

# DSP Selection Guide

2007

## TI DSP Products: Making Innovation Possible





## Table of Contents

### Introduction to TI DSPs

Getting Started with TI DSPs ..... 1

### System Solutions

Audio ..... 2  
 Biometrics ..... 5  
 Industrial ..... 7  
 Telecom ..... 14  
 Video and Imaging/Digital Video, Including DaVinci™ Information ..... 18

### TMS320™ DSP Family

Overview ..... 38

### TMS320C2000™ Controller Platform

TMS320C28x™ Controller Generation ..... 39  
 TMS320C24x™ Controller Generation ..... 41  
 Power Management Products for the C2000™ Controller Platform ..... 45

### TMS320C5000™ DSP Platform

TMS320C55x™ DSP Generation ..... 46  
 TMS320C54x™ DSP Generation ..... 48  
 OMAP™ Processors ..... 51  
 Power Management Products for the C5000™ DSP Platform ..... 54

### TMS320C6000™ DSP Platform

TMS320C64x™ DSP Generation ..... 55  
 DaVinci Digital Media Processors ..... 57  
 TMS320C645x DSP Generation ..... 60  
 TMS320C62x™/TMS320C67x™ DSP Generations ..... 62  
 Power Management Products for the C6000™ DSP Platform ..... 65

### Complementary Products for the TMS320 DSP Family

Linear and Logic Products ..... 66  
 ADCs, DACs, Codecs and Special Functions ..... 69  
 TMS470 Microcontrollers ..... 73  
 MSP430 Microcontrollers ..... 76  
 Interface Products ..... 77

### Software and Development Tools

eXpressDSP™ Software and Development Tools ..... 81  
 Code Composer Studio™ Development Tools for eXpressDSP Software ..... 82  
 DSP/BIOS™ Kernel for eXpressDSP Software ..... 85  
 TMS320 DSP Algorithm Standard for eXpressDSP Software ..... 86  
 Digital Media Software ..... 89  
 XDS560™ PCI-Bus Emulator ..... 91  
 Code Composer Studio IDE Features Supported by Processor Platform Matrix ..... 92  
 DSP Development Tools Feature Matrix ..... 93  
 TI DSP Third Party Network ..... 94  
 TI DSP Third Party Network Consultants ..... 95

### DSP Support Resources

TI DSP Support ..... 97  
 Training Resources ..... 99  
 TI DSP Device Nomenclature ..... 101

## TI Worldwide Technical Support

### Internet

**TI Semiconductor Product Information Center Home Page**  
[support.ti.com](http://support.ti.com)

**TI Semiconductor KnowledgeBase Home Page**  
[support.ti.com/sc/knowledgebase](http://support.ti.com/sc/knowledgebase)

### Product Information Centers

#### Americas

Phone	+1(972) 644-5580	Fax	+1(972) 927-6377
Internet/Email	<a href="http://support.ti.com/sc/pic/americas.htm">support.ti.com/sc/pic/americas.htm</a>		

#### Europe, Middle East, and Africa

Phone			
Belgium (English)	+32 (0) 27 45 54 32	Netherlands (English)	+31 (0) 546 87 95 45
Finland (English)	+358 (0) 9 25173948	Russia	+7 (4) 95 98 10 701
France	+33 (0) 1 30 70 11 64	Spain	+34 902 35 40 28
Germany	+49 (0) 8161 80 33 11	Sweden (English)	+46 (0) 8587 555 22
Israel (English)	180 949 0107	United Kingdom	+44 (0) 1604 66 33 99
Italy	800 79 11 37		
Fax	+49 (0) 8161 80 2045		
Internet	<a href="http://support.ti.com/sc/pic/euro.htm">support.ti.com/sc/pic/euro.htm</a>		

#### Japan

Fax			
International	+81-3-3344-5317	Domestic	0120-81-0036
Internet/Email	<a href="http://support.ti.com/sc/pic/japan.htm">support.ti.com/sc/pic/japan.htm</a>		
Domestic	<a href="http://www.tij.co.jp/pic">www.tij.co.jp/pic</a>		

#### Asia

Phone			
International	+886-2-23786800		
Domestic	Toll-Free Number		Toll-Free Number
Australia	1-800-999-084	Malaysia	1-800-80-3973
China	800-820-8682	New Zealand	0800-446-934
Hong Kong	800-96-5941	Philippines	1-800-765-7404
India	+91-80-41381665 (Toll)	Singapore	800-886-1028
Indonesia	001-803-8861-1006	Taiwan	0800-006800
Korea	080-551-2804	Thailand	001-800-886-0010
Fax	+886-2-2378-6808	Email	<a href="mailto:tiasia@ti.com">tiasia@ti.com</a>
Internet	<a href="http://support.ti.com/sc/pic/asia.htm">support.ti.com/sc/pic/asia.htm</a>		

**C010307**

**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.

**Safe Harbor Statement:** This publication may contain forward-looking statements that involve a number of risks and uncertainties. These "forward-looking statements" are intended to qualify for the safe harbor from liability established by the Private Securities Litigation Reform Act of 1995. These forward-looking statements generally can be identified by phrases such as TI or its management "believes," "expects," "anticipates," "foresees," "forecasts," "estimates" or other words or phrases of similar import. Similarly, such statements herein that describe the company's products, business strategy, outlook, objectives, plans, intentions or goals also are forward-looking statements. All such forward-looking statements are subject to certain risks and uncertainties that could cause actual results to differ materially from those in forward-looking statements. Please refer to TI's most recent Form 10-K for more information on the risks and uncertainties that could materially affect future results of operations. We disclaim any intention or obligation to update any forward-looking statements as a result of developments occurring after the date of this publication.

**Trademarks in this issue:** The black/red banner, Technology for Innovators, C2000, TMS320C2000, TMS320C24x, TMS320C28x, C24x, C28x, C5000, TMS320C5000, TMS320C54x, TMS320C55x, C54x, C55x, DaVinci, C6000, TMS320C6000, TMS320C62x, TMS320C64x, TMS320C64x+, TMS320C67x, C62x, C64x, C64x+, C67x, TMS320DM64x, DM64x, TMS320C5x, Code Composer Studio, DSP/BIOS, eXpressDSP, MicroStar BGA, NanoFree, NanoStar, OMAP, ProbePoint, RTDX, TMS320, XDAIS, XDS510 and XDS560 are trademarks of Texas Instruments. All other trademarks are property of their respective owners.

© 2007 Texas Instruments Incorporated

Printed in U.S.A. by Southwest Precision Printers, Houston, TX



### Web-Based DSP Support Tool Available Now

Responding to the demand from engineers wanting to become more familiar with DSP, TI launched an easy-to-use, web-based tool that helps customers progress their designs from inspiration to implementation. TI's Getting Started with DSP website ([www.ti.com/gettingstarted](http://www.ti.com/gettingstarted)) provides an easy-to-access introduction on DSP to decrease the learning curve and accelerate products to market.

With the variety of applications utilizing digital signal processing, the number of first-time DSP designers needing guidance on getting started with DSP is expanding. TI's web-based support tool reduces complexity, and leaves engineers with a clear roadmap of actions and activities by answering the following primary questions:

- What is DSP?
- Is DSP right for you?
- Which TI DSP should I use?
- How do I get going?
- What else can help me?

The easily navigated site describes digital signal processing and offers extensive

training. In addition, the site discusses how signal processing tasks can be implemented on a DSP as well as when to use such a device.

Since personal electronic devices have power, performance and price demands that are perfectly suited to a certain type of DSP, the site also aids designers in determining which TI DSP platform is right for their applications. Providing customers a clear understanding of each option, it connects to information such as white papers and technical briefs.

Aside from being a tutorial on TI DSPs, the site also offers precise information on how to begin designing, what problems to look for as well as how to solve those problems. With resources available both on and off the Web, customers can minimize their design time and employ the industry knowledge of TI's in-house experts.

The support continues even once the design process commences. Texas Instruments developed the industry's most comprehensive support network that can be accessed using the new on-line tool. Building on the premise that



a supplier should facilitate the design process, the network encompasses training, technical information and access to experts. TI will be completely supportive throughout the entire DSP design process.

To assist you in getting started with DSP, TI offers the free "The Essential Guide to Getting Started with DSP" CD-ROM which includes a variety of resources to start your DSP design. To order your free CD, visit:

[www.ti.com/getstartedwithdsp](http://www.ti.com/getstartedwithdsp). Or, to start utilizing the Getting Started with DSP web-based tool, visit [www.ti.com/gettingstarted](http://www.ti.com/gettingstarted).

### Basic Steps to Starting Development

#### • Step One: Selecting a DSP Processor

If you are not sure which TI DSP platform will best suit your application, visit Which TI DSP is Right for Me? to assist you in your decision.

#### • Step Two: Evaluation of DSP Technology and Tools

The Evaluation stage includes learning how to use a DSP, evaluation of the DSP as a possible processor solution and evaluation of development tools. The following TI development tools are designed for the Evaluation stage:

- **Free Evaluation Tools** – A free 120-day trial period of Code Composer Studio™ IDE.
- **DSP Starter Kit (DSK)** – A DSP-based board with a special version of Code Composer Studio IDE restricted to use only with the DSK target board. The DSK is a low-cost, entry-level tool starting at U.S. \$295.

#### • Step Three: Initial Development

In the Initial Development stage, you have already decided which DSP to use, but beta boards have not been built. The tools to meet the needs of this stage include:

- **Code Composer Studio IDE** – Code Composer Studio (CCStudio) IDE includes all the software (including hardware drivers) needed for development through the production/support stage. CCStudio IDE pricing starts at U.S. \$495.
- **Evaluation Module (EVM) and Developer's Kits** – A wide variety of DSP boards and production-ready development kits are available from TI and TI's Third Party Network. Products include development boards or evaluation modules, and hardware/ software bundles designed to accelerate the application design process from concept through production. Kit pricing starts at U.S. \$1,495.

#### • Step Four: Product Development

In the Product Development stage, there is a need for full development capabilities –

including debugging of product hardware and software. Tools designed to meet those needs include:

#### Emulation Technology

- **Code Composer Studio IDE** – CCStudio IDE includes all the software (including hardware drivers) needed for development through the production/support stage. CCStudio IDE pricing starts at U.S. \$495.
- **Emulation** – The XDS510™ and XDS560™ emulators are used for JTAG emulation. In order to debug custom target boards, a 14-pin JTAG header needs to be included on the board and it connects to a PC via the JTAG emulation cable. XDS emulator pricing starts at U.S. \$1,500.

#### Third Party Network

As you progress in your development, you can speed your time-to-market by utilizing Texas Instruments Third Party Network. The Third Party Network offers the most extensive collection of Digital Signal Processing development support in the industry.



## Audio

### Audio System Solutions

Get additional information at: [www.ti.com/audio](http://www.ti.com/audio)

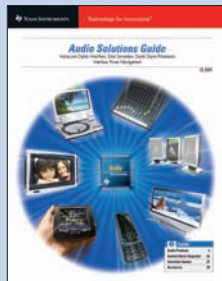
#### Targeted Applications

- Musical instruments
  - Instrument amplifiers
  - Multi-track recorders
  - Synthesizers
  - Guitar effects
- Professional audio
  - Digital mixers
  - Signal processors
  - Broadcast encoders
  - DSP farms
- Home audio
  - AV receivers
  - DVD receivers
  - Home audio jukeboxes
  - Networked audio players
- Portable audio devices
  - HDD-based MP3 players
  - Flash/CD-based MP3 players
  - Wireless audio headphones
- Digital radio

#### Additional Resources

##### Audio Solutions Guide

TI's complete audio solutions offer best-in-class silicon, software, application knowledge and support and include a variety of flexible, cost-efficient, high-performance analog and DSP products. Design resources like the Audio Solutions Guide provide



valuable technical information, including system block diagrams, detailed product specifications, design considerations and more, helping you get to market fast. Download the Audio Solutions Guide to see the complete spectrum of products that meet the demands of your audio signal chain.

[www.ti.com/audioguide](http://www.ti.com/audioguide)

#### Audio Systems Overview

Advances in digital audio technologies offer consumers the ability to enjoy their audio at anytime, anywhere and on any device. This new trend in audio is enabled by DSPs that offer this convenience without any sacrifice in quality. DSP technology is also at the forefront of another amazing trend in consumer audio products, the multichannel listening experience. Due to the rapid drop in price points, consumers are enjoying music, movies and television on high-quality, DSP-based 5.1 audio systems.

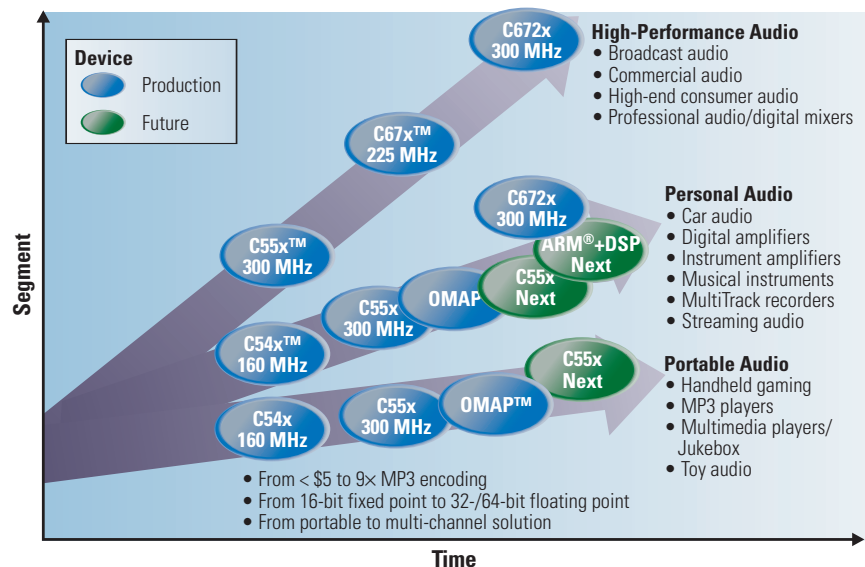
Just as the consumer audio market is benefiting from advances in audio technology, the professional and musical instrument markets are delivering new products that maintain the highest sonic quality at affordable price points. By leveraging DSP horsepower, these markets are giving musicians and sound engineers the ability to create the exact sounds they want.

In order to enable designers of digital audio products to leverage advanced

digital audio techniques, TI provides silicon, software, systems expertise and support focused solely on digital audio technologies. TI currently offers a host of products including DSPs, class-D amplifiers, A/Ds, D/As and SRCs that are designed from the ground up to deliver the most realistic audio experience possible at cost-effective price points. Since TI solutions are based on programmable platforms and flexible analog components, developers have maximum flexibility in designing products that meet the needs of the rapidly changing digital audio landscape.

#### TI Audio Systems Benefits

- Highest performance allows room for innovation with application-specific digital entertainment solutions
- Programmability and scalability provide open-audio platforms for better differentiation
- Compact form factor for cool product designs and great sound
- Easy-to-use, application-specific software and tools get you to market faster



Audio Solutions Roadmap



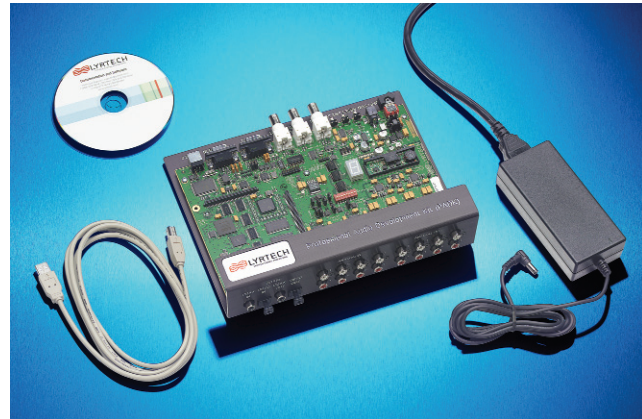
### Audio Integrated Solutions

**Professional Audio Development Kit (PADK)** – The PADK is a hardware/software solution based on the new TMS320C672x floating-point DSPs. The C672x DSPs are optimized for professional audio, musical instruments, broadcast audio and commercial audio applications.

The PADK integrates the TMS320C6727 DSP with Burr-Brown ADCs and DACs. This board also features a host of different I/O options and connectors. In addition to the hardware, the PADK includes real-world audio software example code to demonstrate C672x DSP performance and provide a good reference for developers to create customized applications. Further enhancing the utility board is a convenient expansion slot that can allow daughtercards to be used to evaluate other components not featured on the PADK.

The comprehensive PADK includes the hardware and software needed to quickly design differentiated pro-audio applications.

For more information, contact your authorized TI distributor or visit [www.ti.com/padk](http://www.ti.com/padk)



*PADK includes hardware, software and documentation to get started immediately.*



*PADK Bundle for pro-audio applications.*

**Professional Audio Development Kit Bundle (PADB)** – Based on the TMS320C672x floating-point DSPs, the new PADK bundle saves you time and money by combining the PADK with Code Composer Studio™ IDE Platinum and a USB Emulator. Instantly start your pro-audio application with the PADK bundle, which includes real-world pro-audio algorithms and software examples to demonstrate C672x DSP performance and exercise the core's special audio processing capabilities. Learn more at [www.ti.com/padkbundle](http://www.ti.com/padkbundle)

### Audio Application Notes

Application Note	Web Search Literature #
OMAP5910 Processor Audio System Design	SPRA970
Decoding Convolutional and Turbo Codes in 3G Wireless White Paper	SPRA878
MP3/AAC™ Player Implementation in RF3	SPRA779
Using the File Navigation API Function in an IACD System	SPRA834
Electronic Shock Protection (ESP) for CD Players That Use a C54x™ DSP	SPRA831
TMS320C6201/6701 EVM: TMS320C6000 McBSP to Multimedia Audio Codec	SPRA477
Meeting the Pro Audio Challenge White Paper	SPRAAA3
Using the TMS320C672x Bootloader	SPRAA69

Application Note	Web Search Literature #
TMS320C6000™ McBSP to Voice Band Audio Processor (VBAP) Interface	SPRA489
AIC27 Example for the TMS320C5510 DSP Prototype Board	SPRA813
Implementation of AC-3 Decoder on TMS320C62x DSPs	SPRA724
An Audio Example Using DSP/BIOS™ Kernel	SPRA598
Interfacing TLC320AD57 Sigma-Delta Stereo ADC (in Master Mode) with TMS320C5x™ DSP	SPRA090
TMS320C6713 to TMS320C672x Migration Guide	SPRAA78
How to Create Delay-Based Audio Effects on a TMS320C6727 DSP	SPRAAA5

Check the TI website for a complete listing of technical documentation including application notes.

### Audio eXpressDSP™-Compliant Third-Party Algorithms

AUDIO ALGORITHMS
Dolby Digital
G.711
G.722
G.723.1

AUDIO ALGORITHMS (CONT'D)
G.726
G.729AB
GSM-AMR
iECNR Algorithms

AUDIO ALGORITHMS (CONT'D)
MP3
SBC
WMA



## Audio

### Audio eXpressDSP™-Compliant Third Parties

#### Acoustic Technologies

Western USA

[www.acoustictech.com](http://www.acoustictech.com)



Acoustic Technologies creates high-quality full-duplex software solutions for leading telecom manufacturers worldwide. SoundClear® software provides natural bi-directional communication in mobile phones, VoIP telephones, hands-free car kits and other hands-free products.

#### Adamyia

India

[www.adamyia.com](http://www.adamyia.com)



Adamyia, based in Bangalore, India, focuses both on products and services. The company has a high level of expertise in several cutting-edge technologies including Bluetooth® wireless technology and offers innovative products for the wireless domain.

#### Audyssey Labs

Western USA

[www.audyssey.com](http://www.audyssey.com)



Audyssey Laboratories is revolutionizing the audio industry by significantly raising the bar on audio quality and immersion for consumers and professionals. From acoustical correction to multichannel surround sound, Audyssey has solutions that maximize the emotional impact of audio.

