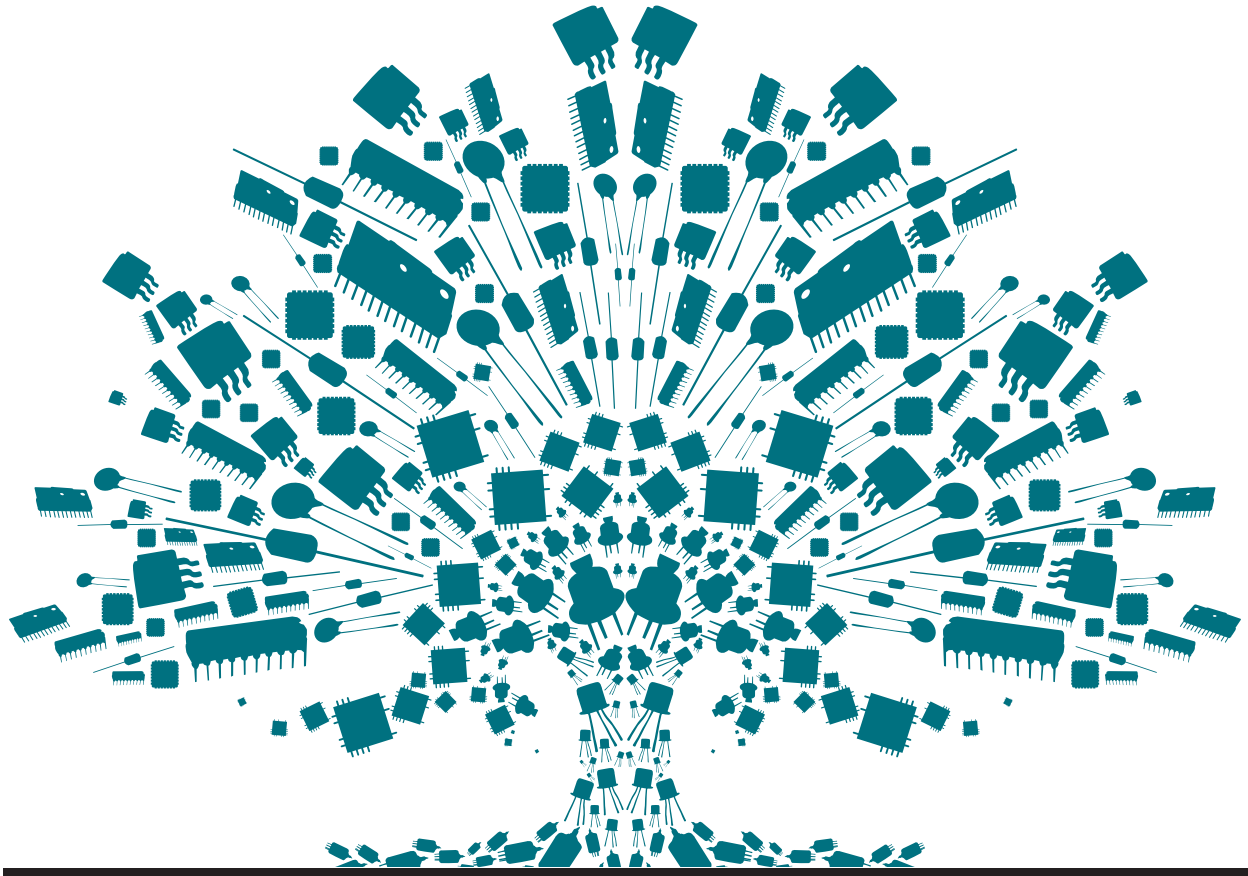
eXpressDSP™



Texas Instruments

Digital Signal Processing Software and Development Tools Selection Guide

1Q 2008

Table of Contents

eXpressDSP Software and Development Tools 1

Code Composer Studio™ IDE and Development Tools 2

JTAG Debug and eXpressDSP Data Visualization 4

eXpressDSP™ Software – Operating Systems 5

Algorithm Standards and Frameworks 6

Digital Media Software Portfolio 7

Getting Started 9

TI Digital Signal Processing Development Tools and Software 10

Digital Signal Processing Development Tools Feature Matrix 11

TI Developer Network 12

eXpressDSP™ Software and Development Tools

eXpressDSP Software and Development Tools

Complete, Real-Time Software and Development Tools for TI Processors

TI's real-time eXpressDSP Software and Development Tools portfolio includes tightly knit ingredients that will empower developers to tap the full potential of TI's TMS320™ DSPs, DaVinci™ and OMAP™ processors. Each element is designed to simplify programming and move development from a custom-crafted approach to a new paradigm of interoperable software from multiple vendors supported by a worldwide infrastructure. There has been an explosive growth in real-time applications demanding the real-time processing power of TI digital signal processing. eXpressDSP tools enable innovators and inventors to speed new products to market and turn ideas into reality. For more information, visit **www.ti.com/expressdsp**.

Standardization and Software Reuse Move Development to a New Level

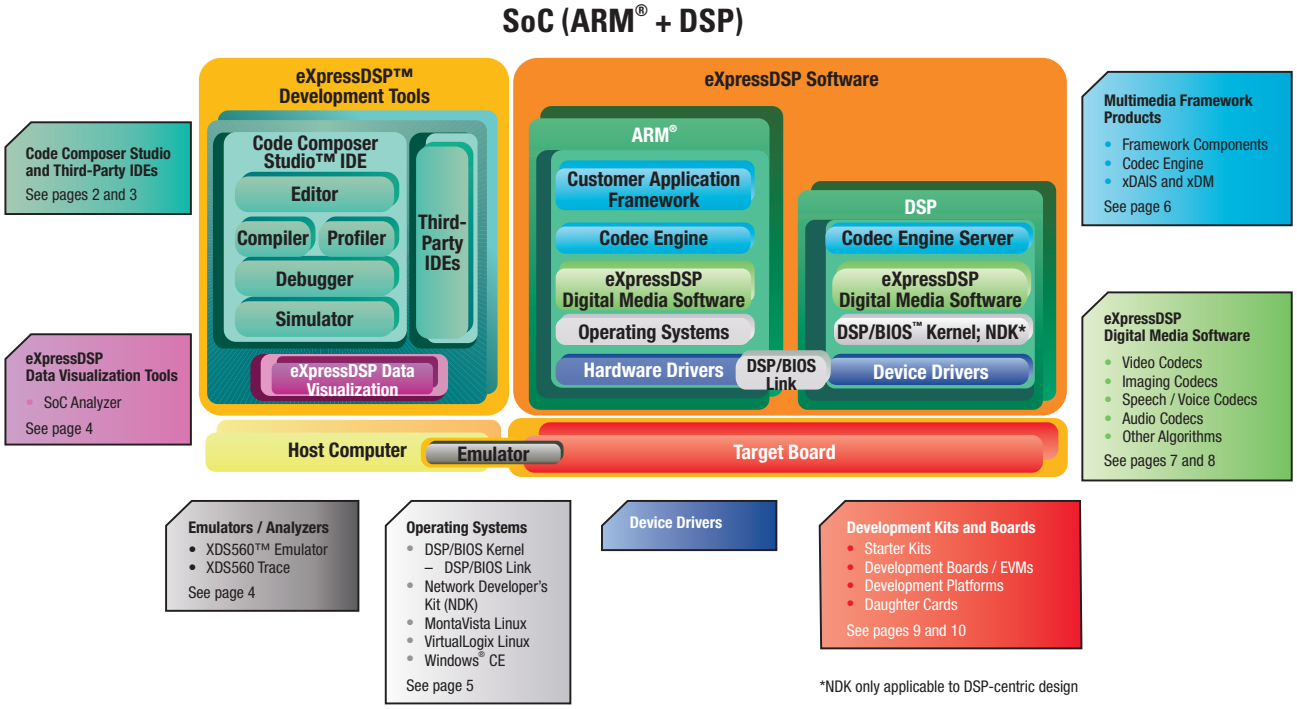
- Standards enabled for modular, reusable multi-function applications
- Developers of all experience levels
- Integrate your own software
- Catalog of interoperable software
- Focus on adding value/differentiation
- Designed to cut development time by up to 50 percent and increase the modularity