#### Dolby

Western USA

[www.dolby.com](http://www.dolby.com)



Dolby Laboratories has more than 40 years of innovation in surround sound entertainment for the cinema and home theater. From virtual to discrete coding, to high-resolution lossless, Dolby Laboratories has set the standard for excellence in audio entertainment.

#### Epigon

India

[www.epigon.co.in](http://www.epigon.co.in)



Epigon is a team of world-class professionals focused on cutting-edge research and development to create low-cost, high-quality solutions for the emerging multimedia market.

#### Fraunhofer IIS

Europe

[www.iis.fraunhofer.de](http://www.iis.fraunhofer.de)

Fraunhofer IIS engineers and scientists develop microelectronic systems and equipment along with the required integrated circuits and software for industries and public authorities worldwide.

#### Ingenient Technologies

Central USA

[www.ingenient.com](http://www.ingenient.com)



Ingenient Technologies offers a wide spectrum of embedded software plus hardware products and system solutions that enable the creation, delivery, management and presentation of rich multimedia content.

#### Lyrtech

Eastern USA

[www.lyrtech.com](http://www.lyrtech.com)



Lyrtech is a recognized player in the global digital signal processing (DSP) market, with 20 years of experience in the delivery of advanced technology solutions and sales in over 20 countries.

#### SRS Labs

Western USA

[www.srslabs.com](http://www.srslabs.com)



SRS Labs is a leading developer and licensor of audio and voice technologies to CE manufacturers worldwide for the improvement of sound quality in speaker or headphone-based audio-enabled products.

#### Vocally

Europe

[www.vocally.fr](http://www.vocally.fr)



Vocally develops innovative real-time software solutions for digital voice processing applications. The team has a strong background in digital signal processing built by more than a decade of practical experience, particularly in the digital communications arena.



## Biometrics System Solutions

Get additional information at: [www.ti.com/biometrics](http://www.ti.com/biometrics)

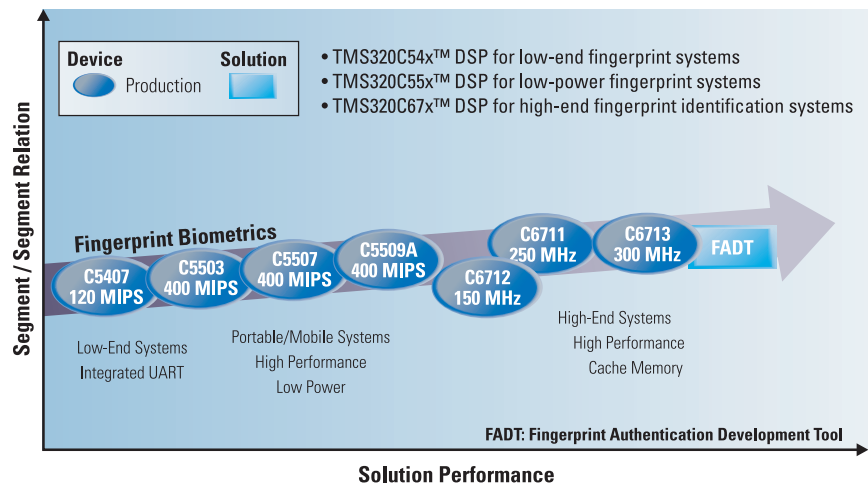
### Targeted Applications

- Physical access/door locks
- Time and attendance
- Computer access
- Point-of-sale (POS) terminals
- Automotive and home security
- Safety deposit boxes/safes
- Cash access machines/ATMs
- Mobile phones and PDAs

### Biometrics Systems Overview

The biometrics market is demanding intelligent security features in faster, smaller, lower-cost and convenient-to-use products. To provide the market with better security, more accuracy and speed, OEMs and security product manufacturers need to develop applications with the capability to handle intricate algorithms for processing image and video compression, image enhancement, normalization, feature extraction, matching and a host of others. A high-performing processor is

an absolute must to meet these demands, but that is not the only consideration. The growing security market needs the right mix of performance, low power consumption and system flexibility to develop the customized features for each product niche. TI offers a variety of DSPs that match these needs as well as software for many of the functions. TI's DSP performance and programmability allows you to move fast and secure your product's position in the market at the right price point.



### Biometrics Solutions Roadmap



## Biometrics

### Biometrics Integrated Solutions

**Fingerprint Authentication Development Tool (FADT)** – The FADT provides developers an easy-to-use, cost-effective way to evaluate and develop fingerprint authentication systems and products based on TI DSPs. The FADT consists of a daughtercard with all the software to get you started, plus the industry's first multi-platform, DSP-based expansion board that can combine with several of TI's DSP Starter Kits (DSKs). To enhance the range of easy-to-use, affordable fingerprint development tools, TI currently offers four different FADT products. Each FADT supports the different fingerprint sensors, Fingerprint Cards FPC1010 and FPC1031 sensors, AuthenTec sensor, Atmel FingerChip™ sensor, and has associated software and drivers.

The FADT is an ideal development tool for both entry-level and experienced designers, and its flexibility allows designers to choose from a range of integrated solutions. Developers also have access to TI's robust suite of eXpressDSP™ Software and Development Tools. This flexible and complete development environment for fingerprint authentication enables developers to quickly and inexpensively evaluate and develop systems and products based on TI DSPs, resulting in highly accurate products.

For more information, contact your authorized TI distributor or visit [www.ti.com/fadt](http://www.ti.com/fadt)



Fingerprint Authentication Development Tools

### Biometrics Application Notes

Application Note	Web Search Literature #
DSP for Smart Biometric Solutions – White Paper	SPRA894
Performance Analysis of Face Recognition Algorithms on TMS320C64x™ DSPs	SPRA874
Wavelet Transforms in the TMS320C55x™ DSP	SPRA800

Application Note	Web Search Literature #
A DSP Kernel for On-Line Dynamic Handwritten Signature Verification Using TMS320™ DSPs	SPRA304
Speaker Independent Speech Recognition on the TMS320C2x and TMS320C5x™ DSPs	SPRA100

Check the TI website for a complete listing of technical documentation including application notes.

### Biometrics eXpressDSP-Compliant Third-Party Algorithms

#### BIOMETRIC ALGORITHMS

Biometrics Image Processing  
Fingerprint 1 to 1  
Fingerprint Recognition Pre  
Fingerprint Recognition Engine

#### ENCRYPTION ALGORITHMS

3-DES  
AES  
Assembly

#### ENCRYPTION ALGORITHMS (CONT'D)

Audio Watermark Det. SDMI Screen  
DES  
DES CBC Mode  
Diffie-Hellman  
ELGAMAL  
HMAC  
HMAC-MD5  
HMAC-SHA-1  
IDEA Decryption

#### ENCRYPTION ALGORITHMS (CONT'D)

IDEA Encryption  
Kasumi Encryption  
MD5  
MD5-V2.0  
MMH-MAC  
NTRU Mobile Security  
RSA  
RSA1024  
SHA-1

### Biometrics eXpressDSP™-Compliant Third Party

#### Shimon Systems

Western USA

[www.shimonsystems.com/](http://www.shimonsystems.com/)



Shimon Systems provides complete biometric end-to-end solutions for various markets needing more secure authentication. Shimon Systems offers a fingerprint-

based access control device for WiFi LANs, a biometric authentication server and other innovative biometric solutions.





## Digital Control System Solutions

Get additional information at: [www.ti.com/digitalcontrol](http://www.ti.com/digitalcontrol)

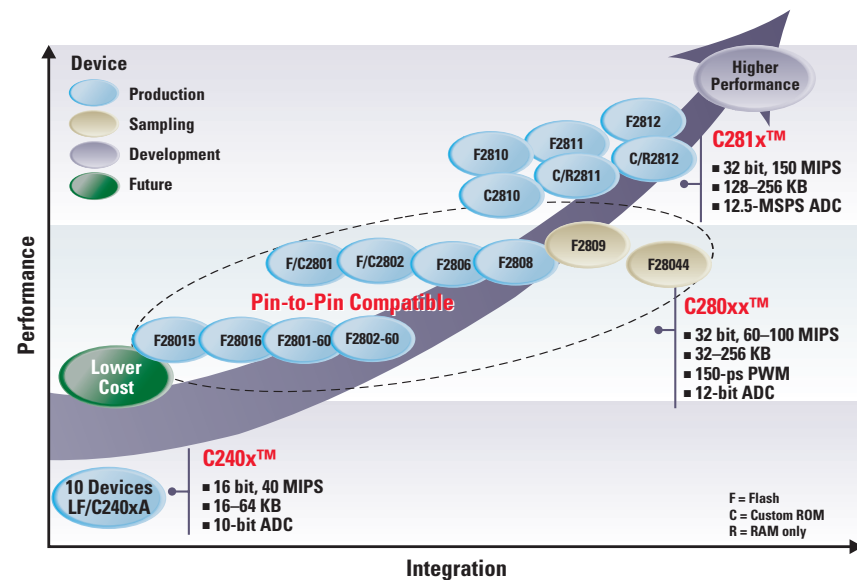
### Targeted Applications

- Industrial
  - Automation – Drives
  - Flow meters – TEC controllers
  - Water quality testing
  - Electricity metering
  - Light / Color sensors
  - Capacitive / Piezoresistive sensors
  - Power line modem
- Digital power conversion
  - Rectifiers – Inverters
  - Converters – Ballast control
- Automotive
  - Electronic power steering
  - Integrated starter alternators
  - Brushless fuel pumps
  - Brake line pressure control
  - Engine knock detect and noise reduction
  - Engine valve and spark control
  - Short distance radar
  - Wiper control
  - Fuel sensors
  - Torque / Inertial sensors
- Appliances / White goods
  - Compressor motors
  - Drive motors
  - Induction cooking
- Medical
  - Muscle stimulators
  - Blood analysis
  - Oxygen sensors
- Consumer
  - RFID detection / deactivation
  - Bar code readers
  - Touch screen controllers
  - Audio feedback control
  - Noise cancellation
  - Musical effects
- Motor types
  - Single, three or six-phase
  - Sensored or sensorless
  - AC induction
  - Brushless DC
  - Brushed DC
  - Permanent magnet synchronous
  - Switched reluctance

### Digital Control Overview

TI delivers DSP performance with micro-controller integration and ease-of-use that allow designers of digital motor control, digital power supplies, and advanced sensing systems to quickly and easily implement advanced, cost-efficient control solutions. Our broad portfolio of control-optimized processors provides the industry's highest performance and on-chip integration to drive system cost down to unprecedented levels. The unique combination of processing power, interrupt handling capability, control-specific peripheral integration and high C-efficiency deliver substantial benefits to control systems. These benefits, such

as improved system efficiency and added performance for innovation, are delivered with fewer external components and reduced system costs in amazingly small packages great for space-constrained applications. TI is focused on the digital control systems designers' needs and is continuing to develop solutions that serve the market. With more than 20 years of experience in processor-based control applications and a worldwide team dedicated to providing progressive embedded control solutions, we offer systems expertise, easy-to-use development tools, an extensive silicon range and unlimited support to get your product to market faster.



Digital Control Solutions Roadmap



## Industrial

### Digital Motor Control System Solutions

Get additional information at: [www.ti.com/motorcontrol](http://www.ti.com/motorcontrol)

#### Digital Motor Control Overview

TMS320C2000™ digital signal controllers reduce the overall cost of motor control systems by providing the integration and performance necessary to implement advanced control techniques such as sensor-less vector control of three-phase motors. Using the more processor-intensive sinusoidal control, for example, allows developers to reduce the size and cost of the motors and power electronics

required to meet their needs. To fully capitalize on the capabilities of the latest advancements in motor designs and control techniques, engineers are turning their focus to C2000™ digital signal controllers.

TI provides a free library of motor control software systems that are tailored to various control techniques and motor types. Each of these systems is a complete project developed for the Code Composer

Studio™ Integrated Development Environment. Each is built upon our foundational motor control library software modules and includes complete documentation with step-by-step instructions to guide engineers through the process of bringing up a motor control system. Each system comes with complete C/C++ source code.

#### Motor-Specific Software Solutions [www.ti.com/c2000appsw](http://www.ti.com/c2000appsw) and [www.ti.com/c2000sigproclib](http://www.ti.com/c2000sigproclib)

System	Motor Type	Sensored	Sensorless	Description	C24x™ Controller	C28x™ Controller
ACI1-1	1 ph AC Induction	•		Tacho I/P VHz / SinePWM/ Closed Loop (CL) Speed PID	•	
ACI3-1	3 ph AC Induction	•		Tacho I/P VHz / SinePWM / CL Speed PID	•	•
ACI3-2	3 ph AC Induction		•	MRAS (Speed Estimator) VHz / SinePWM / CL Speed PID	•	•
ACI3-3	3 ph AC Induction	•		Tacho I/P FOC / SinePWM / CL Current PID for D, Q / CL Speed PID	•	•
ACI3-4	3 ph AC Induction		•	Direct Flux Estimator + Speed Estimator FOC / SinePWM / CL Current PID for D, Q / CL Speed PID	•	•
PMSM3-1	3 ph Permanent Magnet Synch	•		QEP FOC / SinePWM / CL Current PID for D, Q / CL Speed PID	•	•
PMSM3-2	3 ph Permanent Magnet Synch		•	SMO (Sliding Mode Observer) Position Estimator FOC / SinePWM / CL Current PID for D, Q / CL Speed PID	•	•
PMSM3-3	3 ph Permanent Magnet Synch	•		Resolver / FOC / CL Current PID for D, Q / CL Speed PID		•
PMSM3-4	3 ph Permanent Magnet Synch	•		QEP / FOC / Position Control		•
BLDC3-1	3 ph Trapezoidal Brushless DC	•		3 Hall Effect I/P Trapezoidal / CL Loop Current PID / CL Speed PID	•	•
BLDC3-2	3 ph Trapezoidal Brushless DC		•	BEMF / Zero Crossing Detection Trapezoidal / CL Loop Current PID / CL Speed PID	•	•
DCMOTOR	Brushed DC	•		Speed & Position / QEP without Index		•
Digital Motor Control Library	All Motor Types	•	•	Component Modules for Motor-Specific Applications	•	•

Motor-specific software downloads available today, free of charge, that allow designers to develop solutions for both sensed and sensorless control systems.



## Digital Power System Solutions

Get additional information at: [www.ti.com/c2000dps](http://www.ti.com/c2000dps)

### Digital Power Overview

Digital control of power conversion systems results in lower overall cost due to the consolidation of functions into a single programmable controller in place of dedicated discrete components. A single TMS320C2000™ digital signal controller can provide full loop control at over 2-MHz switching frequencies or control multiple output levels and simplify the sequencing of multiple supplies through software rather than dedicated

components. A software-based solution enables intelligent monitoring of load conditions in real time and can lead to improved system reliability, efficiency and operating costs.

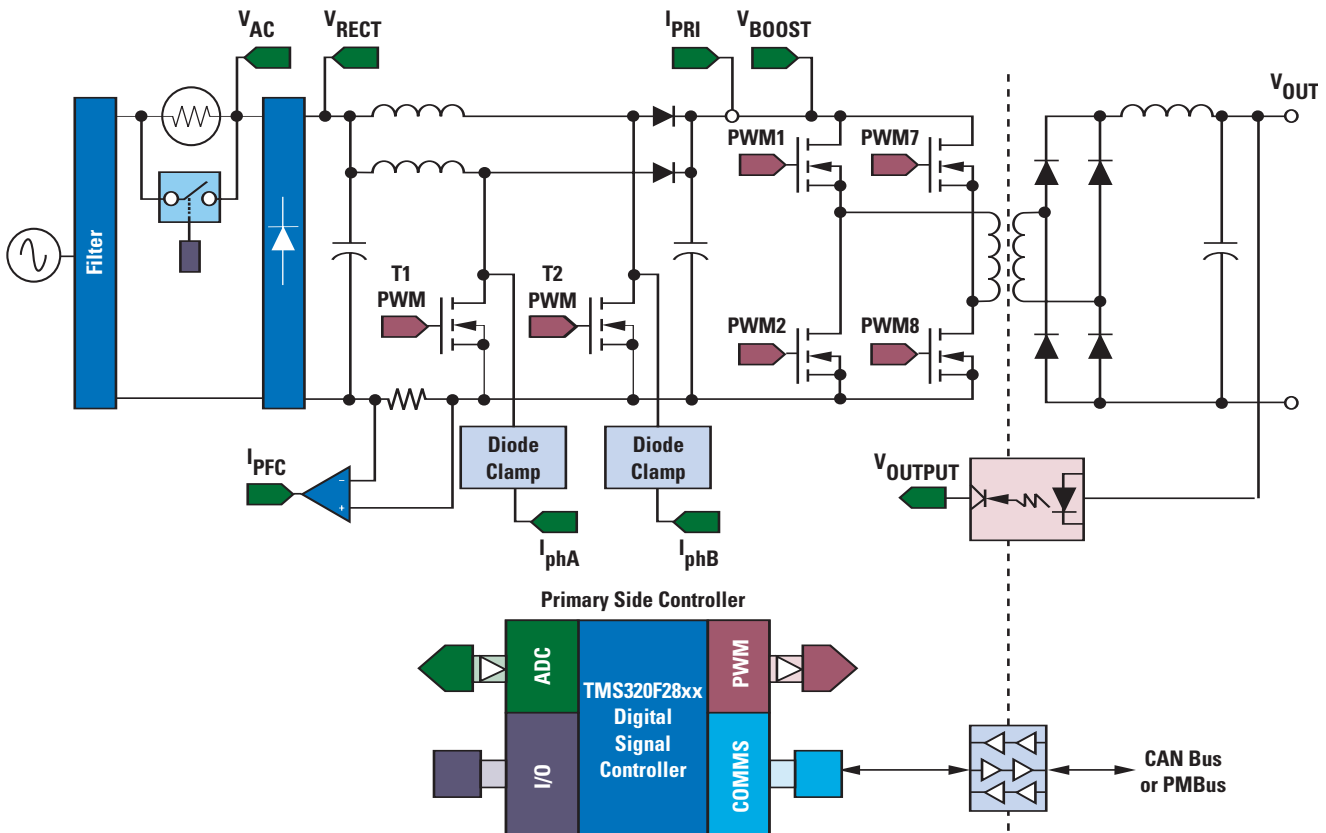
C2000™ digital signal controllers provide both isolated and non-isolated solutions from AC-line to point-of-load and are suitable for applications such as uninterruptible power supplies, servers, telecommunications, solar inverters and industrial equipment. The C2000

controllers connect easily with TI's UCD7000 series of digital power drivers to interface with the actual power stage.

TI provides a free library of power conversion software systems that are tailored to different power conversion topologies, including DC/DC buck and phase-shifted full-bridge, along with power factor correction modules. These can be evaluated in hardware using an F2808 eZdsp™ along with our low-cost PFC and DC-DC adapter boards.

### TMS320C280xx Digital Power Software Solutions

System	Description	Part Number
DC-DC Buck Converter	DC-DC Buck Converter Using High Resolution ePWM	SPRC229
High-Resolution ePWM	Demonstrates HRPWM Capabilities for Digital Power Applications	SPRC227
Standard ePWM	Demonstrates ePWM Capabilities for Digital Power Applications	SPRC228
Power Factor Correction	Power Factor Correction Software	SPRC307
DC-AC Single-Phase Inverter	DC-AC Single-Phase Inverter Software	SPRC303
Phase-Shifted Full-Bridge DC/DC	Phase Shifted Full Bridge DC/DC Software	SPRC311



Telecom Rectifier (DC-DC Converter) Example



## Industrial

### Power Line Communications System Solutions

Get additional information at: [www.ti.com/c2000plc](http://www.ti.com/c2000plc)

#### Power Line Communications Overview

Power Line Communications (PLC) transmits data over an existing high-voltage power line instead of requiring dedicated cabling. PLC can thus provide an inexpensive solution for transmitting data in a pre-wired location.

TMS320C2000™ digital signal controllers are an ideal platform for power line

networked applications such as electricity metering, office lighting automation and factory automation because their performance of up to 150 MIPS, large on-chip memory and integrated peripheral interfaces provide a single-chip solution for the PLC as well as additional control functions.

TI has developed a freely-available PLC software library and hardware reference

design for data throughput speeds up to 5 kbps without crossing an isolation transformer (contact your local TI salesperson). For a higher speed and commercially-hardened system, we recommend our partners at Adaptive Networks, Inc.

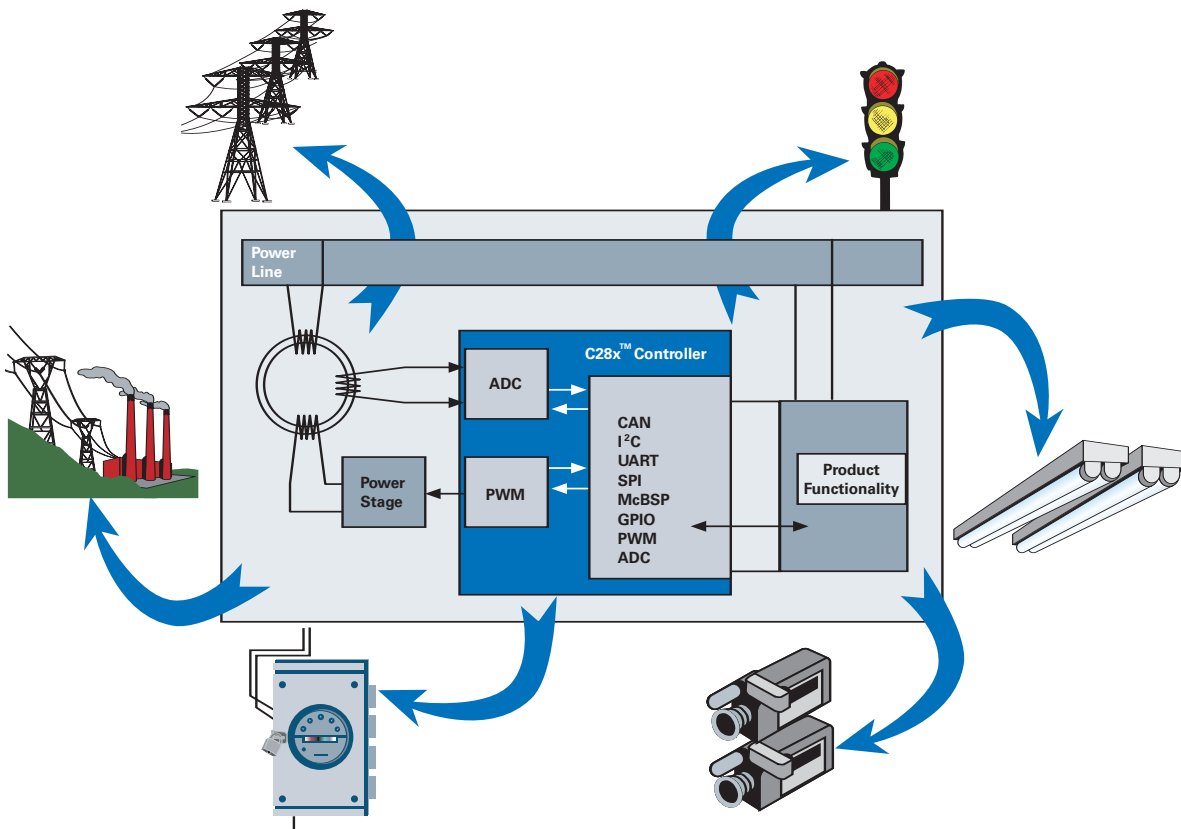
([www.adaptivenetworks.com](http://www.adaptivenetworks.com)).

Adaptive Networks deploys systems that provide up to 100-kbps throughput and offer a range of several kilometers.

#### Power Line Communications Technical Documentation

Application Note	Web Search Literature #
TMS320C2000 Digital Signal Controller Power Line Communication User's Guide	SPRU714

Check the TI website for a complete listing of technical documentation including application notes.



#### Power Line Communications Implementation



## Solar Inverter System Solutions

Get additional information at: [www.ti.com/solar](http://www.ti.com/solar)

### Solar Inverter Overview

There is an emerging concern for future access to energy at the worldwide level. Alternative solutions to fossil fuels have been investigated and are moving to fully industrialized production processes in regions across the globe.

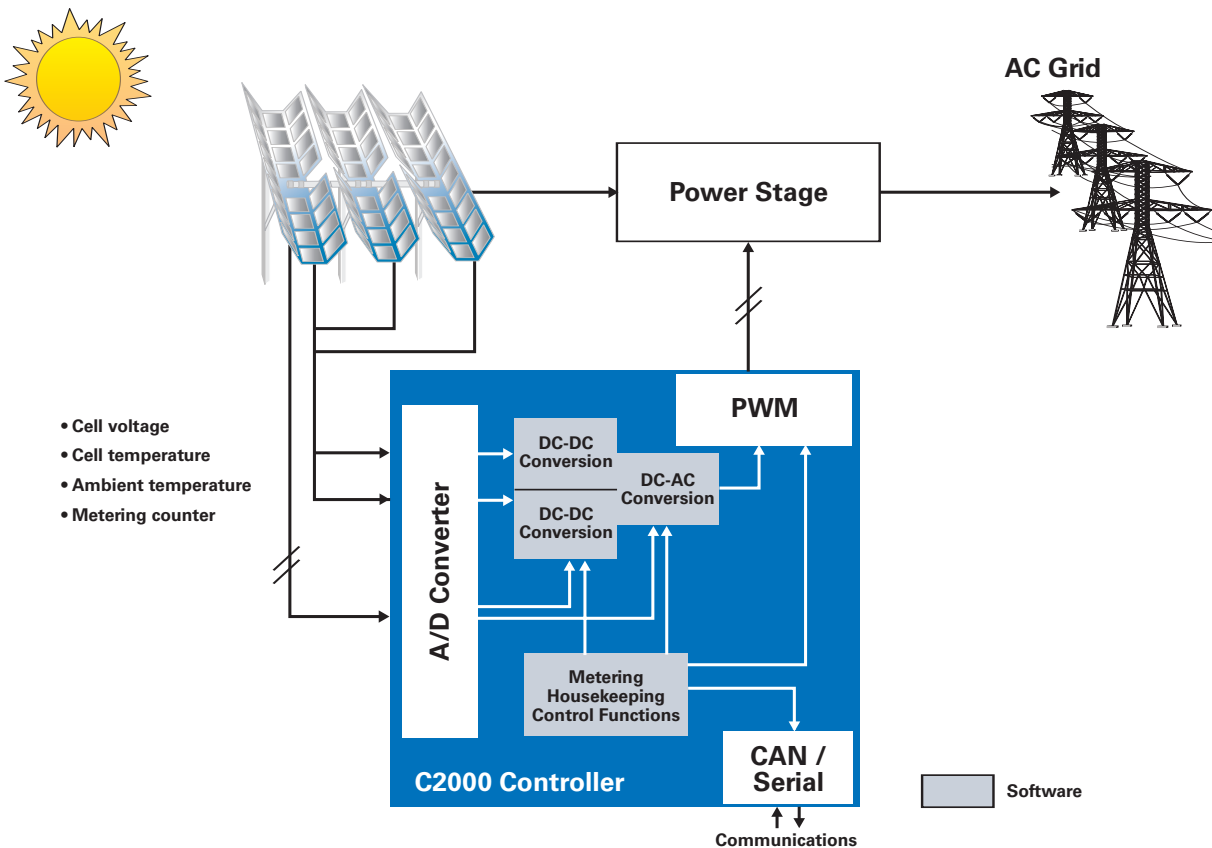
One of the most widespread alternative energy sources is solar, and many innovative companies have decided to focus their research and development, as well as manufacturing activities, on the delivery of photo-voltaic (PV) systems. This includes high-performance solar inverters

for electrical utilities, commercial buildings and individual residences.

The inverter is a critical part of the entire solar energy system. It performs the conversion of the variable DC voltage output of the PV cells into a clean, sinusoidal 50- or 60-Hz current suitable for supplying the commercial electrical grid or local electrical networks.

The TMS320C2000™ digital signal controller platform is the best response to the real-time challenges of the many possible implementations of solar inverters. The 32-bit CPU of the TMS320C28x™

core – running at a maximum frequency of 150 MHz – effectively executes the very precise algorithms required to operate the panels at their maximum power point, and thus ensure the highest efficiency of the power conversion, even in the most severe and variable conditions. The drive of the main bridge of the DC/AC converter is performed by the highly flexible PWM modules of the C2000™ devices, and is combined with the use of the on-chip, high-speed 12-bit ADC, to perform the current and voltage regulation required to achieve the most regular sinusoidal waveform.



### Solar Inverter Example



## Industrial

## TMS320C2000™ Controller Platform Hardware and Software Development Tools

Description	Part #	U.S. <sup>1</sup>
<b>Starter Kits</b>		
F28044 eZdsp Starter Kit <sup>2</sup>	TMDXEZ28044 (U.S. part number)	495
F2808 eZdsp™ Starter Kit <sup>2</sup> (socketed)	TMDSEZS2808 (U.S. part number)	495
Includes USB cable, User's Guide, Code Composer Studio™ (CCStudio) IDE for eZdsp, power supply	TMDSEZS2808-0E (European part number)	
F2812 eZdsp Starter Kit <sup>2</sup>	TMDSEZD2812 (U.S. part number)	395
Includes parallel port cable, User's Guide, CCStudio IDE for eZdsp, power supply	TMDSEZD2812-0E (European part number)	
F2812 eZdsp Starter Kit <sup>2</sup> (socketed)	TMDSEZS2812 (U.S. part number)	495
Includes parallel port cable, User's Guide, CCStudio IDE for eZdsp, power supply	TMDSEZS2812-0E (European part number)	
LF2407A eZdsp Starter Kit <sup>2</sup>	TMDSEZD2407 (U.S. part number)	345
	TMDSEZD2407-0E (European part number)	
LF2401A eZdsp Starter Kit <sup>2</sup>	TMDSEZD2401 (U.S. part number)	595
	TMDSEZD2401-0E (European part number)	
<b>Evaluation Modules</b>		
Power Factor Correction Adapter Board	PFC2808 <a href="http://www.tierelectronics.com">www.tierelectronics.com</a>	295
Phase Shifted Full Bridge DC/DC Adapter Board	PSFB2808 <a href="http://www.tierelectronics.com">www.tierelectronics.com</a>	295
LF2407A Evaluation Module (EVM), CCStudio IDE, XDS510PP-Plus Emulator <sup>3</sup>	TMDS3P701016A (U.S. part number)	1,995
	TMDS3P701016AE (European part number)	
F2812 Development Bundle <sup>3</sup>	TMDSEVP2812 (U.S. part number)	1,995
Includes eZdsp (socketed), CCStudio IDE, XDS510PP-Plus	TMDSEVP2812-0E (European part number)	
F2812 Development Bundle <sup>3</sup>	TMDSEVU2812 (U.S. part number)	2,295
Includes eZdsp (socketed), CCStudio IDE, XDS510™ USB Emulator	TMDSEVU2812-0E (European part number)	
<b>JTAG Emulators</b>		
JTAGjet-TMS-C2000 USB Emulator for Windows	<a href="http://www.signum.com">www.signum.com</a>	595
XDS510PP-Plus Parallel Port Pod with JTAG Cable for Windows	TMDSEMUPP (U.S. part number)	1,500
	TMDSEMUPP-0E (European part number)	
XDS510 USB-Based Emulator for Windows	TMDSEMUUSB	1,995
XDS560™ PCI-Based High-Performance JTAG Emulator	TMDSEMU560	3,995
XDS560 Blackhawk USB High-Performance JTAG Emulator	TMDSEMU560U (U.S. part number)	2,995
	TMDSEMU560U-0E (European part number)	
<b>Software Development Tools</b>		
Code Composer Studio Platinum Edition Development Tools bundled with Annual Software Subscription	TMDSCCSALL-1	3,595
Supports C6000™, C5000™, C2000, DaVinci™ and OMAP™ processor platforms		
C2000 DSP Code Composer Studio Development Tools Annual Software Subscription	TMDSSUB2000	495
Essential Guide to Getting Started with DSP CD-ROM	SPRC119D	Free
Includes C6000, C5000, C2000, DaVinci and OMAP processor CCStudio 120-Day Free Evaluation Tools <sup>4</sup>	<a href="http://www.ti.com/freetools">www.ti.com/freetools</a>	
TMS320C2000 Flash Programming Utilities	<a href="http://www.ti.com/c2000flashtools">www.ti.com/c2000flashtools</a>	Free
TMS320C2000 Digital Motor Control Software	<a href="http://www.ti.com/c2000appsw">www.ti.com/c2000appsw</a>	Free
TMS320C2000 Digital Power Software	<a href="http://www.ti.com/dpslib">www.ti.com/dpslib</a>	Free
TMS320C2000 Signal Processing Libraries	<a href="http://www.ti.com/c2000sigproclib">www.ti.com/c2000sigproclib</a>	Free

<sup>1</sup>Prices are quoted in U.S. dollars and represent year 2007 suggested resale pricing. All prices are subject to change.

*New tools are listed in red.*

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.

<sup>2</sup>Includes board-specific Code Composer Studio integrated development environment IDE, code-generation tools, on-board JTAG emulation, target board and target-specific device driver.

<sup>3</sup>Includes Code Composer Studio, code generation tools with C compiler/assembler/linker, target board and device drivers.

<sup>4</sup>Includes full-featured Code Composer Studio Development Tools, code generation tools (C/C++ compiler/assembler/linker), emulator and simulator configurations all limited to 120 days. Alternative Development Tools are available from third parties such as EWA Blackhawk DSP ([www.blackhawk-dsp.com](http://www.blackhawk-dsp.com)), Spectrum Digital ([www.spectrumdigital.com](http://www.spectrumdigital.com)), Technosoft ([www.technosoft.ch](http://www.technosoft.ch)) and Softronics ([www.softronx.com](http://www.softronx.com)).

Please see the features supported by platform matrix on page 93 for more details.



## TMS320C2000™ Controller Literature and Related Technical Documentation

All documentation and associated literature, user's guides, application notes and software can be found by clicking on the specific device in the parametric table found on the URLs below.

TMS320C28x™ Controller Generation

[www.ti.com/c28x](http://www.ti.com/c28x)

TMS320C24x™ Controller Generation

[www.ti.com/c24x](http://www.ti.com/c24x)

## Control eXpressDSP™-Compliant Third Parties

### A2e Technologies

Western USA

[www.a2etechnologies.com](http://www.a2etechnologies.com)

A2e Technologies is an electronic design services (EDS) firm providing custom application software, embedded design and product development services to industry and government.

### CIDESI

Mexico

[www.cidesi.com/electro\\_ing/b\\_are\\_ener\\_ing.html](http://www.cidesi.com/electro_ing/b_are_ener_ing.html)



The Industrial Development and Engineering Center offers engineering services to the industrial and education sectors, including specific applications requiring analog, digital and communications devices.

### D3 Engineering

Eastern USA

[www.d3engineering.com](http://www.d3engineering.com)



D3 Engineering provides hardware, software and algorithm design services for TI DSPs. D3 offers experience and reference designs in power/temp control, BLDC, AC, stepper and other motor systems utilized on customer projects.

### Drivetech

Eastern USA

[www.drivetechinc.com/](http://www.drivetechinc.com/)



Drivetech is a technical consulting company specializing in the analysis, design and development of customized AC/DC motor drives, motion control and power electronics application systems.

### drivetek ag

Europe

[www.drivetek.ch](http://www.drivetek.ch)



drivetek was founded in 2002. Thirteen experienced engineers develop solutions and products and provide consulting, with a focus on motion control and power electronics, with an expertise in machine, hardware and software design and simulation.

### Signum Systems

Western USA

[www.signum.com](http://www.signum.com)



Signum Systems™ was founded in 1979. From their inception, the company dedicated itself to producing high-quality tools for embedded systems development. Signum actively participates in the embedded emulation market, supplying full-featured in-circuit emulators (ICEs) to the developers of microcontroller-based systems.

### The MathWorks

Eastern USA

[www.mathworks.com/](http://www.mathworks.com/)



The MathWorks is the leading global provider of software for technical computing and model-based design for engineers and scientists in industry, government and education. Their two core products, MATLAB® and Simulink®, are used throughout the industry, as well as academia.

### Tier Electronics

Central USA

[www.tierelectronics.com/](http://www.tierelectronics.com/)



Tier Electronics specializes in power electronics designs for OEMs worldwide. Tier Electronics' talent pool consists of personnel with decades of experience in engineering, technical, sales and manufacturing.

### Visual Solutions

Eastern USA

[www.visim.com](http://www.visim.com)



Visual Solutions produces modeling and simulation software for engineers, scientists and educators. VisSim uses its intuitive graphical building block environment as a foundation for modeling dynamic complex systems, from controls to communications.

### Windmill

Europe

[www.windmill-innovations.com](http://www.windmill-innovations.com)



Windmill Innovations specializes in the design and development of cost-effective, high-performance telemetry solutions based on their patented, Internet-based data acquisition technology.



## Telecom

### Telecom System Solutions

Get additional information at: [www.ti.com/telecom](http://www.ti.com/telecom)

#### Targeted Applications

- Wired telephony
  - Client-side telephony – for home networking (voice/data access points)
  - Remote data collection
  - Industrial monitoring systems
  - Full-duplex speakerphones
  - SMS/MMS phones
  - Intelligent phones
- Wireless terminal (excluding handsets)
  - Broadband wireless access boxes
  - Military and police wireless communication device
  - Digital pagers
  - Amateur radios
- Telecom accessories
  - Hands-free kit
  - Bluetooth® headset
- Infrastructure telecom
  - Enterprise
  - Gateway
  - SoHo

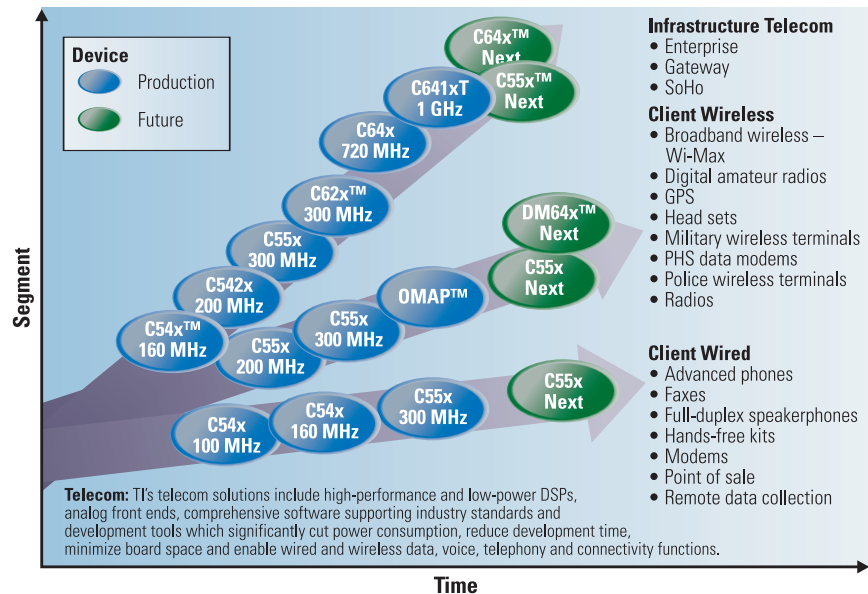
#### Telecom Systems Overview

Telecom applications require the processing power to handle a wide variety of functions. Using TI programmable DSPs, you can easily expand product capabilities and feature sets to match the demands of your design. In addition, you can customize, adapt and scale the DSP-based design to suit your particular requirements and focus on end-product differentiation.