Tools and Standards to Simplify Application Development, Reduce System Cost, Enhance Product Robustness and Innovation and Accelerate Time-to-Market

- Powerful, integrated development environment (IDE) (Code Composer Studio™ IDE)
- Scalable real-time kernel (DSP/BIOS™ kernel)
- eXpressDSP-compliant algorithms (written to the eXpressDSP Algorithm Interface Standard)
- Reusable modular software and support from TI's DSP Developer Network
- Available on TMS320C6000™ and TMS320C5000™ DSPs, TMS320C2000™ digital signal controllers, OMAP application-specific processors and DaVinci digital media processors
- Advanced data visualization and real-time analysis
- Powerful code generation tools

What are eXpressDSP Software and Development Tools?

TI's real-time eXpressDSP Software and Development Tools provide a complete and open digital signal processing software environment to simplify and streamline the product development process. It provides access to a large number of reusable software components, host tooling and target-side content to reduce development time.



eXpressDSP

eXpressDSP™ Development Tools

Code Composer Studio™ IDE and TI Developer Network Development Tools

Integrated Development Environment and Debuggers

Get more information about Code Composer Studio IDE and TI Developer Network development tools at: **www.ti.com/ccstudio**

Code Composer Studio Development Tools Simplify DSP Development

Code Composer Studio (CCStudio) software is a fully integrated development environment (IDE) supporting Texas Instruments industry-leading DaVinci™, TMS320C6000™, TMS320C5000™, TMS320C2000™ and OMAP™ processor platforms.

IDE

- Integrated IDE and debugger
- CodeWright Editor
- Project manager

Debugger

- Co-debug of ARM®/DSP processors
- Data visualization
- Cache visibility
- Robust host-to-target connection

Real-Time Debug

- Non-intrusive memory access
- Handle interrupts while halted

Advanced Event Triggering

- Watchpoints
- Event sequences
- Non-intrusive counters

Simulation

- Cycle accurate simulation
- Rewind back-stepping
- Code coverage

Code-Generation Tools

- Industry-leading performance
- Program-level optimization

Profiling

- Profile functions and loops
- Measure cache activity
- Profile pipeline stalls

Host Operating System Support

- Windows®
- Linux (compilers only)

Integrated Development Environment

The Code Composer Studio (CCStudio) IDE provides a single-user interface taking you through each step of the application development flow. Familiar tools and interfaces allow users to get started faster than ever before and add functionality to their application thanks to sophisticated productivity tools. The integrated CodeWright Editor greatly improves the code creation experience. Easily manage large multi-user, multi-site projects with the built-in project manager.

Debugger

Code Composer Studio IDE's integrated debugger has DSP-specific capabilities and advanced breakpoints to simplify development. Conditional or hardware breakpoints are based on full C expressions, local variables or CPU register symbols. A General Extension Language (GEL) script file can be executed when a particular breakpoint hits.

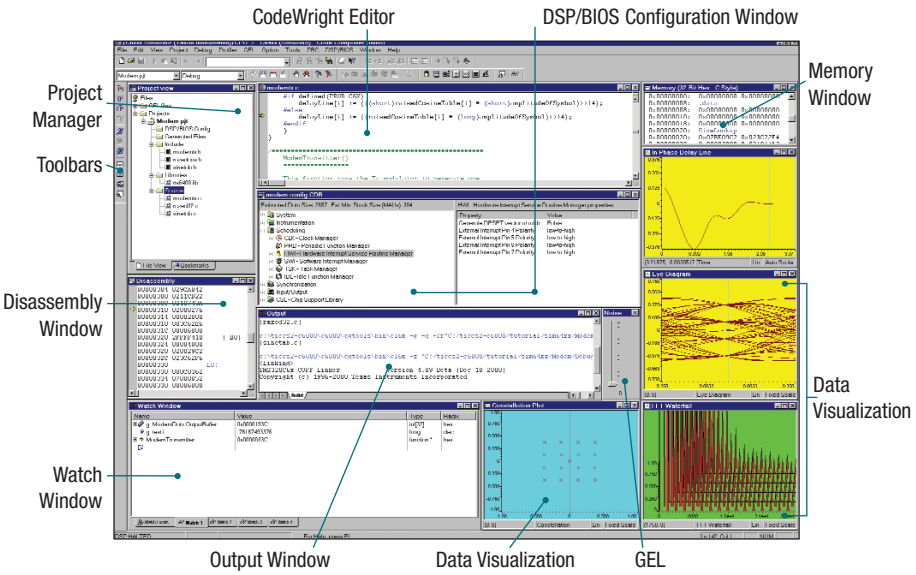
Developers can debug code quickly by selectively stepping into, over or out of C function or assembly subroutines.

The memory window allows you to inspect each level of memory so that you can debug complex cache coherency issues.

Code Composer Studio IDE supports the development of complex systems with multiple boards or multiple processors on a single target board. Global breakpoints are also available for multiprocessor systems. Code Composer Studio's Parallel Debug Manager (PDM) provides synchronized control over multiple processors configured in single- or multiple-scan chains. It can be used to launch individual parent windows to control each processor. The PDM can be used to broadcast commands to different groups of CPUs in the JTAG scan path. A global breakpoint command on one processor can halt other processors when this breakpoint is encountered.

The PDM lets developers open up separate debug windows for any CPU on any board in the system.

Code Composer Studio IDE also supports popular external scripting languages such as Perl and VBA to help developers automate application testing and validation.



Code Composer Studio Development Tools include the features you need to edit, build, debug and visualize your applications.

eXpressDSP™ Development Tools

Real-Time Debug

TI devices include advanced emulation features which provide simple, inexpensive and speed-independent access to the CPU for debugging. Access to registers and memory can be non-intrusive and real-time mode provides for the debugging of code that interacts with interrupts that must not be disabled. Real-time mode allows you to suspend background code at break events while continuing to execute time-critical interrupt service routines.