TI offers complete DSP-based solutions for remote data collection, Internet connectivity, telephony co-processing and voiceband processing client-side telephony applications. These solutions provide

hardware including power-efficient/small form factor DSPs as well as analog front ends. In addition, comprehensive software is provided supporting industry standards as well as flexible software building blocks that accelerate the design process from concept through production.

These complete solutions significantly cut power consumption, reduce development time, minimize board space and enable multi-function applications, making a new class of Internet access devices possible. When you combine the processing power, high integration and flexibility with their low-price points and ease-of-use, TI DSPs are a perfect fit for telecom applications.



Telecom Solutions Roadmap





## Telecom Application Notes

Application Note	Web Search Literature #
TMS320C54CST Client Side Telephony DSP	SPRA187
Client Side Telephony (CST) Chipset Mode	SPRA859
TMS320C54CST Bootloader Technical Reference	SPRA853

Application Note	Web Search Literature #
Client Side Telephony (CST) Chip Flex Mode Flex Examples Description	SPRA862

Check the TI website for a complete listing of technical documentation including application notes.

## Telecom Integrated Solutions

The TMS320C5000™ DSP-based Telephony Developer's Kits include ready-to-go software and hardware that reduce your development time and allow you to focus on end-product differentiation.

**Client-Side Telephony Solution** – Perfect for customers developing remote data collection applications and advanced phone applications such as intelligent phone, SMS/MMS-enabled phone, secure phone, IP phone, USB phone and real/duplex speakerphone. This powerful tool uses the TMS320C54CST version 2.0 with 14 on-board algorithms and up to 40 kW of customizable RAM. The C54CST DSP is the industry's first complete one-chip solution – giving designers a comprehensive way of getting innovative industrial products to market quickly. For additional information, visit [www.ti.com/cst](http://www.ti.com/cst)

**Hands-Free Kit (HFK) Development Platform** – TI's HFK Development Platform is a complete DSP-based solution that brings unprecedented affordable, high-quality audio to consumer products. Providing real-time voice and audio enhancing algorithms as well as Bluetooth® connectivity, the HFK development platform enables developers to get higher quality audio products to market faster while reducing cost.



**Hands-Free Kit Development Platform**



**Client-Side Telephony Developer's Kit**

**SPIRIT CORP**  
DSP Software Source

Telephony algorithms provided by SPIRIT-DSP

With the Bluetooth daughter card, the HFK enables mobile device manufacturers to quickly and easily add Bluetooth functionality to their hands-free kit designs.

This DSP-enabled solution allows immediate development and differentiation of an end product by providing a baseline hardware and software design. The HFK development platform connects to TI's software development environment, Code Composer Studio™ Development Tools, through a JTAG connection.

This development environment combined with documentation provides fast integration of TI DSP third-party software and faster time-to-market.

The HFK development platform is ideally suited for high-quality, after-market hands-free kits where cost and performance are critical. Since the hands-free application has been fully integrated, developers can immediately focus on product differentiation. With 50-percent headroom on the TMS320C5407 DSP, developers can add a wide range of differentiating features, such as an LCD display or advanced speech recognition, to the baseline design as well as quickly integrate other functionality and algorithms available through TI's extensive network of more than 700 third party developers.

For more information, contact your authorized TI distributor or visit [www.ti.com/hfk](http://www.ti.com/hfk)

**Telecom****Telecom eXpressDSP™-Compliant Third Parties****ADT***Eastern USA*[www.adaptivedigital.com](http://www.adaptivedigital.com)

Adaptive Digital Technologies (ADT) is a leading developer and provider of highly-optimized DSP algorithms and solutions for telephony, audio and video applications such as VoIP, conferencing, echo cancellation, streaming video and multimedia.

**Commetrex***Eastern USA*[www.commetrex.com](http://www.commetrex.com)

For more than 10 years, Commetrex has supplied high-quality signal processing technologies to telecom equipment manufacturers. Our fax technology portfolio leads the industry in its scope.

**Compandent***Western USA*[www.compandent.com](http://www.compandent.com)

Compandent creates leading-edge innovative TI DSP algorithms and implementations for next-generation telecom products which may include voice compression, multimedia, packet networks, noise suppression and acoustic echo cancellation.

**D2 Technologies***Western USA*[www.d2tech.com](http://www.d2tech.com)

D2 Technologies' mission is to accelerate the adoption of VoIP technology by providing the highest-quality and most cost-effective software and system solutions available.

**DSP Bayer***Central Europe*[www.dsp-bayer.de](http://www.dsp-bayer.de)

Bayer DSP Solutions provides DSP hardware and software components for network and telecommunications, as well consultancy and full integration of such components into custom systems.

**Encore Software***India*[www.ncoretch.com](http://www.ncoretch.com)

Encore Software Ltd. ("ESL") has developed optimized software modules implementing ITU-T G.7xx compliant speech coders, line echo cancellers, acoustic echo cancellers, tone detectors, V.17 fax and V.90 data modems.

**FITec***South America*[www.fitec-innovation.com/](http://www.fitec-innovation.com/)

FITec provides hardware and software R&D services to telecom and inter-networking equipment vendors in the areas of VoIP, IPTV, WiMax and PSTN. FITec has expertise in embedded real-time and multitasking solutions for DSPs.

**HelloSoft***India*[www.hellosoft.com](http://www.hellosoft.com)

HelloSoft is the world's leading provider of VoIP technologies for wireline and wireless devices. The company enables mass deployment of low-cost, power-efficient, fully-featured multi-mode wireline and wireless devices.

**MESI***Eastern USA*[www.mesi.net](http://www.mesi.net)

MESI offers a scalable system framework with selectable algorithm content for secure voice (STU-III), fax and data modem relay and terminal products. Their solutions are ported to TI TMS320C54x™, C55x™, C62x™, C67x™ and C64x™ DSP generations.

**Spirit***Central Europe*[www.spiritDSP.com](http://www.spiritDSP.com)

SPIRIT DSP has been a major player in the international software licensing business since 1992. More than 80 million installed voice channels are powered by SPIRIT products in 70+ countries worldwide.

**Surf***Central Europe*[www.surf-com.com](http://www.surf-com.com)

Surf develops high-capacity multimedia processing boards for the telecommunication infrastructure industry. Surf's customers use these boards in their media gateway, media server and CTI products.

**Syspac***South America*[www.sypac.com.br/](http://www.sypac.com.br/)

Sypac is a design house with expertise in embedded real-time and multitasking hardware and software solutions for DSPs. They design software modules to enable the utilization of TMS320C54x and C55x generations of DSPs for embedded applications.

**Telecom eXpressDSP™-Compliant Third-Party Algorithms****FAX ALGORITHMS**

T.38 Fax Relay over IP  
V.17 Modem  
V.21 Modem  
V.27 Modem  
V.27ter Modem  
V.29 Modem  
V.34 Modem

**PROTOCOL STACKS ALGORITHMS**

HDLC Generator Level 2  
HDLC Receiver  
HDLC Receiver Level 2  
HDLC Transmitter  
TCP/IP Protocol Stack

**SPEECH ALGORITHMS**

Acoustic Echo Cancellation  
Adaptive Speech Filter  
Broadband Noise Cancellation  
Caller ID Text-to-Speech  
Noise Reduction  
Sound Stretcher  
Speech Enhancement  
Text-to-Speech Synthesizer  
Speech Recognition  
Voice Activity Detector  
Voice Command Recognition

**TELEPHONY ALGORITHMS**

2100-Hz Tone Detector  
Acoustic Echo Canceller  
Auto Gain Control/Voice Activity Detector  
Call Progress Analysis  
Call Progress Decoder  
Call Progress Generator  
Call Progress Monitor  
Call Progress Tone Detector  
Caller ID Detector  
Caller ID Generator  
Caller ID, Type 1 and 2  
Comfort Noise Generator  
CPE Alert Signal  
CPT Detector

**TELEPHONY ALGORITHMS (CONT'D)**

CPT Generator  
DTMF Detector/Suppressor  
DTMF Encoder/Decoder  
Echo Cancellation, Multi-  
Echo Canceller  
Fax and Modem Tone Detect  
Frequency Shift Key Receive  
Frequency Shift Key Send  
G.165 Line Echo Cancellation  
G.167  
G.168 (Long Tail)  
G.168 (Short Tail)  
G.168-2000  
G.726 ADPCM Speech Codec  
MF (10 ms)  
MF R1 Detector  
MF R2 Forward Detector  
MF R2 Reverse Detector  
MF Line/Register Signaling  
Multifrequency Tone Detect  
Music On Hold  
Noise Floor Estimation  
Tone Detector  
Tone Disabler for LEC  
Universal Tone Detection  
Universal Multifrequency Tone Generator  
Variable Rate Convl. Codec w/ Soft Decision  
VITERBI Decoding

**VB MODEM ALGORITHMS**

AGC  
BELL 103 Modem  
BELL 202 Modem  
Binary Phase Shift Key Modem  
G3MDP  
V.21  
V.22  
V.22 bis  
V.23  
V.32  
V.32 bis  
V.34

**VB MODEM ALGORITHMS (CONT'D)**

V.34+  
V.90  
V.92  
V.150  
V.42  
V.42 bis

**VOCODERS ALGORITHMS**

1200-BPS Codec  
2400-BPS Codec  
4800-BPS Codec  
6000-BPS Codec  
End Point Detector  
Enhanced G.711  
ESAC4 Codec  
ESAC7 Codec  
G.711 Codec  
G.711 PLC  
G.722 Codec  
G.722.1 Codec  
G.722.2 Codec  
G.723.1 Codec  
G.723A Codec  
G.726 ADPCM Codec  
G.726 U-Law ADPCM Codec  
G.728 Codec  
G.729 Codec  
G.729A Codec  
G.729AB Codec  
G.729B Codec  
G.729E Codec  
IPCM Wideband

**WIRELESS ALGORITHMS**

16-Bit CRC-CCITT Standard  
2.28-bps/Hz PTCM Decoder  
32-Bit CRC-CCITT Standard  
GSM-AMR Transcoder  
GSM AMR Codec  
GSM Enhanced Full-Rate Codec  
GSM Full-Rate Codec

**Telecom DSP Signal Processing Libraries**

Signal Processing Libraries	Website
TMS320C5000™ DSP Foundation Software	<a href="http://www.dspvillage.ti.com/c5000dsplib">www.dspvillage.ti.com/c5000dsplib</a>
TMS320C54x™ DSP Software Library	<a href="http://www.ti.com/c54xdsplib">www.ti.com/c54xdsplib</a>

Signal Processing Libraries	Website
TMS320C55x™ DSP Software Library	<a href="http://www.ti.com/c55xdsplib">www.ti.com/c55xdsplib</a>



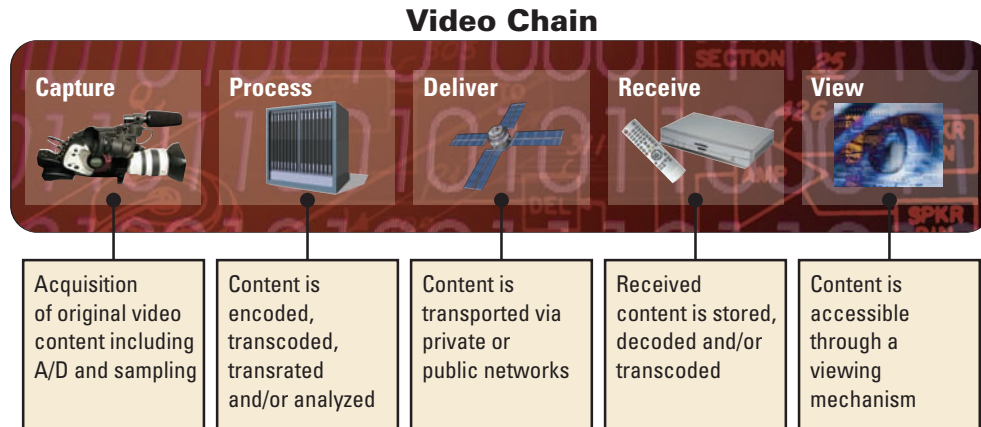
## Video and Imaging

### TI's Solutions Cover the Entire Video Chain

TI has a 25-year involvement the video market from one end of the video chain to the other. The video chain includes many different steps from the creation of original content to the final viewing experience.

Customers can leverage TI's vast expertise in video to launch differentiated products quickly and cost effectively in any number market

segments. TI has a number of customized solutions for various market segments which simplify development by providing access to software, tools, third parties and local support. For more information on TI's market expertise and solutions for the entire video chain, please visit [www.ti.com/video](http://www.ti.com/video)



### TI Will Enable the Future of Video Entertainment via Multi-Format Transcoding

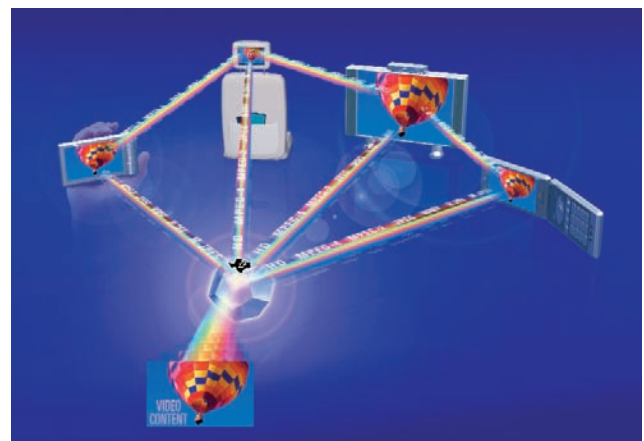
Transcoding will be essential for the continued evolution of the video entertainment market since content is king and consumers demand transportability of video on any device. Transcoding is the ability to take existing video content and change the format, bitrate and/or resolution in order to view it on another video playback device. Transcoding a single video format is available today but that will not meet consumers' needs to easily navigate the changing video environment. The ability to seamlessly view content on any device in real-time requires the need to transcode many video formats, thus multi-format transcoding is key.

Multi-format transcoding is the most important challenge to overcome for manufacturers and service providers to solve before realizing the potential tremendous growth in video. Consumers have an insatiable appetite for immersion in entertainment, and transcoding multiple formats in real-time will be a necessary function for all future video products to be successful.

TI will leverage its proven expertise in supporting multi-format advanced video codecs to enable this key market need. A research study done by IDC finds that transcoding is an essential technology for delivering digital content to video playback devices that were previously incompatible. Read more about this

report: "Transcoding: The Future of the Video Market Depends on It" and view a panel discussion on this topic:

[www.ti.com/transcoding](http://www.ti.com/transcoding)



*As the accelerating video market extends its reach to products such as cell phones, portable media players and automotive infotainment systems, consumers are demanding easy access to their video content throughout the home and on the go. Multi-format transcoding will enable the seamless transmission of video content between all types of video devices.*



## Video and Imaging System Solutions

Get additional information at: [www.ti.com/videoandimaging](http://www.ti.com/videoandimaging)

### Targeted Applications

- Automotive infotainment
- Broadcast systems
- Cable head-end video equipments (routers)
- Digital camcorders
- Digital still cameras
- Digital TV and server head-ends
- Digital video recorders
- IP-based video-conferencing end-points
- IP-based video phones
- Hard-copy appliances
- Media encoder/decoder appliances
- Personal video recorders
- Professional-grade video broadcast equipment
- Security recording systems
- Set-top boxes
- Streaming video appliances
- Video-conferencing, multi-point conference units (MCUs)/gateways
- Video jukeboxes
- Video security systems
  - Video security camera (D1, CIF resolution and low cost)
  - Digital video security recorder (DVR)
- Video surveillance cameras
- Webpads
- Wireless cameras
- Automotive video sensing
- Machine vision and cognitive medical imaging

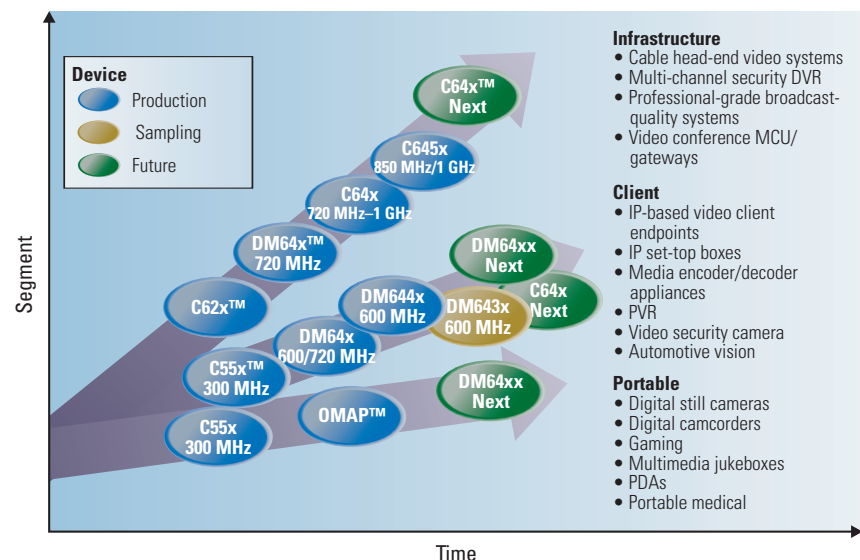
### Video and Imaging Systems Overview

As the video and imaging markets continue to evolve with new functionality requirements and multiple emerging video standards (i.e., MPEG-4, H.264, Windows Media®, Real Video, etc.), developers need to adapt designs with the right balance of processing performance, power consumption and system flexibility. Portable and plugged applications need different levels of support for real-time video processing such as video coding, transcoding, transrating, as well as video and imaging instruction sets plus the right power consumption to meet market demands. TI DSPs provide the processing performance and programmability other processors are unable to provide. For example, the TMS320C64x™ DSP generation can perform simultaneous real-time (30 frames/second) MPEG-4 encoding and decoding at D1 resolution with high quality.

Performance and programmability allow developers to future-proof designs now to make the challenges of the future

simply opportunities to beat competition to market.

TI offers a number of products including hardware, software and integrated system solutions that are perfect for a variety of portable and plugged video and imaging applications. Numerous application development kits are available to get these designs off the ground quickly. These kits provide hardware and software at a variety of integration levels and price points to handle real-time performance, channel density, simultaneous processing of video, audio/voice and data streams across both wired and wireless networks. These kits help the developer create designs that provide the integration of various types of digital media streams and real-time delivery, avoiding network and system-level bottlenecks. In addition, the kits provide the flexibility to upgrade evolving digital media standards in software during system deployment and reduce the latency or lag times in delivering media content across different endpoints.



Video and Imaging Solutions Roadmap



## Video and Imaging

### Video and Imaging Application Device Matrix

Applications		TMS320C55x™ DSP	OMAP™	TMS320C62x™ DSP	TMS320C64x™ DSP	TMS320DM64x™/ TMS320DM644x DSPs
Portable	Network camera	•				
	Digital still camera	•	•			
	Digital camcorder	•	•			
	Portable data terminals (PDT)	•	•			
Client	IP video phone					•
	Network IP camera			•		•
	Visual inspection			•	•	•
	Personal video recorder (PVR)					•
	Smart security camera					•
	Media encoder/decoder					•
	IP set-top box					•
Video Infrastructure	Video conferencing gateways				•	•
	Professional broadcast systems				•	
	Statistical multiplexer				•	
	Cable head-end video system				•	
	Multi-channel digital video recorder (DVR)				•	•
	Wireless video gateway				•	•

### High-Performance Media Solutions

High-performance digital media technologies cover a wide range of streaming media and emerging media-based technologies including integration of video, voice and data content into many new and different applications, reshaping the way digital media content is delivered.

Some of the challenges faced by digital media include real-time performance, greater channel density and the software programming flexibility for simultaneous processing of video, voice and data streams across both wired and wireless networks. Typical digital media processing functions include encoding and decoding media streams, transcoding (converting from one format to another),

and transrating streams (scaling from a higher to a lower bit rate) to accommodate various system-level dependencies. Other processing functions include compression, decompression, encryption, packetization and transport of media streams.