Advanced Event Triggering

Advanced Event Triggering (AET) allows a user to halt the CPU or trigger other events based on complex events or sequences such as invalid data or program memory accesses and invalid program accesses. It can non-intrusively measure performance and count system events (for example, cache events).

Code-Generation Tools

In the past, developing high-performance DSP code has required optimizing assembly code by hand and an intimate knowledge of the particular device architecture. The TI Code Composer Studio compiler tools address this need by shifting the burden of optimization from hand-coded assembly to the C compiler. With these tools it is possible to exploit the high performance of TI processors without ever writing hand-coded assembly.

TI compilers can perform program-level optimizations that evaluate code performance at the application level. With a program-level view, the compiler is able to generate the small, fast code an assembly program developer with a full system view would generate. This application-level view is leveraged by the compiler to make trade offs that significantly increase performance.

Simulation

Simulators provide a way for users to begin development prior to having access to a development board. Simulators also have the benefit of providing enhanced visibility into application performance and behavior.

Several simulator variants are available allowing users to trade off cycle accuracy, speed and peripheral simulation, with some simulators being ideally suited to algorithm benchmarking and others for more detailed system simulation.

The Rewind feature allows you to step and run backward to trace the source of a problem. There is no need to restart the execution of the program. Full reverse mode visibility is available through watch, register and memory windows.

Watchpoints allow the user to stop his code on data read or write to a particular memory location. Track memory corruption problems using this feature.

The Interrupt Latency Detector enables you to measure the worst-case interrupt latency of the code, including programming interrupt constraints such as disabling GIE/NMIE and architectural behavior such as non-serviceability of interrupts in branch delay slots.

Pipeline analysis of a TMS320C55x™ DSP shows both the stalls and their causes through a detailed pipeline visibility.

Code Coverage shows which source lines (both C and assembly) are executed.

The CacheTune tool tracks program, data cache activities visualized over time – most effective for improving cache utilization.

Real-Time Data Exchange

Real Time Data Exchange (RTDX™) and High-Speed RTDX (HS-RTDX) allow a developer to exchange data between the target and the host PC without stopping the target application, thus providing a bi-directional "data pipe" between the application and the host. This allows developers to access data from the application for real-time visibility, or to simulate data input to the device, shortening development time by giving developers a realistic view of the way their systems operate.

Profiling

Code Composer Studio IDE's interactive profiler makes it easy to quickly measure code performance and ensure the efficient use of the DSP target's resources during debug and development sessions. The profiler allows developers to easily profile all C/C++ functions in their application for instruction cycles or other events such as cache misses/hits, pipeline stalls and branches. Profile ranges can be used to concentrate efforts on high-usage areas of code during optimization, helping developers produce finely-tuned code. Profiling is available for ranges of assembly, C++ or C code in any combination. To increase productivity, all profiling facilities are available throughout the development cycle.

Developer Network Development Tools

TI is committed to enabling third-party development tools partners to support our ARM®- based SoC devices.

GreenHills MULTI®

MULTI is a complete integrated development environment for embedded applications using C, C++ and Embedded C++. The MULTI debugger offers an excellent environment for debugging of SoC devices containing both ARM and the TMS320C64x+™ DSP core. MULTI also offers OS-aware debugging for several operating systems including INTEGRITY, velOSity, u-velOSity, MontaVista Linux and DSP/BIOS™ kernel. For more information on GreenHills MULTI please contact **sales@ghs.com**.

Lauterbach Trace32

Trace32 is an ARM debugger that also supports debugging of TI DSPs and thus can provide co-debug support for the ARM and DSP on TI SoC devices. Lauterbach also provides OS aware debugging for most embedded operating systems including Linux. For more information please visit **www.lauterbach.com**.

Code Composer Studio full-function evaluation tools are available for a free 120-day evaluation. To order your CD-ROM, visit **www.ti.com/freetools**

eXpressDSP™ Development Tools

JTAG Debug and eXpressDSP Data Visualization

Emulators and Analysis Tools

Get more information about JTAG debug and eXpressDSP data visualization tools at: **www.ti.com/emulatoranalyzer**

Real-Time execution visibility is the key to optimizing and debugging systems. Emulators provide a connection to a target for execution control and system visibility. eXpressDSP Data Visualization Tools-based solutions graphically simplify complex, interrelated data sets.

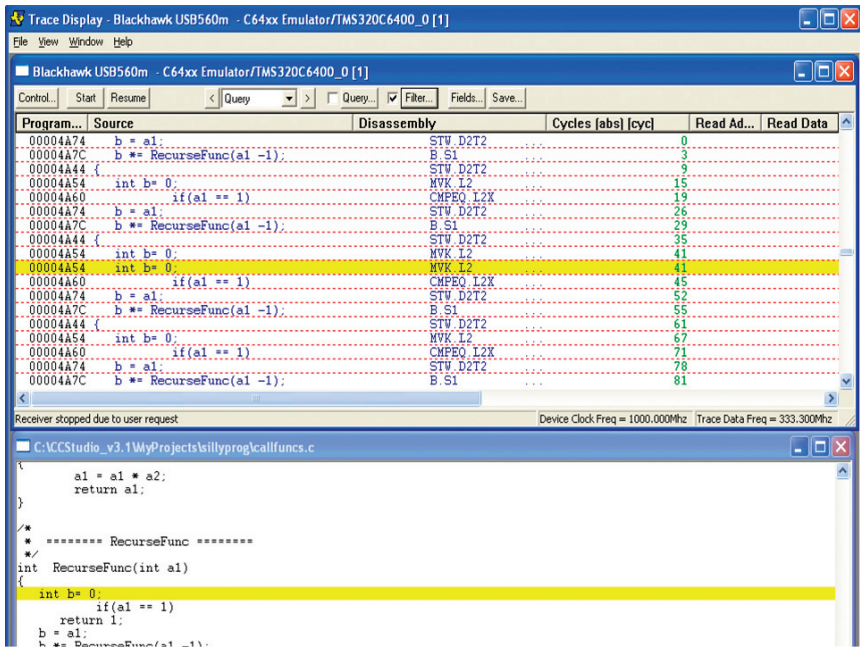
XDS560™ Emulator

The XDS560 Emulation platform provides a robust and reliable IEEE 1149.1 JTAG connection to the target device. It provides high-speed download speeds, Advanced Event Triggering (AET), and High Speed Real-Time Data Exchange (HS-RTDX) capability.

Non-Intrusive Debugging

TI devices include advanced emulation features which provide simple, inexpensive and speed-independent access to the CPU for debugging. Access to registers and memory can be non-intrusive and real-time mode provides for the debugging of code that interacts with interrupts that must not be disabled. Real-time mode allows you to suspend background code at break events while continuing to execute time-critical interrupt service routines.

- Advanced Event Triggering (AET) allows a user to halt the CPU or trigger other events based on complex events or sequences such as invalid data or program memory accesses and invalid program accesses. It can non-intrusively measure performance and count system events (for example, cache events).
- Real Time Data Exchange (RTDX) and High-Speed RTDX (HS-RTDX) allow a developer to exchange data between the target and the host PC, without stopping the target application, thus providing a bi-directional "data pipe" between the application and the host. This allows developers to access data from the application for real-time visibility, or to simulate data input to the device, shortening development time by giving developers a realistic view of the way their systems operate.



Blackhawk XDS560 Trace delivers non-intrusive, real-time data capture to expose the toughest real-time bugs.

XDS560 Trace

The XDS560 Trace module helps customers find previously "invisible" complex real-time bugs. Trace can detect the really hard to find bugs – race conditions between events, intermittent real-time glitches, crashes from stack overflows, runaway code and false interrupts without stopping the processor. Trace is a completely non-intrusive debug method that relies on a debug unit inside the DSP so it does not interfere or change the application's real-time behavior.

Trace can fine tune code performance and cache optimization of complex switch intensive multi-channel applications. It enables real-time code and event profiling as well as fast and accurate code analysis with profiling, cache view and code coverage for some of the most popular TMS320 devices today used in applications such as video teleconferencing and medical imaging.

SoC Analyzer Data Visualization Tool

eXpressDSP Data Visualization SoC Analyzer is TI's high-level system tuning and visibility tool which enables developers to visualize SoC streaming data rather than be limited to post-mortem static data analysis. By being able to capture and graphically display system interactions and load distribution, isolate bottlenecks, identify unexpected behaviors and benchmark application performance, developers are able to maximize efficiency and overall performance while eliminating tedious manual data collection and comparison. This tool is non-invasive and aids in analyzing and identifying problems by capturing and graphically displaying: system interaction, load distribution, bottlenecks in data throughput and other types of behavior.

Read more about real-time debug at **www.ti.com/emulatoranalyzer**

eXpressDSP™ Software

DSP/BIOS™ Real-Time DSP Kernel and ARM® Operating Systems

Get more information about DSP/BIOS real-time kernel and ARM operating systems at: **www.ti.com/expressdspos**

Complete Operating System Solutions for Both ARM and DSP-Based Devices

- DSP/BIOS real-time kernel
  - Available royalty-free with Code Composer Studio™ (CCStudio) integrated development environment (IDE)
  - Supports DaVinci™, OMAP™, TMS320C6000™, TMS320C5000™ and TMS320C2000™ processors
  - Provides deterministic, preemptive multithreading
  - DSP/BIOS Link provides ARM–DSP program loading and communications services
- Network Developers Kit (NDK)
  - Integrated with DSP/BIOS kernel
  - Provides standard TCP/IP networking services
  - Includes higher-level applications such as HTTP, TELNET, DNS and DCHP
- MontaVista Linux
  - Stable, robust, proven embedded Linux
  - Fully supported and maintained by MontaVista
  - Available for DaVinci and OMAP processors
- Microsoft Windows® CE
  - Available on select ARM-based DaVinci and OMAP processors through TI's Authorized Software Providers (ASPs)
- VirtualLogix Linux
  - Full-featured embedded Linux complete with drivers
  - Co-exists with DSP/BIOS kernel via real-time VLX virtualization technology
  - Available on select TMS320C64x+™ DSP core-based processors

DSP/BIOS Software Kernel Foundation

DSP/BIOS kernel is a robust multithreading kernel, proven in thousands of embedded applications, and is augmented by the NDK embedded networking stack and the DSP/BIOS Link ARM–DSP communications and control software. DSP/BIOS kernel is highly scalable to minimize footprint requirements.

DSP/BIOS kernel provides preemptive multithreading, cache and interrupt management and a selection of interprocessor communication services, including mailboxes, semaphores and variable-length message passing that works transparently across single- and multi-core configurations.

To aid debugging of complex applications, DSP/BIOS kernel includes real-time logging services that are integrated with the CCStudio IDE graphical real-time analysis displays. DSP programmers can view the sequence of thread execution, CPU load, or use a low-overhead printf for custom instrumentation.

DSP/BIOS kernel is frequently deployed as the real-time DSP kernel on multicore devices like TI's DaVinci and OMAP SoC processors. In such applications, the DSP/BIOS Link inter-processor communication provides powerful interconnection service to ARM-side operating systems like Linux and Windows CE. DSP/BIOS Link is typically used with TI's codec engine, as shown in the DaVinci software pages of this guide (see page 6).

Monta Vista Linux

MontaVista Professional Edition Linux provides a full-featured development environment with options for both command-line and Eclipse-based tools. MontaVista provides tools for build, debug, profiling and analysis on the host coupled with a Linux Support Package (LSP) with a full set of hardened drivers and a rich complement of target-based software components. MontaVista's embedded Linux kernel includes real-time support, along with rich networking and file systems services. MontaVista licenses may be purchased as part of the TI Digital Video Software Production Bundle (DVSPB), which entitles the license holder to updates on the MontaVista Zone customer portal. For more information on the DVSPB, visit **www.ti.com/dvspb**.

Open Source Community Linux

In addition, TI sponsors the OMAP and DaVinci Linux communities that provide the option to participate in the latest kernel version development. An implementation of the GStreamer framework for DaVinci, uboot and an active community support mailing list are available at **www.linux.davincidsp.com**.

DSP/BIOS is available royalty-free with the Code Composer Studio full-function evaluation tools. To order your CD-ROM, visit **www.ti.com/freetools**

Multimedia Framework Products

Algorithm Standards and Frameworks

Standards for Algorithm Interoperability and Integration

Get more information on algorithm standards and frameworks at: **www.ti.com/frameworks**

The xDAIS and xDM standards simplify integration of multiple algorithms into an application. Framework Components enable users to easily develop frameworks that can use xDAIS-compliant algorithms. Codec Engine is an low-level framework that automates instantiation of xDAIS and xDM-compliant algorithms.

- xDAIS and xDM
  - eXpressDSP™ Algorithm Interface Standard (xDAIS)
  - xDAIS for Digital Media (xDM)
  - Well-established standard first introduced in 1999
  - Enhanced in 2006 to support DaVinci™ digital media API
- Framework Components
  - Off-the-shelf modules for querying and allocating xDAIS algorithm memory and DMA resources
- Codec Engine
  - Automated instantiation of xDAIS/xDM algorithms, including resource allocation
  - Transparent remote or local execution
  - Easily incorporated into higher-level frameworks

For further technical information or for no charge downloads of multimedia framework products, go to **www.ti.com/mfp**

TI's multimedia framework products include the xDAIS and xDM algorithm standards and the Codec Engine algorithm execution framework.

eXpressDSP Algorithm Interoperabilty Standard (xDAIS)

xDAIS and the eXpressDSP Digital Multimedia (xDM) standards leverage the ability of DSPs to perform a wide range of multimedia functions on a single device. xDAIS accelerates "time-to-revenue" by eliminating integration problems caused by algorithms having hard-coded access to system resources that must be shared with other algorithms. xDAIS forces an algorithm to let the application framework decide which resources to allocate.

xDM specifies a standard API for the application to call a particular algorithm class, enabling an integrator to quickly change to an algorithm from a different source if different functionality or performance is required. The xDM standard defines APIs for several classes of codecs, including video decode/encode and audio encode/decode.