TI's TMS320C6000™ digital media processors play a major role in enabling these technologies in video and imaging solutions. Based on the proven TMS320C64x™ DSP core, the TMS320C6000 DSPs are the highest-performance multimedia engines that are easy to upgrade with the latest software codecs.

For more information, please visit:

[www.ti.com/video](http://www.ti.com/video)

#### Key Benefits

- Choose the option that fits your needs – broad range of high-performance/low-cost options optimized for video applications
- Rapidly develop products with the latest algorithms due to code compatibility and full software programmability
- Utilize any video standard such as MPEG-4 AVC (H.264) encode and decode
- Get started today with TI video-based development tools



## Digital Video System Solutions

Get additional information at: [www.ti.com/davinci](http://www.ti.com/davinci)



### Targeted Applications

- Video encode and decode applications, such as
  - Video phones
  - IP set-top boxes
  - Video security systems
  - Automotive infotainment
  - Cameras
  - Portable video
  - and more

### Key Features/Benefits

- **Product Innovation:** An open development platform enables OEM product differentiation with a flexible, complete solution
- **Development Efficiency:** Save months of development time by leveraging integrated, production-tested, software and hardware components
- **Lower System Cost:** Lower system cost up to 50% and leverage IP across multiple products

DaVinci™ technology is a DSP-based solution tailored for digital video applications that provides video equipment manufacturers with integrated processors, software and tools to simplify the design process and accelerate innovation.

### DaVinci Processors Reduce System Cost

The portfolio of DaVinci processors consist of scalable, programmable Digital Signal Processing SoCs, accelerators and peripherals optimized to match the price, performance and feature requirements for a broad spectrum of digital video end equipments. The DaVinci processor portfolio includes:

- **TMS320DM644x digital media processors** – are highly integrated SoCs based on an ARM926 processor and the new TMS320C64x+ DSP core. The TMS320DM6446 and TMS320DM6443 processors are ideal for applications such as video phones, automotive infotainment, digital still cameras, streaming media and IP set-top boxes.
- **TMS320DM643x digital media processors** – are also based on the new TMS320C64x+ DSP core and priced as low as U.S. \$9.95. The TMS320DM6437, TMS320DM6435, TMS320DM6433 and TMS320DM6431

processors are ideal for cost-sensitive digital media applications and include special features that make them suitable for automotive video applications such as lane departure and collision avoidance as well as machine-vision systems, robotics and video security.

### Complete System Tools and Support Get You to Market Faster

Developers can get started today with DaVinci-based software and development tools tailored to simplify design in video applications, including:

- **TMS320DM644x Development Tools**
  - Digital Video Evaluation Module (DVEVM)
  - Digital Video Software Development Kit (DVSDK)
  - Digital Media Software
- **TMS320DM643x Development Tools**
  - TMS320DM6437 Digital Video Development Platform (DVDP)
  - Digital Media Software

DaVinci products are backed by TI's Third Party Network that is able to offer video system expertise to customers worldwide. In addition to DaVinci products, TI offers a complete portfolio of high-performance analog products for video applications.





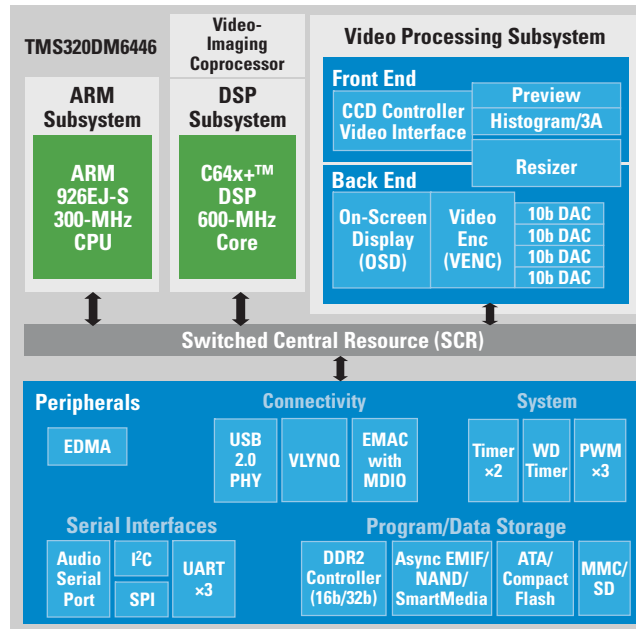
## Digital Video

### TMS320DM644x Digital Media Processors

TMS320DM644x digital media processors are highly integrated SoCs based on an ARM926 processor and the

TMS320C64x+™ DSP core. They are ideal for applications such as video phones, automotive infotainment, digital still

cameras, streaming media and IP set-top box.



TMS320DM6446 Block Diagram

### DaVinci™ Digital Media Processors

Device	CPUs	Frequency (MHz)	L1/ SRAM (Bytes)	L2/ SRAM (Bytes)	ROM (Bytes)	External Memory I/F	EDMA	Video Ports (Configurable)	Serial I/F	Connectivity I/F	Program/ Data Storage	Voltage (V)		Packaging	Price <sup>1</sup>	
												Core	I/O			
TMS320DM6446ZWT	C64x+,	594	112 K	64 K	16 K	1 16-/8-Bit	64 Ch	1 Input,	ASP, I²C,	USB 2.0,	Async SRAM,	1.2	1.8/	361 BGA,	39.49	
	ARM9,	(DSP)	(DSP)	(DSP)	(ARM)	EMIFA		1 Output	SPI,	VLYNQ,	DDR2 SDRAM,		3.3			16 × 16 mm
	DaVinci Video	297	40 K	(ARM)		1 32-/16-Bit			3 UARTs	10/100 EMAC	NAND Flash, SmartMedia/xD					
TMS320DM6443ZWT	C64x+,	594	112 K	64 K	16 K	1 16-/8-Bit	64 Ch	1 Output	ASP, I²C,	USB 2.0,	Async SRAM,	1.2	1.8/	361 BGA,	33.84	
	ARM9,	(DSP)	(DSP)	(DSP)	(ARM)	EMIFA			SPI,	VLYNQ,	DDR2 SDRAM,		3.3			16 × 16 mm
	DaVinci Video	297	40 K	(ARM)		1 32-/16-Bit			3 UARTs	10/100 EMAC	NAND Flash, SmartMedia/xD					
TMS320DM6441ZWT	C64x+,	513/405	112 K	64 K	16 K	1 16-/8-Bit	64 Ch	1 Input,	ASP, I²C,	USB 2.0,	Async SRAM,	1.2/	1.8/	361 BGA,	27.05	
	ARM9,	(DSP)	(DSP)	(DSP)	(ARM)	EMIFA		1 Output	SPI,	VLYNQ,	DDR2 SDRAM,	1.05	3.3			16 × 16 mm
	DaVinci Video	256/202	40 K	(ARM)		1 32-/16-Bit			3 UARTs	10/100 EMAC	NAND Flash, SmartMedia/xD					

<sup>1</sup> Prices are quoted in U.S. dollars and represent year 2007 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.

New devices are listed in red.





**Digital Video Evaluation Module (DVEVM)** – The DVEVM enables developers to start immediate evaluation of the TMS320DM644x processors and begin building digital video applications quickly. The DVEVM allows developers to write production-ready application code for the ARM and provides access to the DSP core using DaVinci APIs. For more information visit [www.ti.com/dvevm](http://www.ti.com/dvevm)



Digital Video Evaluation Module



Digital Video Software Development Kit

**Digital Video Software Development Kit (DVSDK)** – The Digital Video Software Development Kit (DVSDK) is designed to tune complex systems quickly and efficiently by incorporating multiple tools that significantly improve software integration and system visibility. The DVSDK requires a target platform for the TMS320DM644x processor and can be used in conjunction with the DVEVM or platforms from TI third parties. Review technical documents or learn specifics of the DVSDK at [www.ti.com/dv sdk](http://www.ti.com/dv sdk)

## DaVinci Hardware and Software Development Tools

Description	Part Number	U.S. <sup>1</sup>
<b>Evaluation Module (EVM)</b>		
Digital Video Evaluation Module (DVEVM)	TMDXEVM6446 (U.S. part number) TMDXEVM6446-0E (European part number)	2,495
<b>Software Development Tool</b>		
Digital Video Software Development Kit (DVSDK) with MontaVista™ Pro Linux, Code Composer Studio™ IDE and XDS560™ Emulator	TMDSSDK6446-L (U.S. part number) TMDSSDK6446-3L (U.S. part number)	6,995 10,995

<sup>1</sup> Prices are quoted in U.S. dollars and represent year 2007 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. *New tools are listed in red.*



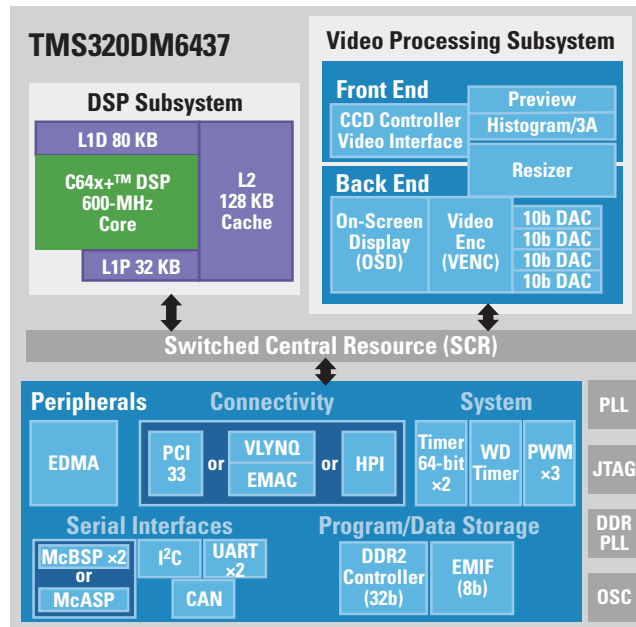
## Digital Video

### TMS320DM643x Digital Media Processors

TMS320DM643x digital media processors are based on the TMS320C64x+™ DSP core. They are ideal for cost-sensitive

digital media applications such as machine-vision systems, robotics, video security, video telephony and automotive

vision applications such as lane departure and collision avoidance.



TMS320DM6437 Block Diagram

### DaVinci™ Digital Media Processors

Device <sup>1</sup>	CPU	Frequency (MHz)	L1/ SRAM (Bytes)	L2/ SRAM (Bytes)	ROM (Bytes)	External Memory I/F	EDMA	Video Ports (Configurable)	Parallel I/F	Serial I/F	Connectivity I/F	Program/Data Storage		Voltage (V)		Packaging	Price <sup>2</sup>
												Core	I/O	Core	I/O		
<b>TMX320DM6431</b>	C64x+, DaVinci Video	300	64 K	64 K	64 K	1 8-Bit EMIFA, 1 16-Bit DDR2	64 Ch	1 Input	–	McASP, I²C, 1 UART, 1 McBSP, 1 HECC	10/100 EMAC	Async SRAM, DDR2 SDRAM, NAND Flash	1.05	1.8/3.3	361 BGA, 16 × 16 mm, 376 BGA, 23 × 23 mm	11.25	
<b>TMX320DM6433</b>	C64x+, DaVinci Video	400, 500, 600	112 K	128 K	64 K	1 8-Bit EMIFA, 1 16-/32-Bit DDR2	64 Ch	1 Output	16-Bit HPI	McASP, 1 McBSP, I²C, 1 UART	32-Bit PCI, VLYNQ, 10/100 EMAC	Async SRAM, DDR2 SDRAM, NAND Flash	1.05/1.2	1.8/3.3	361 BGA, 16 × 16 mm, 376 BGA, 23 × 23 mm	15.75, 16.65, 18.50	
<b>TMX320DM6435</b>	C64x+, DaVinci Video	400, 500, 600	112 K	128 K	64 K	1 8-Bit EMIFA, 1 16-/32-Bit DDR2	64 Ch	1 Input	16-Bit HPI	McASP, I²C, 1 McBSP, 2 UARTs, 1 HECC	VLYNQ, 10/100 EMAC	Async SRAM, DDR2 SDRAM, NAND Flash	1.05/1.2	1.8/3.3	361 BGA, 16 × 16 mm, 376 BGA, 23 × 23 mm	16.30, 17.25, 19.15	
<b>TMX320DM6437</b>	C64x+, DaVinci Video	400, 500, 600	112K	128 K	64 K	1 8-Bit EMIFA, 1 16-/32-Bit DDR2	64 Ch	1 Input, 1 Output	16-Bit HPI	McASP, I²C, 1 HECC, 2 McBSPs <sup>3</sup> , 2 UARTs	32-Bit PCI, VLYNQ, 10/100 EMAC	Async SRAM, DDR2 SDRAM, NAND Flash	1.05/1.2	1.8/3.3	361 BGA, 16 × 16 mm, 376 BGA, 23 × 23 mm	22.05, 23.35, 25.93	

<sup>1</sup> All devices will be available in the ZDU (376-pin plastic BGA) and ZWT (361-pin Pb-free PBGA) packages.

*New devices are listed in red.*

<sup>2</sup> Prices are quoted in U.S. dollars and represent year 2007 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.

<sup>3</sup> McBSP can be configured as an SPI peripheral.



**TMS320DM6437 Digital Video Development Platform (DVDP)** – Rapidly accelerate the development time of your low-cost digital video application with the new DaVinci™ TMS320DM6437 Digital Video Development Platform.

Available today for U.S. \$495, the DVDP includes both hardware and software and enables immediate evaluation of the DM6437 digital media processors.



TMS320DM6437 Digital Video Development Platform (DVDP)

### DaVinci Hardware and Software Development Tools

Description	Part Number	U.S. <sup>1</sup>
<b>Evaluation Module (EVM)</b>		
TMS320DM6437 Digital Video Development Platform	TMDXVDP6437 (U.S. part number)	495

<sup>1</sup> Prices are quoted in U.S. dollars and represent year 2007 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. **New tools are listed in red.**

# Find Products Fast!

[www.ti.com/selection](http://www.ti.com/selection)

## Product Selection Guides:

- Amplifier and Data Converter
- Analog Switch
- Clocks & Timing
- DSP
- Interface
- Logic
- Low-Power RF
- MSP430
- Power Management





## Digital Video

### TMS320DM64xx DaVinci™ Software

#### Digital Media Software

eXpressDSP™ Digital Media Software is production tested and optimized for a portfolio of DSP and SoC platforms. Instead of investing time and effort in standardized media software, manufacturers are able to save years of development time to differentiate their digital media products. eXpressDSP digital media software is available for free evaluation and numerous flexible pricing options exist to fit any development need. Visit [www.ti.com/digitalmediasoftware](http://www.ti.com/digitalmediasoftware) to:

- Evaluate digital media software at no charge for 60 days with a simple click-wrap license.
- Learn more about flexible production licensing that allows for a range of

pricing options based on project quantity and download 10 KU volume pricing options

Unlike example software or freeware, all digital media software components have been developed by following stringent coding guidelines. Accompanying each module is a re-targetable production library featuring reentrant code. Each module is fully documented with a datasheet, release notes, user guide and usage examples.

All digital media software is both unit tested and system tested by applying thousands of test vectors in world-class testing labs. In addition, a wide range of use-case scenarios from end equipments/ applications, including cell phones,

wireless networking, video/IP phones, streaming media, set-top boxes and others contribute to the library of test vectors used to validate each algorithm.

#### Current Listing of eXpressDSP Digital Media Software

e = encode d = decode

Currently Available	Available 1H 2007
H.264 MP d D1	WMV9 MP / VC1 d D1
H.264 BP e/d D1	WMV9 MP / VC1 e D1
MPEG-4 SP e/d D1	WMA8 e
MPEG-2 MP d D1	AAC HE e
JPEG e/d D1	AAC LC e
AAC LC d	G.729 AB e/d
MP3 d	G.726 e/d
G.711 e/d	G.723.1 e/d
HE-AAC d	
AC3 d	
WMA9 d	

#### Authorized Software Providers Support TI Digital Media Software



TI's Digital Media Software is fully supported through a worldwide network of Authorized Software Providers (ASPs). Highly qualified, trained ASPs make evaluation and implementation easy, so you can

focus on differentiating products and accelerating your time-to-market.

Start your evaluation today – Offering production-ready software, and robust support, the TI Digital Media Software program includes:

- A free 60-day evaluation period, including four hours of technical support from your ASP
- Flexible production licensing models, which include up to 40 hours of technical support from your ASP

#### Authorized Software Providers by Region

ASPs	Regions						
	Americas	Europe	China	Asia – Other	Japan	Korea	India
ATEME	X	X	X	X	X	X	
eInfochips	X	X					X
eSOL					X		
Ingenient	X	X	X	X	X	X	
Ittiam	X	X		X	X	X	X
Logic	X						
MPC Data		X					
Wintech Digital			X	X			X

For the most up-to-date information, visit [www.ti.com/davinci](http://www.ti.com/davinci)



## DaVinci™ Technology Support, Training and Resources

### DaVinci White Papers and Articles

View the wide variety of DaVinci white papers and articles to see the possibilities for designing and developing digital video and audio end-equipment devices and applications using DaVinci technology. Visit

[www.ti.com/davinciwhitepaper](http://www.ti.com/davinciwhitepaper)

### DaVinci Frequently Asked Questions (FAQ)

Have questions about DaVinci technology? Browse the DaVinci questions and answers to find out everything you need to know about the DaVinci processors, development tools, reference designs, applications frameworks, training and support at [www.ti.com/davincifaq](http://www.ti.com/davincifaq)

### CD Provides Comprehensive View of DaVinci Technology

This highly informative CD includes several white papers, an FAQ, a technical fact sheet, a product bulletin, benchmarks, customer reviews, information about third-party support and more. Get your free copy now at [www.ti.com/davincicd](http://www.ti.com/davincicd)



### DaVinci Technology Benchmarks

Get all the information you need about DaVinci processors' video benchmarks, including filters, FFTs, vector, search, image/video compression/decompression and telecom. The dedicated video-processing sub-system incorporates:

- Back end: Integrated OSD, four video DACs, 24-bit digital RGB output
- Front end: Resizer, image-processing engine, 16-bit digital input (DM6446 processor only)

Details are available at

[www.ti.com/davincibenchmarks](http://www.ti.com/davincibenchmarks)

### DaVinci Technology Product Bulletin

Learn just how the DaVinci platform simplifies the job of digital video innovation. Review key features, a processor block diagram, details about Digital Video Evaluation Module and much more. It's all here:

[www.ti.com/davinciproductbulletin](http://www.ti.com/davinciproductbulletin)

### Video360 Blog Provides Valuable Perspective

Check out the latest posts by TI's Gene Frantz, a recognized leader in DSP technology, and Jeremiah Golston, CTO for TI's DSP video and imaging group. Interesting, enlightening and opinionated, they'll give you insight into trends at TI and throughout the industry. See what they're saying at [www.ti.com/davinciblog](http://www.ti.com/davinciblog)



### Delve Into Digital Video with Video360 Podcasts and Vidcasts

The Video360 podcasts and vidcasts feature industry news, technology updates and practical tips regarding the latest innovations in digital video. Check out the archive at

[www.ti.com/davincipodvidcast](http://www.ti.com/davincipodvidcast)



### Webcasts Explore DaVinci Technology

Download the archived webcasts to help you learn how to accelerate and simplify your video system design.