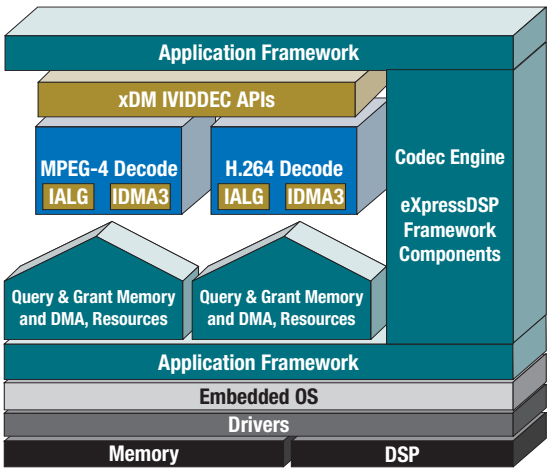
eXpressDSP Framework Components

For developers who wish to develop eXpressDSP-compliant frameworks, TI provides low-level components (DSKT, DMAN3) that enable a framework to query xDAIS-compliant algorithms for their memory and DMA resources and then allocate them.

Codec Engine

Codec Engine is an algorithm execution framework that automates the invocation and instantiation of eXpressDSP-compliant algorithms. Codec Engine can execute in ARM®-only, ARM+DSP or DSP-only environments and supports concurrent execution of multiple channels and algorithms. Codec Engine is designed to be used in conjunction with higher layer frameworks or middleware that provide A/V synchronization, I/O and network services while calling Codec Engine for algorithm-processing operations. This approach enables system providers to easily differentiate their applications. Codec Engine is currently available for Linux and Windows® CE on ARM-based devices and for DSP/BIOS™ kernel on DSPs.

An important feature of Codec Engine is the consistent APIs that it provides across TI SoC and DSP devices, enabling scalable development for multiple TI devices and easier migration to new TI architectures.



Use of xDAIS and xDM APIs enable easy integration of multiple algorithms into an application.

eXpressDSP™ Digital Media Software

Digital Media Software Portfolio

Encoders, Decoders, Codecs and Libraries

Get more information about eXpressDSP Digital Media Software at: **www.ti.com/digitalmediasoftware**

eXpressDSP Digital Media Software is a set of production-tested encoders, decoders, codecs and libraries that address the most common media processing functions required by embedded product OEMs.

Features and Benefits

- High-quality encoding
  - Tested against PC-based reference encoders to within 0.5 dB PSNR at typical bit rates
- Robust, error resilient decoding
  - Tested with ITU standard test streams and error streams
- Application-specific libraries
  - Video Analytics for security applications
  - Graphics for 2D and 3D video on DaVinci™ technology
- All TI Digital Media Software is compliant to the xDM API and integrated with the DaVinci software infrastructure

Request your free evaluation of TI digital media software at **www.ti.com/digitalmediasoftware** under "Contact Me."

eXpressDSP Digital Media Software is production tested and optimized for TI DSP and SoC platforms. Instead of investing time and effort in standardized media encoders, decoders and libraries, OEMs are able to save years of development time and can focus development efforts on differentiating product features. eXpressDSP Digital Media Software is available for free evaluation on TI EVMs, and numerous flexible production licensing options exist to fit any development need.

Visit **www.ti.com/digitalmediasoftware** to:

- Evaluate digital media software on your TI DVEVM or DVDP board at no charge for 60 days (requires a simple click-wrap license)
- Learn more about flexible production licensing that allows for a range of pricing options based on project quantity
- View published suggested resale pricing options.

Unlike example software or freeware, digital media software components all follow stringent coding guidelines. Each module includes a re-targetable production library featuring reentrant code. Each module is fully documented with a data sheet, release notes, user guide and usage examples. All digital media software is unit tested and system tested with thousands of test vectors in world-class testing labs. The encoders and decoders are hardened with a wide range of test vectors from end equipments and applications in which TI digital media software is deployed: wireless handsets, wireless networking equipment, video/IP phones, streaming media appliances, set-top boxes and video infrastructure to name just a few.

Broad eXpressDSP Digital Media Software Portfolio

e = encode, d = decode, BP = Baseline profile, SP = Simple profile, MP = Main profile, ASP = Advance simple profile, LC = Low complexity, HE = High efficiency, DN = Available now from Developer Network, ✔ = Available now, [blank] = Not planned

TI DM Software	TMS320DM644x	TMS320DM643x	TMS320DM647/8	TMS320DM355	TMS320DM6467
Video / Imaging DSP, Accelerator Codecs					
MPEG-2 MP d	✔	✔			
MPEG-2 MP e	✔				1Q08
MPEG-4 SP e/d	✔	✔	✔	✔	2Q08
MPEG-4 ASP e/d	✔				2Q08
H.263 e/d	✔	✔	✔	✔	
H.264 BP e/d	✔	✔	✔		1Q08[3]
H.264 MP d	✔	✔			1Q08[3]
VC1 / WMV9 MP d	✔	✔			Future
WMV9 MP / VC1 e	✔[1]	1H08			1Q08
DivX d	✔[2]	DN			Future
JPEG e/d	✔	✔		✔	Future
On2 VP6/7	DN	DN			DN
Sorrenson Sparc 3	DN	DN			DN
AVS	DN	DN			DN
SVC	DN				DN
Flash Lite Player	DN				Future

Voice / Speech DSP Codecs

The following wireline voice codecs are available for DM664, DM643x, DM647/8, DM6467 and TMS320C64x+™ processors: G.711, G.726 x[4], G.723.1 x[4], G.729AB x[4]

The following audio DSP codecs are available for DM664, DM643x, DM647/8, DM6467 and C64x+ processors: MP3 e/d, WMA9 d x, WMA8 e x, AAC LC e/d x, HE-AAC e/d x, MPEG-1 L2 e/d, AC-3 d, DTS d, MLP d

Notes: 1 – WMV9 encode only. 2 – Pending license agreement. 3 – H.264 HP decoder, also supports MP
4 – Available as combination codec server bundle only, not available as individual components