- Programming Digital Video Using DaVinci Technology and Green Hills Software
- Programming Digital Video Using DaVinci Technology and MontaVista™ Linux
- Designing Digital Video Systems Leveraging DaVinci Technology
- Discover New DaVinci Products from Texas Instruments

View all of the webcasts now at [www.ti.com/davinciwebcasts](http://www.ti.com/davinciwebcasts)



### DaVinci Training

Discover how DaVinci technology benefits digital video or learn how to develop a complete video system centered around TMS320DM644x processors. Register today for the DaVinci workshops or download the many DaVinci on-line training sessions. Visit

[www.ti.com/davincitraining](http://www.ti.com/davincitraining)

### Third Party Support

Get details about a dozen members of TI's Third Party Network that provide integral components and tools complementing DaVinci technology. These companies offer various levels of video system integration, optimization and system expertise, further speeding your time-to-market. Get details at [www.ti.com/davinci3psupport](http://www.ti.com/davinci3psupport)





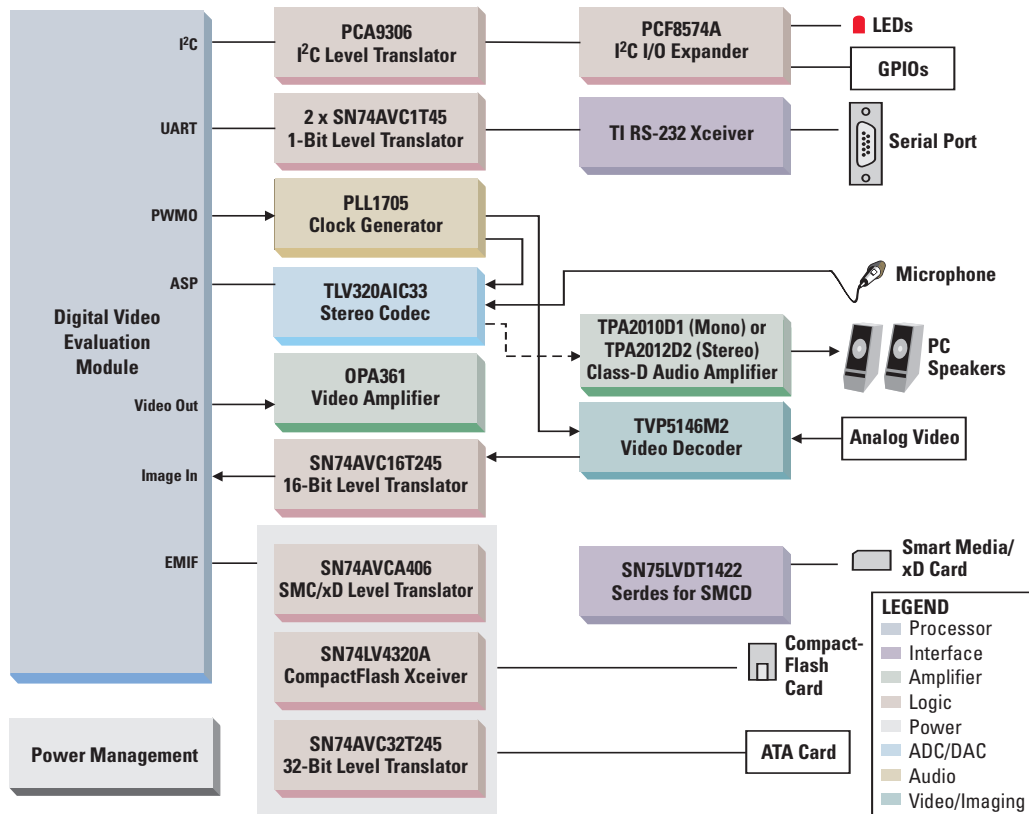
## Digital Video

### Compatible Analog Products for DaVinci™-Based Digital Video Applications

TI provides engineers with high-performance signal chain, interface, clocking and power management solutions to complete digital video applications based on DaVinci Technology. The

following block diagram represents a few of the many high-performance analog and logic products that help maximize the performance and functionality of your application.

High-Performance Analog & Logic Products featured on the DaVinci Technology-based Digital Video Evaluation Module (DVEVM).



TI offers a broad range of compatible Analog products to complement the DVEVM.



## DaVinci™ Technical Documentation

Application Notes	Web Search Literature #
Basic Application Loading over the Serial Interface for the DaVinci TMS320DM644x	SPRAAI0
Motion JPEG Demo on TMS320DM6446	SPRAAH9
Implementing DDR2 PCB Layout on the DM644x DMSoC	SPRAAC5
DaVinci System Level Benchmarking Measurements	SPRAAF6
Booting DaVinci EVM from NAND Flash	SPRAAA0
Fast Development with DaVinci On-Screen Display (OSD)	SPRAAD7
TMS320DM644x Power Consumption Summary	SPRAAD6
EDMA v3.0 (EDMA3) Migration Guide for TMS320DM644x DMSoC	SPRAAA6
TMS320C64x™ to TMS320C64x+™ CPU Migration Guide	SPRAA84
TMS320DM644x Thermal Considerations	SPRAAE4
User's Guides	
TMS320DM643x DMP 64-Bit Timer User's Guide	SPRU989
TMS320DM643x DMP Pulse-Width Modulator (PWM) User's Guide	SPRU995
TMS320DM643x DMP DDR2 Memory Controller User's Guide	SPRU986
TMS320DM643x DMP DSP Subsystem Reference Guide	SPRU978
TMS320DM643x DMP Inter-Integrated Circuit (I <sup>2</sup> C) Module User's Guide	SPRU991
TMS320DM643x DMP General-Purpose Input/Output (GPIO) User's Guide	SPRU988
TMS320DM643x DMP Asynchronous External Memory Interface (EMIF) UG	SPRU984
TMS320DM643x DMP Peripherals Overview Reference Guide	SPRU983
TMS320DM643x DMP EMAC/MDIO User's Guide	SPRU941
TMS320C64x+ DSP Cache User's Guide	SPRU862
TMS320C64x+ Megamodule Reference Guide	SPRU871
TMS320C64x/C64x+ DSP CPU and Instruction Set Reference Guide	SPRU732
TMS320DM644x DMSoC Enhanced Direct Memory Access (EDMA) Controller User's Guide	SPRUE23
TMS320C64x+ DSP Little-Endian Library Programmer's Reference Guide	SPRUEB8
TMS320DM643x DMP Peripherals Overview Reference Guide	SPRU983
TMS320DM643x DMP Inter-Integrated Circuit (I <sup>2</sup> C) Module User's Guide	SPRU991
TMS320DM643x DMP General-Purpose Input/Output (GPIO) User's Guide	SPRU988
TMS320DM643x DMP EMAC/MDIO User's Guide	SPRU941
TMS320DM643x DMP Asynchronous External Memory Interface (EMIF) UG	SPRU984
TMS320DM644x DMSoC VLYNQ™ Port User's Guide	SPRUE36
TMS320DM644x DMSoC Peripherals Overview Reference Guide	SPRUE19
TMS320C64x+ Image/Video Processing Library Programmer's Reference	SPRUEB9
TMS320C64x+ DSP Big-Endian Library Programmer's Reference	SPRUEC5
TMS320DM644x DMSoC Inter-Integrated Circuit (I <sup>2</sup> C) Peripheral UG	SPRUE27
TMS320DM644x DMSoC DDR2 Memory Controller User's Guide	SPRUE22
TMS320DM644x DMSoC Video Processing Front End (VPFE) User's Guide	SPRUE38
TMS320DM644x DMSoC Video Processing Back End (VPBE) User's Guide	SPRUE37
TMS320DM644x DMSoC Universal Serial Bus (USB) Controller User's Guide	SPRUE35
TMS320DM644x DMSoC Universal Asynchronous Receiver/Transmitter (UART) User's Guide	SPRUE33
TMS320DM644x DMSoC Serial Peripheral Interface (SPI) User's Guide	SPRUE32
TMS320DM644x DMSoC Pulse-Width Modulator (PWM) User's Guide	SPRUE31

User's Guides (Cont'd)	Web Search Literature #
TMS320DM644x DMSoC Multimedia Card (MMC)/Secure Digital (SD) Card Controller User's Guide	SPRUE30
TMS320DM644x DMSoC Audio Serial Port (ASP) User's Guide	SPRUE29
TMS320DM644x DMSoC 64-Bit Timer User's Guide	SPRUE26
TMS320DM644x DMSoC General-Purpose Input/Output User's Guide	SPRUE25
TMS320DM644x DMSoC EMAC/MDIO Module User's Guide	SPRUE24
TMS320DM644x DMSoC Enhanced Direct Memory Access (EDMA) Controller User's Guide	SPRUE23
TMS320DM644x DMSoC ATA Controller User's Guide	SPRUE21
TMS320DM644x DMSoC Asynchronous External Memory Interface (EMIF) User's Guide	SPRUE20
TMS320DM644x DMSoC DSP Subsystem Reference Guide	SPRUE15
TMS320DM644x DMSoC ARM Subsystem Reference Guide	SPRUE14
TMS320C64x+ Megamodule Reference Guide	SPRU871
TMS320DM644x DMSoC Peripherals Overview Reference Guide	SPRUE19
TMS320C6000™ DSP Peripherals Overview Reference Guide	SPRU190
White Papers	
BDTI Analysis of TI Digital Video Evaluation Module	SPRY095
DaVinci Technology Background and Specifications	SPRT401
Transforming Performance to Safety in Automotive Applications	SPRY093
Transcoding FAQ	SPRV058
Transcoding Backgrounder	SPRV059
Programming Details of Codec Engine for DaVinci Technology	SPRY091
Video Compression: System Trade-Offs with H.264, VC-1 and Other Advanced CODECS	SPRY088
The DaVinci Effect: Achieving Digital Video Without Complexity	SPRY079
DaVinci Technology for Digital Video	SPRY067
The Future of Digital Video	SPRY066
Product Bulletins	
DaVinci-Based 3P Reference Design Simplifies Media Player Development	SPRT414
Universal IP Player Solution from ATEME	SPRT383
Digital Media Software Product Bulletin	SPRT390
Portable Media Player Based on DaVinci Technology	SPRT394
TMS320DM644x Digital Media Processors	SPRT411
DaVinci Technology – Digital Video Innovation Product Bulletin	SPRT378
DaVinci Benchmarks Product Bulletin	SPRT379
Digital Media Software Product Bulletin	SPRT390
DaVinci Software Product Bulletin	SPRT389
Data Sheets	
TMS320DM6446 Digital Media System-on-Chip	SPRS283
TMS320DM6446 Digital Media System-on-Chip Errata	SPRZ241
TMS320DM6443 Digital Media System-on-Chip	SPRS282
TMS320DM6443 Digital Media System-on-Chip Errata	SPRZ240
TMS320DM6431 Digital Media Processor	SPRS342
TMS320DM6433 Digital Media Processor	SPRS343
TMS320DM6435 Digital Media Processor	SPRS344
TMS320DM6437 Digital Media Processor	SPRS345



## Video and Imaging

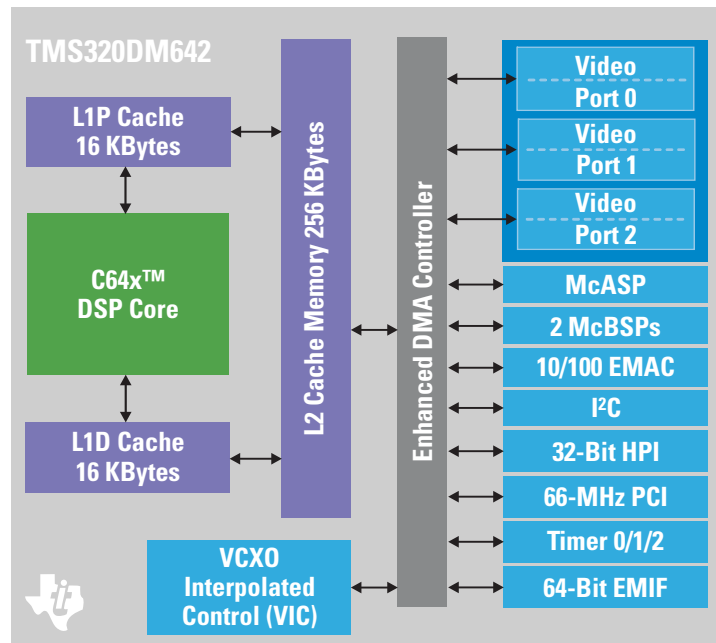
Get additional information at: [www.ti.com/videoandimaging](http://www.ti.com/videoandimaging)

### TMS320DM64x™ Digital Media Processors

The TMS320DM64x digital media processors are optimized for video and include a range of high-performance and low-cost options. The TMS320DM64x generation

of digital media processors are fully programmable and offer industry-leading performance for the most demanding streaming multimedia applications. In

addition, TI offers a wide range of complementary analog parts, easy-to-use development tools, extensive video and imaging third-party algorithms and more.



#### TMS320DM642 DSP Block Diagram

The TMS320DM64x digital media processors give designers the industry's most powerful, flexible and easy-to-use solutions for high-performance digital media applications.





## TMS320DM64x™ DSP Generation – Video Application-Specific Fixed-Point DSPs

Part Number	Internal RAM (Bytes) L1 Program Cache/ L1 Data Cache/ L2 Unified RAM/Cache	Video Ports	McBSP	Enhanced DMA (Channels)	COM <sup>2</sup>	Timers	MHz	MIPS	Power (W)		Voltage (V)		Packaging	1 KU (U.S.) <sup>1</sup>
									CPU and L1 <sup>3</sup>	Total <sup>4</sup>	Core	I/O		
<b>Video Application Specific</b>														
TMS320DM640AGDK4	16K/16K/128K	1 8-bit	2	64	EMAC	3	400	3200	0.66	1.15	1.2	3.3	548 BGA, 23 mm	21.45
TMS320DM640AGNZ4	16K/16K/128K	1 8-bit	2	64	EMAC	3	400	3200	0.66	1.15	1.2	3.3	548 BGA, 27 mm	21.45
TMS320DM641AGDK5	16K/16K/128K	2 8-bit	2	64	HPI 16/EMAC	3	500	4000	0.66	1.30	1.2	3.3	548 BGA, 23 mm	27.80
TMS320DM641AGNZ5	16K/16K/128K	2 8-bit	2	64	HPI 16/EMAC	3	500	4000	0.66	1.30	1.2	3.3	548 BGA, 27 mm	27.80
TMS320DM641AGDK6	16K/16K/128K	2 8-bit	2	64	HPI 16/EMAC	3	600	4800	0.93	1.90	1.4	3.3	548 BGA, 23 mm	30.60
TMS320DM641AGNZ6	16K/16K/128K	2 8-bit	2	64	HPI 16/EMAC	3	600	4800	0.93	1.90	1.4	3.3	548 BGA, 27 mm	30.60
TMS320DM643AGDK5	16K/16K/256K	2 20-bit	1	64	HPI 32/EMAC <sup>6</sup>	3	500	4000	0.66	1.30	1.2	3.3	548 BGA, 23 mm	30.90
TMS320DM643AGNZ5	16K/16K/256K	2 20-bit	1	64	HPI 32/EMAC <sup>6</sup>	3	500	4000	0.66	1.30	1.2	3.3	548 BGA, 27 mm	30.90
TMS320DM643AGDK6	16K/16K/256K	2 20-bit	1	64	HPI 32/EMAC <sup>6</sup>	3	600	4800	0.93	1.90	1.4	3.3	548 BGA, 23 mm	33.70
TMS320DM643AGNZ6	16K/16K/256K	2 20-bit	1	64	HPI 32/EMAC <sup>6</sup>	3	600	4800	0.93	1.90	1.4	3.3	548 BGA, 27 mm	33.70
TMS320DM642AGDK5	16K/16K/256K	3 20-bit	2 <sup>5</sup>	64	PCI/HPI 32/EMAC <sup>6</sup>	3	500	4000	0.66	1.30	1.2	3.3	548 BGA, 23 mm	36.70
TMS320DM642AGNZ5	16K/16K/256K	3 20-bit	2 <sup>5</sup>	64	PCI/HPI 32/EMAC <sup>6</sup>	3	500	4000	0.66	1.30	1.2	3.3	548 BGA, 27 mm	36.70
TMS320DM642AGDK6	16K/16K/256K	3 20-bit	2 <sup>5</sup>	64	PCI/HPI 32/EMAC <sup>6</sup>	3	600	4800	0.93	1.90	1.4	3.3	548 BGA, 23 mm	40.35
TMS320DM642AGNZ6	16K/16K/256K	3 20-bit	2 <sup>5</sup>	64	PCI/HPI 32/EMAC <sup>6</sup>	3	600	4800	0.93	1.90	1.4	3.3	548 BGA, 27 mm	40.35
TMS320DM642AGDK7	16K/16K/256K	3 20-bit	2 <sup>5</sup>	64	PCI/HPI 32/EMAC <sup>6</sup>	3	720	5760	0.93	2.15	1.4	3.3	548 BGA, 23 mm	56.90
TMS320DM642AGNZ7	16K/16K/256K	3 20-bit	2 <sup>5</sup>	64	PCI/HPI 32/EMAC <sup>6</sup>	3	720	5760	0.93	2.15	1.4	3.3	548 BGA, 27 mm	56.90

<sup>1</sup> Prices are quoted in U.S. dollars and represent year 2007 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.

<sup>2</sup> HPI is selectable, 32-bit or 16-bit.

<sup>3</sup> Assumes 60% CPU utilization.

<sup>4</sup> Assumes 60% CPU utilization, 50% EMIF utilization (133 MHz for 1.4 V, 100 MHz for 1.2 V), 50% writes, 64-bits, 50% bit switching, 2.2-MHz McBSP at 100% utilization, and 2 50-MHz timers at 100% utilization. See SPRA962.

<sup>5</sup> The DM642 can be configured to have up to three serial ports in various video/McASP/McBSP combinations.

<sup>6</sup> The DM640 has an Ethernet MAC. The DM641 can be configured to have either a 16-bit HPI or Ethernet MAC. The DM643 can be configured to have either a 32-bit HPI or a 16-bit HPI and Ethernet MAC. The DM642 can be configured to have either a 32-bit PCI or 32-bit HPI or a 16-bit HPI and Ethernet MAC.

Note: Check [www.ti.com](http://www.ti.com) for extended temperature and packaging options. Enhanced plastic and Military DSP versions are available for selected DSPs.

## Video and Imaging Development Tools



TMS320DM642 Digital Media Development Kit

### TMS320DM642 Digital Media Development Kit (DM642 DMDK)

The DMDK allows immediate development of multi-channel, multi-format digital media applications or other future-ready, high-performance video and imaging applications. Loaded with starterware, supported by eXpressDSP™ host tools and target software and offered at an exceptional price/performance ratio, the DMDK (part number TMDXDMK642) is a comprehensive, fully integrated development platform and an easy-to-use, robust tool suite. Based on the high-performance TMS320C64x™ DSP core, this development platform supports TI's DM642, DM641 and DM640 digital media processors. The DMDK is ideal for developers who have minimal experience with DSP as well as developers who are experienced with programmable DSPs and want to add multimedia functionality to an existing or new product/system.

For more information, contact your authorized TI distributor or visit [www.ti.com/dm64xdevkit](http://www.ti.com/dm64xdevkit)



## Video and Imaging

**TMS320DM642 Evaluation Module (DM642 EVM)** – The DM642 EVM (part number TMDSEVM642) is a low-cost, high-performance video and imaging development platform designed to jump-start application development and evaluation of multi-channel and multi-format digital applications. Leveraging the high-performance TMS320C64x DSP core, this development platform supports TI's TMS320DM642, DM641 and DM640 digital media processors. This PCI form factor EVM is supported by award-winning eXpressDSP™ host tools and target software, allowing users to quickly and easily integrate eXpressDSP-compliant algorithms from over 100 TI third parties into the included starterware, accelerating evaluation and development of digital media solutions.

For more information, contact your authorized TI distributor or visit [www.ti.com/dm642evm](http://www.ti.com/dm642evm)



*TMS320DM642 Evaluation Module*



*VSIP Development Platform*

**Video Security over Internet Protocol (VSIP) Development Platform** – The VSIP development platform enables developers to build intelligent security cameras that take advantage of a digital IP network by leveraging the real-time performance and flexibility inherent in DSP technology.

Offering the flexibility of a programmable DSP solution, the VSIP development platform allows developers to change compression standards, add specific processing capabilities and develop different products on the same hardware platform – enabling a wide range of products and creating a future-proof system.

Using the VSIP development platform, developers can leverage advanced digital functionality by incorporating this function directly into a standalone IP camera or by incorporating functionality into a network encoder that supplies digital intelligence for multiple standard analog surveillance cameras. In the latter scenario, developers benefit from the ability to use existing cameras without the expense of replacing them with new ones.

The VSIP includes all the hardware, software and tools needed to create a fully digital system for the encoding and transmission of camera surveillance information.

The development platform is among the first to offer MPEG-4 compression, the latest and most efficient of the MPEG video compression algorithms, designed to minimize bandwidth requirements in network video transmission. Since the VSIP is an application-oriented, open platform, it is not necessary for developers to have a deep understanding of DSP programming techniques. Moreover, application software from developers and third parties is easy to integrate, allowing straightforward customization for market differentiation.

For more information, contact your authorized TI distributor or visit [www.ti.com/vsipinfo](http://www.ti.com/vsipinfo)



## Video and Imaging Hardware and Software Development Tools

Description	Part Number	Price <sup>1</sup>
<b>Hardware Development Tools</b>		
TMS320DM642 Digital Media Development Kit (DM642 DMDK)	TMDSDMK642 (U.S. part number) TMDSDMK642-0E (European part number)	6,495
Video Security over Internet Protocol Development Platform (VSIP) – NTSC format	TMDXVSK642 (U.S. part number)	15,000
VSIP Development Platform – PAL format	TMDXVSK642-0E (European part number)	
VSIP Development Platform with ATEME Emulator – NTSC format	TMDXVSK642-3 (U.S. part number)	16,000
VSIP Development Platform with ATEME Emulator – PAL format	TMDXVSK642-3E (European part number)	
Network and Video 1-GHz Development Kit	TMDXNVK6415-T (U.S. part number) TMDXNVK6415-TE (European part number)	4,495
<b>Evaluation Modules (EVMs)</b>		
Digital Video Evaluation Module (DVEVM)	TMDXEVM6446 (U.S. part number) TMDXEVM6446-0E (European part number)	2,495
TMS320DM642 Evaluation Module	TMDSEVM642 (U.S. part number) TMDSEVM642-0E (European part number)	1,995
<b>JTAG Emulators</b>		
XDS560™ PCI-Based High-Performance JTAG Emulator	TMDSEMU560	3,995
XDS560 Blackhawk USB High-Performance JTAG Emulator	TMDSEMU560U (U.S. part number) TMDSEMU560U-0E (European part number)	2,995
XDS510PP-Plus – Parallel Port Emulator for Windows	TMDSEMUPP (U.S. part number) TMDSEMUPP-0E (European part number)	1,500
XDS510™ USB-Based Emulator for Windows	TMDSEMUUSB	1,995
<b>Software Development Tools</b>		
<b>Digital Video Software Development Kit (DVSDK)</b> with MontaVista™ Pro Linux, Code Composer Studio™ IDE and XDS560 Emulator	TMDXSDK6446-L (U.S. part number) TMDXSDK6446-3L (U.S. part number)	6,995 10,995
Code Composer Studio™ Platinum v 3.3 Development Tools Bundled with Annual S/W Subscription Supports C6000™, C5000™, C2000™, DaVinci™ and OMAP™ processor platforms	TMDSCCSALL-1	3,595
C6000, C5000, C2000, DaVinci, and OMAP processor CCStudio Development Tools Annual Software Subscription for Version 3.10 and higher	TMDSSUBALL	600
Essential Guide to Getting Started with DSP CD-ROM Includes C6000 DSP and DaVinci Code Composer Studio 120-Day Free Evaluation Tools <sup>2</sup>	SPRC119D ( <a href="http://www.ti.com/freetools">www.ti.com/freetools</a> )	Free
TMS320C62x™ DSP Image Library	SPRC093	Free
TMS320C64x™ DSP Image Library	SPRC094	Free

<sup>1</sup> Prices are quoted in U.S. dollars and represent year 2007 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. **New tools are listed in bold red.**

<sup>2</sup> Includes full-featured Code Composer Studio Development Tools, code generation tools (C/C++ compiler/assembler/linker) and simulator all limited to 120 days.

## Video and Imaging Integrated Solutions

For more information on TI's video and imaging solutions, go to [www.ti.com/videoandimaging](http://www.ti.com/videoandimaging)



## Video and Imaging

### Video and Imaging eXpressDSP™-Compliant Third Parties

#### ATEME

Europe

[www.ateme.com](http://www.ateme.com)



ATEME is a worldwide provider of advanced video compression technology. Its expertise spans from the development of IP cores for DSP, FPGA and PC libraries to development platforms, production-ready designs and custom services.



#### BroadMotion

Western USA

[www.broadmotion.com/](http://www.broadmotion.com/)



BroadMotion develops JPEG2000 encoders and decoders optimized for hardware implementations where performance is critical. Their unique design, broad platform support and common API enable vendors to rapidly implement the fastest and most advanced hardware support.

#### Clarity Design

Western USA

[www.claritydsn.com/](http://www.claritydsn.com/)



Clarity Design is a full-service engineering and manufacturing firm that excels at turning ideas into reality. Since 1991, Clarity Design has created cost-effective, highly manufacturable products for audio/video, control, security and other leading industries.

#### Divx Networks

Western USA

[www.divxnetworks.com](http://www.divxnetworks.com)



DivX, Inc. creates and distributes DivX® video technology, the defacto standard for digital video. DivX 6, which introduces the DivX Media Format, includes DivX video, audio and advanced media features for a truly interactive experience.

#### eInfochips

India

[www.einfochips.com](http://www.einfochips.com)



eInfochips has extensive experience with TI's TMS320DM64x™ digital media and TMS320DM644x DaVinci™ technology-based platforms and provides complete solutions from concept to prototype development including hardware design, firmware development and application integration.



#### Empower Technologies

Western USA

[www.empowertechologies.com](http://www.empowertechologies.com)



Empower Technologies offers LEOs, the Linux-based embedded operating software and Software Development Kit (SDK), DSP codecs, and LDK591x embedded system development platforms for consumer electronics developers and manufacturers.

#### eSol

Japan

[www.esolglobal.com/](http://www.esolglobal.com/)



eSol is a leading embedded software developer with core expertise in real-time operating system suites and integrated development environments for DM644x DaVinci technology-based processors.



#### Ingenient Technologies

Central USA

[www.ingenient.com](http://www.ingenient.com)



Ingenient Technologies offers a wide spectrum of embedded software plus hardware products and system solutions that enable the creation, delivery, management and presentation of rich multimedia content.



#### InterVideo

Western USA

[www.intervideo.com](http://www.intervideo.com)



InterVideo is a leading provider of DVD software and offers a broad suite of advanced digital video and audio multimedia software products that allow users to record, edit, author, distribute and play digital multimedia content on PCs and other devices.

#### Ittiam Systems

India

[www.ittiam.com](http://www.ittiam.com)



Ittiam Systems, headquartered in Bangalore, is primarily focused on DSP systems for the media and communications industries. The company operates through its network of offices and representatives around the world.



#### Logic Product Development

Central USA

[www.logicpd.com](http://www.logicpd.com)



Logic's product development process and high-performance teams expertly combine user research, design, technology and manufacturing to create innovative new products and product categories.



## Video and Imaging



### Mango DSP

Western USA

[www.mangodsp.com](http://www.mangodsp.com)



Mango DSP is a leading system provider of video-processing DSP-based solutions. Mango has a large range of products designed for the homeland security, video and imaging markets.



### Mistral

Western USA

[www.mistralsoftware.com](http://www.mistralsoftware.com)



Mistral Software provides end-to-end services for product design and development in the embedded space. Established in 1997, Mistral is a single source for both hardware and software engineering expertise.



### MPC Data

Europe

[www.mpcdata.co.uk](http://www.mpcdata.co.uk)



MPC Data Limited is one of the UK's leading creative software solution providers. Through their in-house teams of business and technical specialists, they are able to combine consultancy, analysis, design, implementation and supporting services.



### Object Video

Eastern USA

[www.objectvideo.com](http://www.objectvideo.com)



ObjectVideo's OnBoard™ program allows original equipment manufacturers (OEMs) to significantly increase the value and effectiveness of their solutions by embedding intelligent video analytics into a wide variety of video-related devices.

### W&W Communications

Western USA

[www.wwcoms.com](http://www.wwcoms.com)



W&W Communications develops a range of video codecs optimized for Texas Instruments DSPs. Its H.264 codec is an efficient and flexible H.264 compression solution for full D1 and 2-way communication.

### Wintech Digital

China

[www.wintechdigital.com/](http://www.wintechdigital.com/)

Wintech Digital Systems Technology Corp. is an embedded video communication solution and DSP development tool provider. It has developed DSP development platforms, target boards, emulators and DSP application software.



## Video and Imaging eXpressDSP™-Compliant Third-Party Algorithms

VIDEO & IMAGING ALGORITHMS
BSAC
DivX™
Dolby® Digital
DV25
H.263
H.263 Baseline Profile
H.264
H.264 Baseline Profile CIF
H.264 Baseline Profile D1
H.264 Main Profile
JPEG
JPEG2000

VIDEO & IMAGING ALGORITHMS (CONT'D)
JPEG/GIF/BMP/TIFF
MJPEG
MP3
MPEG-1/2 Layer II
MPEG-2
MPEG-2 AAC LC
MPEG-2 PS/TS Demux
MPEG-4
MPEG-4 AAC LC
MPEG-4 Simple Profile
MPEG-4 SP Transrater
MPEG-4 Advanced Simple Profile

VIDEO & IMAGING ALGORITHMS (CONT'D)
MPEG-4 ASP Transrater
MPEG-4 ASP L4&L5 Transrater
MPEG-4 Fine Granularity Scalable Profile Transrater
MPEG-4 H.264 Transrater
MPEG-4 AAC/HE
MPEG-4 Simple Scalable Profile
WMV9
WMV Main Profile
All combinations of MPEG-4 to MPEG-2 to H.264 to WMV transcoders



## Video and Imaging

### Power Management Products for the TMS320DM644x/DM643x/DM64x™ DSP Generations

Get samples, datasheets, Evaluation Modules (EVMs) and app reports at: [power.ti.com](http://power.ti.com)

#### Suggested Texas Instruments Power Management Solutions for Battery-Powered TMS320DM644x/TMS320DM643x Processors

Core and I/O Voltages						
Input Voltage	LDO	Synchronous Controller (External FETs)	Non-Synchronous Controller (External FET and Diode)	Synchronous Integrated FET Converter	Non-Synchronous Integrated FET Converter	PMU Multiple-Output Controller
3.3 V	TPS75401	TPS40041	TPS64200	TPS62040		TPS65023
5 V	TPS75401	TPS40042	TPS64200	TPS62040	TPS54350	TPS65023
12 V		TPS40190	TPS40200		TPS5420	TPS5124
24 V			TPS40200*		TPS5420*	

\*Due to  $V_{out}/V_{in}$  ratio core voltage may have to be stepped down from I/O voltage.

I/O supply 3.3 V, current up to 1 A

Core supply down to 1.0 V, current up to 2 A

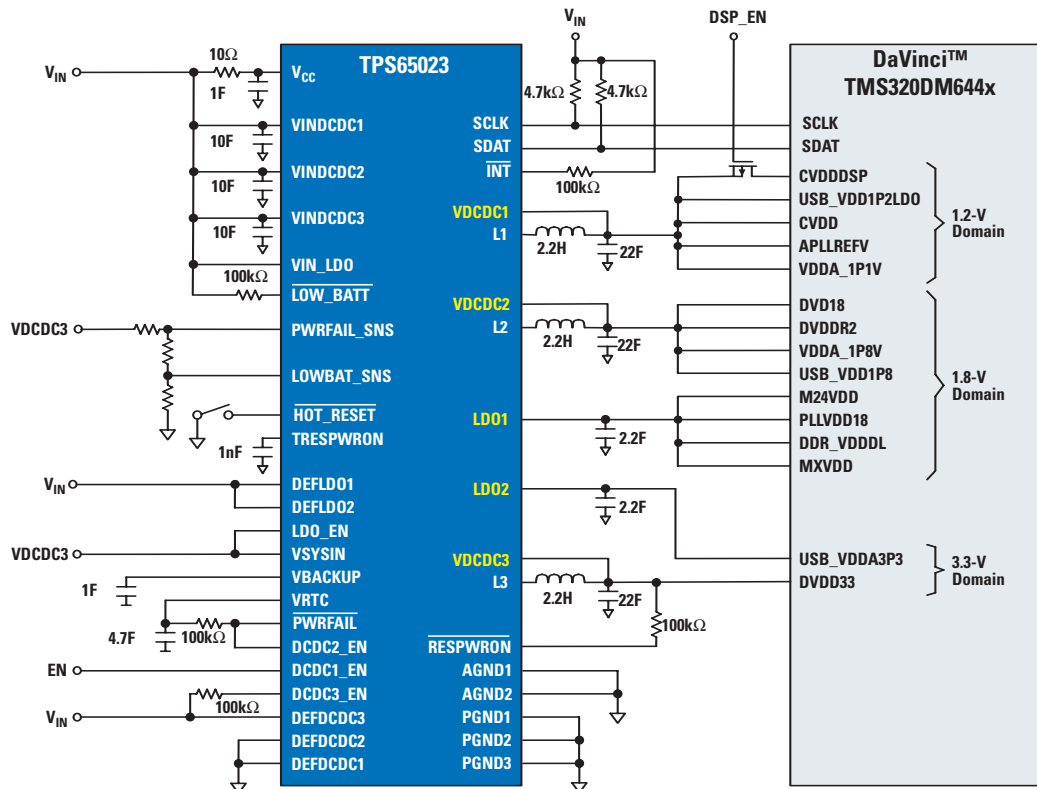
#### Suggested Texas Instruments Power Management Solutions for Line-Powered TMS320DM644x/DM643x/DM64x™ Processors

Core and I/O Voltages								
Input Voltage	LDO	Synchronous Controller (External FETs)	Non-Synchronous Controller (External FET and Diode)	Synchronous Integrated FET Converter	Non-Synchronous Integrated FET Converter	Non-Isolated Power Module	Isolated Power Module	PMU Multiple-Output Controller
3.3 V	TPS75401	TPS40041	TPS64200	TPS54317		PTH04070		TPS65023
5 V	TPS75401	TPS40042	TPS40200	TPS54317	TPS54350	PTH04070		TPS65023
12 V		TPS40190	TPS40200	TPS54350	TPS54350	PTH08080		TPS5124
24 V		TPS40057	TPS40200*		TPS5430*	PTN78000*	PTB78560*	
48 V		TPS40061	TPS40200*				PTMA403033*	

\*Due to  $V_{out}/V_{in}$  ratio core voltage may have to be stepped down from I/O voltage.

I/O supply 3.3 V, current up to 1 A

Core supply down to 1.0 V, current up to 2 A





## Video and Imaging Technical Documentation

Application Notes	Web Search Literature #
Image Processing Examples with the C62x™ DSP Generation Image/Video Processing Library (IMGLIB)	SPRA886
Image Processing Examples with the C64x™ DSP Generation Image/Video Processing Library (IMGLIB)	SPRA887
Performance Analysis of Face Recognition Algorithms on C64x DSPs	SPRA874
Real-Time Digital Video Transfer via High-Speed RTDX™	SPRA398
Wavelet Transforms in the TMS320C55x™ DSP Generation	SPRA800
Programming the VC5509 DSP Multi Media Controller in Native Mode	SPRA808
H.263 Encoder: TMS320C6000™ DSP Implementation	SPRA721
H.263 Decoder: TMS320C6000 DSP Implementation	SPRA703
Optimizing JPEG on the TMS320C6211 2-Level Cache DSP	SPRA705
TMS320C6000 DSP Platform JPEG Implementation	SPRA704
JPEG for Digital Panel on the TMS320C5000™ DSP Platform	SPRA664
Hardcopy Solutions, the HAVE Revolution and TI DSPs	SPRA652
Programmable DSP Platform for Digital Still Cameras	SPRA651
MPEG-2 Video Decoder: TMS320C62x DSP Implementation	SPRA649
On the Implementation of MPEG-4 Motion Compensation Using the TMS320C62x DSP Generation	SPRA586
A DSP-Based Three-Dimensional Graphics System	SPRA402
Digital Monopulse Doppler Radar and DSP Teaching	SPRA342

Check the TI website for a complete listing of technical documentation including application notes.

Application Notes (Cont'd)	Web Search Literature #
A DSP Kernel for On-Line Dynamic Handwritten Signature Verification Using TMS320™ DSPs	SPRA304
Front-End Processing for Monopulse Doppler Radar	SPRA299
Implementing the Color Space Transformation Algorithm Using the TMS320C2xx DSPs	SPRA364
DSP-Based Handprinted Character Recognition	SPRA143
High Resolution Video Using the DM642 DSP and the THS8200 Driver	SPRA961
Interfacing an LCD Controller to a DM642 Video Port	SPRA975
Software Reference Guides	
TMS320C62x DSP Image/Video Library Programmer's Reference	SPRU400
TMS320C64x DSP Image/Video Processing Library Programmer's Refer.	SPRU023
Product Bulletins	
Network Video Developer's Kit Product Bulletin	SPRT247
TMS320DM64x Digital Media Development Tools Product Bulletin	SPRT281
Video Phone Development Platform Product Bulletin	SPRT344
Video Security over Internet Protocol (VSIP) Dev. Platform Product Bulletin	SPRT284
Data Sheets	
TMS320DM642 DSP Data Sheet	SPRS200
TMS320DM641/DM640 DSP Data Sheet	SPRS222
TMS320DM643 DSP Data Sheet	SPRS269

## Video and Imaging DSP Signal Processing Libraries

Signal Processing Libraries	Website
TMS320C64x™ DSP Image Library	www.ti.com/c64ximagelib

## Additional Resources

### Video/Imaging On-Line Information

A wealth of video/imaging information awaits you at [www.ti.com/video](http://www.ti.com/video)

Whether you need details about any of TI's vast array of devices ... or block diagrams regarding various end equipments ... or links to selection guides, solutions guides and application notes, you'll find it here. You'll also find access to:

- Development boards and EVMs
- Various system block diagrams
- White papers
- TI device information
- Free Digital Media Focus eNewsletter
- Video/imaging events around the world
- News releases

Check out TI's video/imaging applications page today. And bookmark it for the future.

### Video and Imaging Solutions Guide

Explore TI's solutions for a wide variety of video and imaging applications in this comprehensive guide. TI's Video and Imaging Solutions Guide contains valuable video and imaging information for your design needs. Find out everything you need to know in this complete guide that includes system block diagrams, product information, development tools, software, support and various other resources.

[www.ti.com/visolutionsguide](http://www.ti.com/visolutionsguide)



### Subscribe to the Digital Media eNewsletter

TI's technologies and resources allow you to design high-end to low-cost video/imaging products with DSP-based solutions. Subscribe to the monthly Digital Media eNewsletter to receive the latest TI technology releases, informative documentation, time-saving training and other useful tips and tricks to get your design to market quickly. Go to [www.ti.com/digitalmediafocus](http://www.ti.com/digitalmediafocus) to subscribe.





## Overview



### Advantages of Designing with DSPs Over Other Architectures

- Multiple multiply-accumulate operations per cycle
- Real-time performance, simulation and emulation
- Programming flexibility
- Reliability
- Increased system performance
- Reduced system cost

Texas Instruments offers a broad portfolio of DSPs and a wide range of peripheral, price and performance options so that you can choose a DSP that best fits your application. In addition, code compatibility within each platform ensures that your software investment will be reusable in future designs. The TMS320™ DSP family includes:

#### MCU-Like Control, DSP Performance: TMS320C2000™ DSP Platform

The C2000™ digital signal controller platform combines the control peripheral integration and ease-of-use of a microcontroller (MCU) and the processing power and C efficiency of TI's leading DSP technology. C2000 DSPs are ideal for embedded industrial applications such as digital motor control, digital power supplies and intelligent sensor applications.