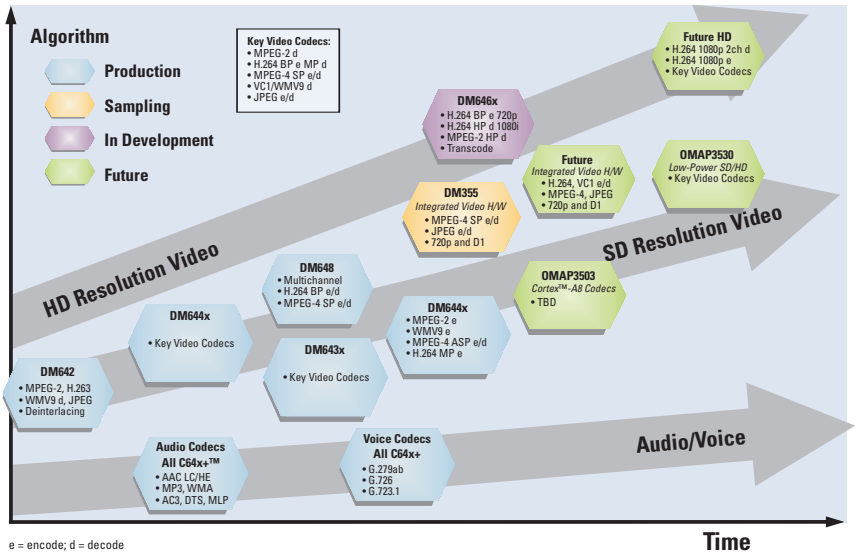
eXpressDSP™ Digital Media Software

Authorized Software Providers Support TI Digital Media Software

The TI Digital Media Software portfolio is a collection of optimized encoders, decoders, codecs and libraries licensed by TI and by TI Authorized Software Providers (ASPs) to customers worldwide. Each software component was developed by TI or by TI Developer Network members in compliance with the xDAIS eXpressDSP algorithm interface standard and xDM extension for digital media, and each component is packaged for easy integration with DaVinci™ and eXpressDSP software framework building blocks. The entire portfolio is available with support from highly qualified, trained ASPs, who can also offer additional software IP products or custom engineering services to enable rapid time to market for TI customers.

Authorized Software Providers by Region

	Region						
ASP	Americas	Europe	China	Japan	Korea	India	Asia – Other
ATEME	✔	✔	✔	✔	✔		✔
eInfochips	✔	✔				✔	
eSOL				✔			
Ingenient	✔	✔	✔	✔	✔		✔
Ittiam	✔	✔	✔	✔	✔	✔	✔
LogicPD	✔						
MPC Data		✔					
SEED Electronic Tech.			✔				
TES Electronic Solutions	✔	✔					
Wintech Digital			✔			✔	✔



TI Digital Media Software plugs directly into the DaVinci and OMAP™ software architecturea.

To request a free software evaluation, sign up for updates or ask questions, go to "Contact Me" at **www.ti.com/digitalmediasoftware**

Customers have several entry points to designing with TI SoC and DSP processors, ranging from high-level frameworks and applications to low-level functions. The concept of multiple development entry points is also incorporated in eXpressDSP Digital Media Software, which enables a low-level entry point at the codec API layer and also allows higher-level entry points through Codec Engine and application software built on it. Because all TI digital media software components have been tested and integrated with Codec Engine and the full DaVinci software infrastructure, mid-level entry points are fully enabled. Even higher-level entry points are possible via applications and operating systems built on the DaVinci software foundation; some examples include Windows® CE with the DirectShow media framework and GStreamer for Linux.

Getting Started

Integrated Development Environment, Codecs, Training and Kits

Code Composer Studio™ Integrated Development Environment Free Evaluation Tools

- Supports TMS320C2000™, TMS320C5000™, TMS320C6000™, OMAP™ and DaVinci™ processors
- 120-day full-featured trial
- On-line tutorials and multimedia feature demos show off key capabilities
- Order CD-ROM on-line or download at **www.ti.com/freetools**

Evaluation Codecs

- High-quality, production tested encoders, decoders, codecs and other digital media software modules and algorithms
- Free supported 60-day software evaluation
- More information on digital media software, including a complete inventory, can be found at **www.ti.com/digitalmediasoftware**

Training

- Workshops
- On-line training
- View on-line at **www.ti.com/training**

TI and members of the TI DSP Developer Network offer a wide range of hardware and software getting started kits and production-ready solutions to jump start new designs. These bundled solutions are an excellent way to evaluate TI processors, digital media codecs and test drive the eXpressDSP tools offering to begin application development. Many production-ready bundles include full software licenses, production-ready software and standalone emulators to take an application into production. A wide selection of daughter cards is also available to add capability and new hardware features. Reference designs provide developers with hardware and software ready for rapid product implementation and deployment, for fully system tested end equipment applications.

DSP Starter Kits

Starting at just U.S. $395, Digital Signal Processing Starter Kits (DSKs) and eZdsp™ Starter Kits are a low-cost entry-level means of evaluating TI processor platforms and eXpressDSP development tools. TI, partnered with Spectrum Digital Inc., offers a variety of processor selections in each platform to let developers test algorithms, benchmark code and write simple programs to prove out designs and evaluate the processor architecture. The DSKs are bundled with a special Code Composer Studio (CCStudio) IDE that runs exclusively through the embedded emulation on the target board, so that developers can explore the rich feature set that CCStudio IDE has to offer. Nearly a dozen DSKs are available today for the TMS320C2000, TMS320C5000 and TMS320C6000 processor platforms.

DaVinci Development Tools/Kits

Comprehensive ARM®/DSP system-level tooling helps developers jump start development of any digital video application. The DaVinci kits are designed to simplify development of digital video applications such as video phones, automotive infotainment, digital still cameras, streaming media, IP set-top boxes, video security systems and digital video products that have yet to be invented.

- **Digital Video Development Platform (DVDP)** includes both hardware and software to enable immediate evaluation of DaVinci DSP-based processors. Available today for both the TMS320DM648 and TMS320DM6437 digital media processors, the DVDP provides developers with a comprehensive platform that can be used throughout the entire design process.
- **Digital Video Evaluation Module (DVEVM),** comprised of both hardware and software, enables developers to start instantaneous evaluation of DaVinci ARM9-based processors and begin building digital video applications. Available today on TMS320DM6446, TMS320DM355 and TMS320DM6467 digital media processors.
- **Digital Video Software Production Bundle (DVSPB),** recommended for Linux developers going into production with DaVinci ARM9-based processors, is a software development bundle designed to tune complex DaVinci-based digital video systems quickly and efficiently. The DVSPB combines MontaVista's proven Linux OS and system-tested Linux board support package with the eXpressDSP™ Linux-based Digital Video Software Development Kit (DVSDK) providing developers with improved software integration and system visibility. The DVSPB includes a one-year subscription to the MVZone and MontaVista's Dev Rocket IDE. DSP developers may wish to take advantage of the DVSPB product bundled with TI's eXpressDSP Code Composer Studio IDE and Spectrum Digital's XDS560R JTAG emulator.

eXpressDSP™ Software and Development Tools

Whether you are just starting a project and need to determine which processor best suits your application or beginning product design, TI's Starter Kits, Evaluation Modules and Development Platforms offer developers bundled solutions designed to simplify and accelerate the application design process from concept through production.

DaVinci™ Development Tools and Software

Evaluation, Development and Production Kits

Get more information on DaVinci development tools and software at: **www.ti.com/davincitools**

TI offers a wide range of development tools specifically for aiding DaVinci technology-based design. For a complete list, visit **www.ti.com/davincitools**.

	DaVinci ARM® and ARM+DSP Tools					DaVinci DSP	
	Evaluation and Development			Production		Evaluation, Development and Production	
	DM6446	DM355	DM6467			DM6437	DM648
	DVEVM	DVEVM	DVEVM	DVSPB-L	DVSPB-3L	DVDP	DVDP
	US $2,495	US $495	US $1,995	US $6,995	US $10,995	US $495	US $1,295
Hardware							
DaVinci target board	✔	✔	✔			✔	✔
Video camera/LCD	✔						
Power supply w/ US, EU and UK cables	✔	✔	✔			✔	✔
Connectivity cables	✔	✔	✔			✔	✔
Mass storage	40-GB HDD	2-GB NAND Flash	40-GB HDD				
IR remote control	✔	✔	✔				
XDS560R USB EMU					✔		
On-board EMU						✔	
Software							
Linux-based DVSDK	✔	✔	✔	✔	✔		
DSP/BIOS™ kernel-based DVSDK						✔	✔
MontaVista Linux Pro	Demo	Demo	Demo	License	License		
Third-party software demos and evals	GHS MULTI®					Virtual Logix	Ittiam
C64x+™ Linux code-generation tools	Eval	Eval	Eval	✔	✔	Eval	
Code Composer Studio™ IDE v3.3					License	H/W version	FET

OMAP™ Development Tools and Software

Evaluation, Development and Production Kits

Get more information on OMAP development tools and software at: **www.ti.com/omaptools**

OMAP ARM	OMAP3503 EVM
Evaluation and Development	US $1,495
Hardware	
OMAP target board	✔
Power supply with US, EU, and UK cables	✔
Connectivity cables	✔
Memory	64-MB mobile DDR SDRAM 128-MB NAND Flash
Display w ith touch screen	✔
Software	
TI platform support (SDK)	✔
Linux BSP (kernel 2.6.22)	✔
Third-party software demonstrations and evaluations	Sourcery G++™ evaluation tools from CodeSourcery™

DSP Development Tools

Evaluation and Development Kits

Get more information on DSP development tools and software at:
www.ti.com/dspdevkits

DSP Starter Kits

Part Number	Description
TMDSDSK6713	TMS320C6713 DSP Starter Kit (DSK)
TMDSDSK6416-T	TMS320C6416 DSP Starter Kit (DSK)
TMDSDSK6455	TMS320C6455 DSP Starter Kit (DSK)
TMDSDSK5416	TMS320C54x™ DSP Starter Kit (DSK)
TMDSDSK5510	TMS320C55x™ DSP Starter Kit (DSK)
TMDSDSK5509	TMS320C5509 DSP Starter Kit (DSK)
TMDXEZ28044	TMS320F28044 eZdsp™ Starter Kit
TMDSEZD2407	TMS320LF2407A eZdsp Starter Kit
TMDSEZD2812	TMS320F2812 eZdsp Starter Kit
TMDSEZS2812	F2812 eZdsp Starter Kit (Socketed)
TMDSEZS2808	F2808 eZdsp Starter Kit (Socketed)
TMDXEZ28335	TMS320F28335 eZdsp Starter Kit

Digital Signal Processing Development Tools Feature Matrix

TI Part Number	Tool Description	Annual Subscription	Code Composer Studio IDE	DSP/BIOS™ Real-Time Operating System/Kernel Services	TMS320™ DSP Algorithm Standard Developer's Kit	Code-Generation Tools C/C++ Compiler/Assembler/Linker	Target Board (Hardware)	Standalone Emulator	Linux DVSDK	DSP/BIOS DVSDK	Price $ U.S. [1]
TMDSCCSALL-1	Code Composer Studio™ (CCStudio) IDE Development Tools Platinum Edition	X	X	X	X	X					3,595
TMDSCCS2000-1	C2000 Code Composer Studio IDE Development Tools[2]	X	X[2]	X[2]	X	X[2]					495
SPRC119	Code Composer Studio IDE Free Evaluation Tools		L	L	X	L					Free
TMDXEVM3503	OMAP35x Evaluation Module (EVM)						X				1,495
TMDXEVM355	DM355 Digital Video Evaluation Module (DVEVM)						X		X		495
TMDSEVM6446	DM644x Digital Video Evaluation Module (DVEVM)						X		X		2,495
TMDXEVM6467	DM6467 Digital Video Evaluation Module (DVEVM)						X		X		1,995
TMDXVDP6437	DM6437 Digital Video Development Platform (DVDP)		X[3]	X[3]	X	X[3]	X			X	495
TMDXDVP648	DM648 Digital Video Development Platform (DVDP)		L	L	X	L	X			X	1,295
TMDSDVSPBA9-L	MontaVista Pro Digital Video Software Production Bundle (DVSDP)	X[4]							X		6,995
TMDSDVSPBA9-3L	MontaVista Pro Digital Video Software Production Bundle w/ CCStudio+EMU	X[4]	X	X	X	X		X	X		10,995
TMDXEVM6424	C6424 Evaluation Module		X[3]	X[3]	X	X[3]	X				495
TMDXEVM6452	C6452 Evaluation Module						X				1,295
TMDSDSK6713	C6713 DSP Starter Kit (DSK)[5]		X[3]	X[3]	X	X[3]	X				395
TMDSDSK6416-T	C6416 DSP Starter Kit (DSK)[5]		X[3]	X[3]	X	X[3]	X				495
TMDSDSK6455	C6455 DSP Starter Kit (DSK)		X[3]	X[3]	X	X[3]	X				595
TMDXEVM6455	C6455 Evaluation Module w/ SRIO[5]		X[3]	X[3]	X	X[3]	X				1,795
TMDXEVM642	DM642 Evaluation Module						X				1,995
TMDSDMK642	DM642 Digital Media Development Kit	X	X	X	X	X	X	X			6,495
TMDXVSK642	Video Security Over Internet Protocol (VSIP) Development Platform[5]	X	X	X	X	X	X	X			15,000
TMDXVSK642-3	Video Security Over IP (VSIP) with ATEME Emulator (NTSC)[5]	X	X	X	X	X	X	X			16,000
TMDSPDK6727	Pro Audio Development Kit (PADK)						X				1,995
TMDSPDB6727	Pro Audio Development Kit (PADK) Bundle	X	X	X	X	X	X	X			5,995
TMDSDSK5416	C54x™ DSP Starter Kit (DSK)[5]		X[3]	X[3]	X	X[3]	X				395
TMDSDSK5510	C55x™ DSP Starter Kit (DSK)[5]		X[3]	X[3]	X	X[3]	X				395
TMDSDSK5509	C5509 DSP Starter Kit (DSK)[5]		X[3]	X[3]	X	X[3]	X				495
TMDXEZ28335	F28335 eZdsp™ Starter Kit		X[3]	X		X	X				495
TMDS3P701016A	LF2407A Evaluation Module (EVM)[5]		X			X	X	X			1,995
TMDXEZ28044	F28044 eZdsp Starter Kit		X[3]			X	X				495
TMDSEZD2407	LF2407A eZdsp Starter Kit[5]		X[3]			X	X				345
TMDSEZD2812	F2812 eZdsp Starter Kit[5]		X[3]	X		X	X				395
TMDSEZS2812	F2812 eZdsp Starter Kit (Socketed)[5]		X[3]	X		X	X				495
TMDSEZS2808	F2808 eZdsp Starter Kit (Socketed)		X[3]	X		X	X				495
TMDSEVP2812	F2812 Development Bundle (Parallel Port)		X	X		X	X	X			1,995
TMDSEVU2812	F2812 Development Bundle (USB)		X	X		X	X	X			2,295
TMDSEMU560PCI	XDS560™ Blackhawk PCI-Bus High-Performance JTAG Emulator							X			2,995
TMDSEMU560U	XDS560 Blackhawk USB High-Performance Emulator							X			2,999
TMDSEMU560T	XDS560 USB Trace Emulator							X			9,995
TMDSEMUPP	XDS510PP-Plus Spectrum Digital (Parallel Port) Emulator[5]							X			1,095
TMDSEMUUSB	XDS510™ Spectrum Digital USB-Based Emulator for Windows							X			1,495

[1] Prices are quoted in U.S. dollars and represent year 2008 suggested resale pricing. All prices are subject to change. Customers are advised to obtain the most current and complete pricing information from TI prior to placing orders. TI may verify final pricing prior to accepting any order.

[2] C2000 target support only. DSP/BIOS kernel and C++ compiler are supported on C28x platform only.

[3] Code Composer Studio IDE is limited to use with the target hardware board ONLY.

[4] MontaVista Pro license

[5] Orderable part number will vary to specify European power cords

X = included L = Full featured – Limited to 120 days

TI Developer Network

A Wide Variety of DSP Solutions

Utilize the TI Developer Network for:

- **Complete solutions** – Developer Network members offer complete solutions for quickly solving application problems. Many solutions incorporate TI's data converters and power management devices.
- **Reduced time to market** – Time-consuming programming and troubleshooting tasks can be eliminated by utilizing proven hardware, software, algorithms and libraries from Developer Network members.
- **Lower costs** – Don't spend time and money recreating something that has already been produced. Developer Network members enable you to dedicate your resources to producing value-added, application-specific products.
- **Additional expertise** – Developer Network members provide consulting services, training, integration, contract engineering, research and development and much more. They are an extra resource for project assistance.

eXpressDSP™-Compliant Products

Texas Instruments, in conjunction with its industry-leading DSP Developer Network, offers an array of eXpressDSP-compliant algorithms designed to reduce system integration time and lower support and development costs by eliminating custom coding tasks. Third parties also provide eXpressDSP-compliant plug-in tools to reduce development time.

TI Developer Network Overview

More than 200 independent Developer Network members provide a vital link between TI silicon and the final application by providing additional hardware, algorithms and libraries, software tools and consulting services. Products/services include:

- **End-Equipment Solutions** – Production-ready, DSP application-specific resources and collateral bundles, inclusive of block diagrams, application notes, tools, software and other full end-equipment solution-related information
- **Embedded Software** – Production-tested, application-targeted software components for popular industry standards, optimized at the processor-specific level
- **Engineering Services** – DSP generation-specific hardware and software design, manufacturing and consulting services, ranging from board level to full-turnkey support
- **Development Tools** – DSP generation-specific physical development and evaluation boards and kits, application-targeted companion chips and cards, and other development resources such as emulation tools, reference designs and user guides

Get additional information and search for Developer Network products and services at: **www.ti.com/dncatalog**

Developer Network Product Catalog on TI's Website

For information regarding the vast array of products available from TI's Developer Network, check out: **www.ti.com/dncatalog**. Extensive information can be found through searchable listings of members located worldwide. Search hundreds of listings by company, device supported, keyword, product name or product category.

Developer Network Logo Indicates TMS320™ Processor-Based Solution

Registered TI DSP Developer Network members use a distinctive Developer Network logo on various printed and electronic collateral. Look for the logo to identify companies that are ready to provide a TMS320 processor-based solution.

Texas Instruments
DSP Developer Network

Embedded Software

- Operating systems
- Codecs and algorithms
- Application-specific libraries
- Framework software
- Drivers
- Signal-processing libraries

Engineering Services

- Digital hardware/board design
- Software design services
- Full turnkey design services
- Analog/RF/Power designs
- Manufacturing
- Consulting

Development Tools

- Compilers, assemblers, linkers
- Evaluation modules and development boards
- Debuggers
- Emulators/Analyzers
- Daughter cards
- Free evaluation tools

End-Equipment Solutions

- Video and imaging
- Communications and telecom
- Security
- Wireless

Solutions to reduce development time.

TI Worldwide Technical Support

Internet

TI Semiconductor Product Information Center Home Page
support.ti.com

TI Semiconductor KnowledgeBase Home Page
support.ti.com/sc/knowledgebase

Product Information Centers

Americas

Phone	+1(972) 644-5580
Fax	+1(972) 927-6377
Internet/Email	support.ti.com/sc/pic/americas.htm

Europe, Middle East, and Africa

Phone

European Free Call	00800-ASK-TEXAS (00800 275 83927)
International	+49 (0) 8161 80 2121
Russian Support	+7 (4) 95 98 10 701

Note: The European Free Call (Toll Free) number is not active in all countries. If you have technical difficulty calling the free call number, please use the international number above.

Fax	+(49) (0) 8161 80 2045
Internet	support.ti.com/sc/pic/euro.htm

Japan

Fax	International	+81-3-3344-5317
	Domestic	0120-81-0036
Internet/Email	International	support.ti.com/sc/pic/japan.htm
	Domestic	www.tij.co.jp/pic

The platform bar, Code Composer Studio, DaVinci, DSP/BIOS, eXpressDSP, OMAP, RTDX, C54x, C55x, C64x+, TMS320, TMS320C2000, TMS320C5000, TMS320C6000, TMS320C54x, TMS320C55x, TMS320C64x+, XDS510 and XDS560 are trademarks of Texas Instruments. All other trademarks are the property of their respective owners.

Asia

Phone

International	+91-80-41381665
Domestic	Toll-Free Number
Australia	1-800-999-084
China	800-820-8682
Hong Kong	800-96-5941
India	1-800-425-7888
Indonesia	001-803-8861-1006
Korea	080-551-2804
Malaysia	1-800-80-3973
New Zealand	0800-446-934
Philippines	1-800-765-7404
Singapore	800-886-1028
Taiwan	0800-006800
Thailand	001-800-886-0010

Fax	+886-2-2378-6808
Email	tiasia@ti.com or ti-china@ti.com
Internet	support.ti.com/sc/pic/asia.htm

Important Notice: The products and services of Texas Instruments Incorporated and its subsidiaries described herein are sold subject to TI's standard terms and conditions of sale. Customers are advised to obtain the most current and complete information about TI products and services before placing orders. TI assumes no liability for applications assistance, customer's applications or product designs, software performance, or infringement of patents. The publication of information regarding any other company's products or services does not constitute TI's approval, warranty or endorsement thereof.

A010208

© 2008 Texas Instruments Incorporated
Printed in U.S.A. by Digi-Color, Houston, TX

TEXAS INSTRUMENTS