#### Power-Efficient Performance: TMS320C5000™ DSP Platform

The C5000™ DSP platform offers the industry's lowest standby power and advanced automatic power management for personal and portable products like digital music players, VoIP, hands-free accessories, GPS

receivers and portable medical equipment.

#### Highest Performance: TMS320C6000™ DSP Platform

The C6000™ DSP platform offers the industry's highest performance fixed- and floating-point DSPs ideal for video, imaging, broadband infrastructure and performance audio applications.

#### DaVinci™ Technology: Optimized for Digital Video

DaVinci technology is optimized for digital video systems and includes a portfolio of digital signal processing System-on-Chips (SoCs) that are based on the TMS320C64x+™ DSP core, software codecs, Authorized Software Providers (ASPs), frameworks and development tools. These integrated components are the industry's first complete offering of an open platform.

#### Applications Matrix Guideline

	C2000 DSP	C5000 DSP	C6000 DSP	DaVinci SoC	OMAP™
Audio	•	•	•	•	•
Biometrics		•	•		•
Digital Control	•	•			
Telecom	•	•	•		•
Video and Imaging			•	•	•

#### Easy-to-Use Software and Development Tools

For accelerated DSP product development, TMS320 DSPs are supported by eXpressDSP™ Software and Development Tools including Code Composer Studio™ IDE, DSP/BIOS™ kernel, TMS320 DSP Algorithm Standard and numerous reusable, modular software from the largest Third Party Network in the industry.

#### Complementary Analog Products

TI offers a range of complementary data converter, power management, amplifiers, interface and logic products to complete your design.

#### For More Information

Visit [www.ti.com/dsp](http://www.ti.com/dsp) for technical documentation, systems block diagrams and more.





## TMS320C28x™ Controller Generation, Fixed Point

MCU Control. DSP Performance

Get samples, datasheets, tools and app reports at: [www.ti.com/c2000](http://www.ti.com/c2000)

### Specifications

- 32-bit, fixed-point C28x™ DSP core
- Up to 150-MIPS operation
- 1.8-/1.9-V core and 3.3-V peripherals
- Easy-to-use software and development tools speed time-to-market

### Applications

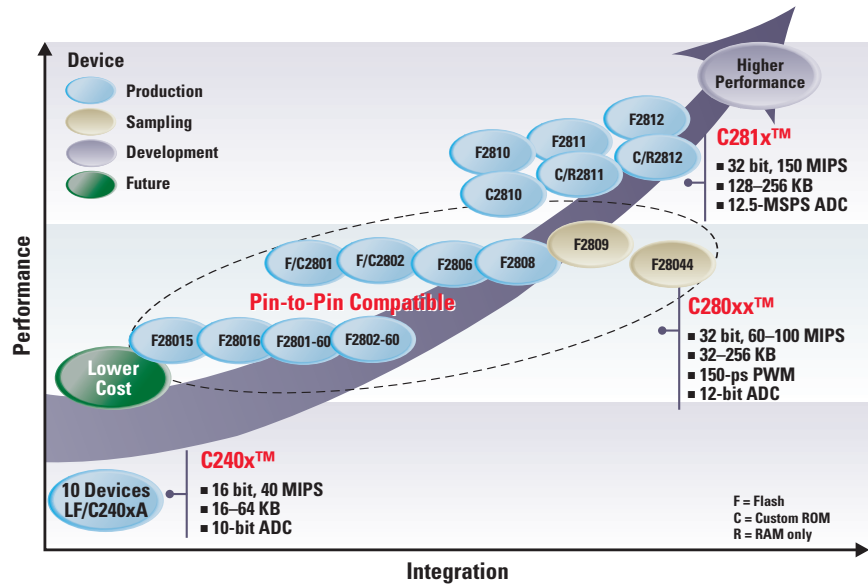
Digital motor control, digital power supply and advanced sensing in industrial, automotive, medical and consumer markets

### Features

- Ultra-fast 20–40 ns service time to any interrupts
- Powerful 20 Mbit/s data logging debug capability
- 32-/64-bit saturation, single-cycle read-modify-write instructions, and 64-/32-bit and 32-/32-bit modulus division
- Enhanced tool suites with C and C++ support
- Unique real-time debugging capabilities
- 32 × 32-bit single-cycle fixed-point MAC
- Dual 16 × 16-bit single-cycle fixed-point MACs
- Supported by 16-bit instructions for improved code efficiency
- Compatible with TMS320C24x™ DSP and TMS320C2xLP™ source code

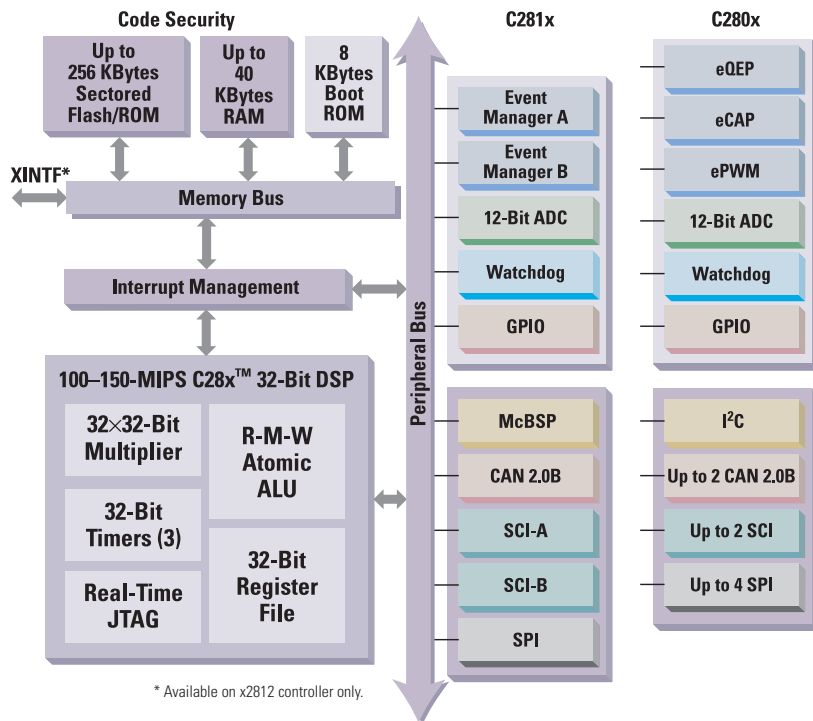
### Peripherals

- 16 to 128 Kwords sectored Flash or factory programmed ROM (with code security)
- 12-bit A/D, as fast as 12.5-MSPS throughput with 80-ns minimum conversion time
- Flexible QEP, CAP, timers and PWM generation
- High-res mode resolution of 16 bits @ 100 KHz and over 12 bits @ 1.5-MHz ePWM frequency
- Up to two serial communication interfaces (SCI / UART)
- Up to four serial peripheral interfaces (SPI)
- Up to two enhanced CAN 2.0B modules
- McBSP or I<sup>2</sup>C



### TMS320C2000 Digital Signal Controller Platform Roadmap

The C2000™ controller platform provides an optimized combination of DSP performance and MCU integration for digital control systems.



### TMS320C28x Digital Signal Controller Block Diagram

The C28x controllers are the industry's first 32-bit control-based DSPs with onboard reprogrammable Flash, factory programmed ROM, or cost effective RAM-only memory options and performance from 100 to 150 MIPS.



Silicon

## TMS320C28x™ Controller Generation

Device <sup>1</sup>	(F) Flash	(R) RAM-Only	(C) ROM	MIPS	Boot ROM	RAM	Flash/ROM	Timers	CAP/QEP	PWM Channels	# HiRes PWM	12-Bit A/D Chs/ Conversion Time (ns)	EMIF	WD Timer	Comm Ports				I/O Pins	Core Voltage (V)	Packaging	1 KU (SU.S.) <sup>*</sup>
															Other	SPI	SCI	CAN				
TMS320F28015 - PZA/S/Q	60	8 KB	12 KB	32 KB	9	2/0	8 + 2	4	16 ch/267	–	Y	I <sup>2</sup> C	1	1	0	35	1.8	100 LQFP	3.25			
TMS320F28016 - PZA/S/Q	60	8 KB	12 KB	32 KB	9	2/0	8 + 2	4	16 ch/267	–	Y	I <sup>2</sup> C	1	1	1	35	1.8	100 LQFP	3.50			
TMS320F2801-60 - PZA/S/Q	60	8 KB	12 KB	32 KB	9	2/1	6 + 2	3	16 ch/267	–	Y	I <sup>2</sup> C	2	1	1	35	1.8	100 LQFP	3.95			
TMS320F2802-60 - PZA/S/Q	60	8 KB	12 KB	64 KB	9	2/1	6 + 2	3	16 ch/267	–	Y	I <sup>2</sup> C	2	1	1	35	1.8	100 LQFP	4.75			
TMS320F2801-PZA/S/Q	100	8 KB	12 KB	32 KB	9	2/1	6 + 2	3	16 ch/160	–	Y	I <sup>2</sup> C	2	1	1	35	1.8	100 LQFP	5.80			
TMS320F2801-GGMA/S <sup>2</sup> , ZGMA/S	100	8 KB	12 KB	32 KB	9	2/1	6 + 2	3	16 ch/160	–	Y	I <sup>2</sup> C	2	1	1	35	1.8	100 BGA	5.80			
TMS320F2802-PZA/S/Q	100	8 KB	12 KB	64 KB	9	2/1	6 + 2	3	16 ch/160	–	Y	I <sup>2</sup> C	2	1	1	35	1.8	100 LQFP	7.10			
TMS320F2802-GGMA/S <sup>2</sup> , ZGMA/S	100	8 KB	12 KB	64 KB	9	2/1	6 + 2	3	16 ch/160	–	Y	I <sup>2</sup> C	2	1	1	35	1.8	100 BGA	7.10			
TMS320F2806-PZA/S/Q	100	8 KB	20 KB	64 KB	15	4/2	12 + 4	4	16 ch/160	–	Y	I <sup>2</sup> C	4	2	1	35	1.8	100 LQFP	8.70			
TMS320F2806-GGMA/S <sup>2</sup> , ZGMA/S	100	8 KB	20 KB	64 KB	15	4/2	12 + 4	4	16 ch/160	–	Y	I <sup>2</sup> C	4	2	1	35	1.8	100 BGA	8.70			
TMS320F28044-PZA/S	100	8 KB	20 KB	128 KB	19	0/0	16	16	16 ch/80	–	Y	I <sup>2</sup> C	1	1	0	35	1.8	100 LQFP	9.95			
TMS320F2808-PZA/S/Q	100	8 KB	36 KB	128 KB	15	4/2	12 + 4	4	16 ch/160	–	Y	I <sup>2</sup> C	4	2	2	35	1.8	100 LQFP	11.60			
TMS320F2808-GGMA/S <sup>2</sup> , ZGMA/S	100	8 KB	36 KB	128 KB	15	4/2	12 + 4	4	16 ch/160	–	Y	I <sup>2</sup> C	4	2	2	35	1.8	100 BGA	11.60			
TMS320F2809-PZA/S/Q	100	8 KB	36 KB	256 KB	15	4/2	12 + 4	6	16 ch/80	–	Y	I <sup>2</sup> C	4	2	2	35	1.8	100 LQFP	12.95			
TMS320F2809-GGMA/S <sup>2</sup> , ZGMA/S	100	8 KB	36 KB	256 KB	15	4/2	12 + 4	6	16 ch/80	–	Y	I <sup>2</sup> C	4	2	2	35	1.8	100 BGA	12.95			
TMS320F2810-PBKA/S/Q	150	8 KB	36 KB	128 KB	7	6/2	16	–	16 ch/80	–	Y	McBSP	1	2	1	56	1.9	128 LQFP	13.85			
TMS320F2811-PBKA/S/Q	150	8 KB	36 KB	256 KB	7	6/2	16	–	16 ch/80	–	Y	McBSP	1	2	1	56	1.9	128 LQFP	14.75			
TMS320F2812-GHHA/S <sup>2</sup> , ZHHA/S	150	8 KB	36 KB	256 KB	7	6/2	16	–	16 ch/80	Y	Y	McBSP	1	2	1	56	1.9	179 BGA	15.65			
TMS320F2812-PGFA/S/Q	150	8 KB	36 KB	256 KB	7	6/2	16	–	16 ch/80	Y	Y	McBSP	1	2	1	56	1.9	176 LQFP	15.65			
TMS320C2801-PZA/S/Q	100	8 KB	12 KB	32 KB	9	2/1	6 + 2	3	16 ch/160	–	Y	I <sup>2</sup> C	2	1	1	35	1.8	100 LQFP	3.99 <sup>3</sup>			
TMS320C2801-GGMA/S <sup>2</sup> , ZGMA/S	100	8 KB	12 KB	32 KB	9	2/1	6 + 2	3	16 ch/160	–	Y	I <sup>2</sup> C	2	1	1	35	1.8	100 BGA	3.99 <sup>3</sup>			
TMS320C2802-PZA/S/Q	100	8 KB	12 KB	64 KB	9	2/1	6 + 2	3	16 ch/160	–	Y	I <sup>2</sup> C	2	1	1	35	1.8	100 LQFP	4.90 <sup>3</sup>			
TMS320C2802-GGMA/S <sup>2</sup> , ZGMA/S	100	8 KB	12 KB	64 KB	9	2/1	6 + 2	3	16 ch/160	–	Y	I <sup>2</sup> C	2	1	1	35	1.8	100 BGA	4.90 <sup>3</sup>			
TMS320C2810-PBKA/Q	150	8 KB	36 KB	128 KB	7	6/2	16	–	16 ch/80	–	Y	McBSP	1	2	1	56	1.9	128 LQFP	7.08 <sup>3</sup>			
TMS320C2811-PBKA/Q	150	8 KB	36 KB	256 KB	7	6/2	16	–	16 ch/80	–	Y	McBSP	1	2	1	56	1.9	128 LQFP	8.25 <sup>3</sup>			
TMS320C2812-GHHA <sup>2</sup> , ZHHA	150	8 KB	36 KB	256 KB	7	6/2	16	–	16 ch/80	Y	Y	McBSP	1	2	1	56	1.9	179 BGA	9.61 <sup>3</sup>			
TMS320C2812-PGFA/Q	150	8 KB	36 KB	256 KB	7	6/2	16	–	16 ch/80	Y	Y	McBSP	1	2	1	56	1.9	176 LQFP	9.61 <sup>3</sup>			
TMS320R2811-PBKA/Q	150	8 KB	40 KB	–	7	6/2	16	–	16 ch/80	–	Y	McBSP	1	2	1	56	1.9	128 LQFP	9.15			
TMS320R2812-GHHA <sup>2</sup>	150	8 KB	40 KB	–	7	6/2	16	–	16 ch/80	Y	Y	McBSP	1	2	1	56	1.9	179 BGA	10.65			
TMS320R2812-PGFA/Q	150	8 KB	40 KB	–	7	6/2	16	–	16 ch/80	Y	Y	McBSP	1	2	1	56	1.9	176 LQFP	10.65			

<sup>1</sup> A = –40° to 85°C; S = –40 to 125°C (10% adder over A); Q = –40 to 125°C, Q100 qualified (15% adder over S)

<sup>2</sup> Non Pb-Free/Green version of MicroStar BGA™; All other devices are Pb-Free/Green.

<sup>3</sup> Minimum volumes for C28x devices are 10 KU with NRE of \$11,000.

<sup>\*</sup> Prices are quoted in U.S. dollars and represent year 2007 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.

*New devices are listed in red.*



## TMS320C24x™ Controller Generation, Fixed Point

MCU Control. DSP Performance

Get samples, datasheets, tools and app reports at: [www.ti.com/c2000](http://www.ti.com/c2000)

### Specifications

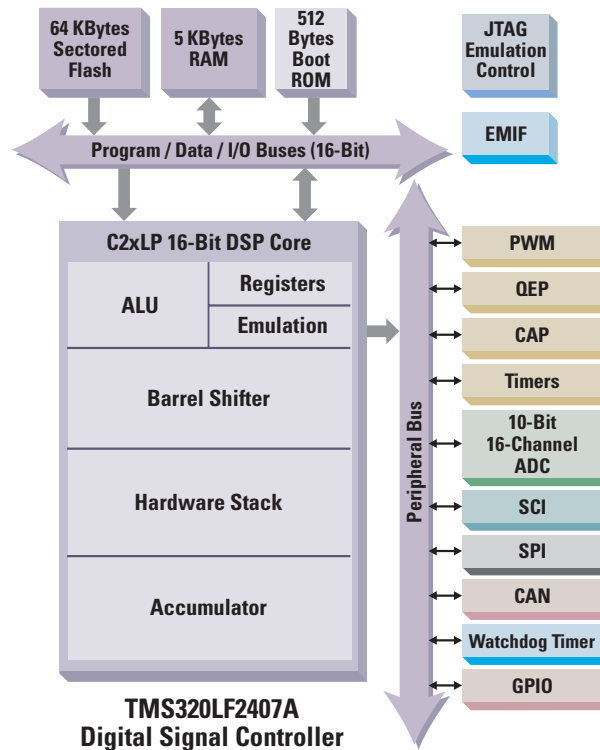
- Up to 40-MIPS operation
- Three power-down modes
- Code-compatible, control-optimized DSPs
- JTAG scan-based emulation
- 3.3-V and 5-V designs

### Applications

- Appliances/white goods, industrial automation, power conversion, metering, office equipment, sensing

### Features and Peripherals

- 375-ns (minimum conversion time) analog-to-digital (A/D) converter
- Deadband logic
- Dual 10-bit A/D converters
- Up to four 16-bit general-purpose timers
- Watchdog timer module
- Up to 16 PWM channels
- Up to 41 GPIO pins
- Five external interrupts
- Up to two event managers
- Up to 32K words on-chip sectored Flash
- Controller Area Network (CAN) interface module
- Serial communications interface (SCI)
- Serial peripheral interface (SPI)
- Up to six capture units (four with QEP)
- Boot ROM (LF240xA devices)
- Code security for on-chip Flash/ROM (Lx240xA devices)



**TMS320LF2407A Digital Signal Controller Block Diagram**

For high-performance industrial applications, the Flash-based LF2407A digital signal controller includes peripherals such as a controller area network (CAN) module to enable control of multiple motors by a single DSP-based controller.



### TMS320LF / C2401A Digital Signal Controllers: For Space-Constrained Designs

The TMS320LF/C2401A controllers pack a tremendous amount of power in an unbelievably small package. In only 49 mm<sup>2</sup>, the TMS320LF/C2401A controllers provide 40 MIPS of processing power with 500-ns conversion time, 8 Kw of sectored memory with code security and much more.

**Silicon****TMS320C24x™ Controller Generation**

Device	MIPS	Boot ROM	RAM	Flash	ROM	General-Purpose Timers	PWM Channels	10-Bit A/D Channels / Conversion Time (µs)	EMIF	Watchdog Timer	SPI	SCI	CAN	I/O Pins	Voltage (V)	Packaging	1 KU (U.S.) <sup>*</sup>
TMS320LC2401AVFA	40	–	2 KB	–	16 KB	2	7	5 ch / 0.5	–	Y	–	Y	–	13	3.3	32 LQFP	1.95 <sup>2</sup>
TMS320LC2402APGA <sup>1</sup>	40	–	1 KB	–	12 KB	2	8	8 ch / 0.425	–	Y	–	Y	–	21	3.3	64 PQFP	2.60 <sup>2</sup>
TMS320LC2402APAGA <sup>1</sup>	40	–	1 KB	–	12 KB	2	8	8 ch / 0.425	–	Y	–	Y	–	21	3.3	64 LQFP	2.60 <sup>2</sup>
TMS320LC2403APAGA <sup>1</sup>	40	–	2 KB	–	32 KB	2	8	8 ch / 0.425	–	Y	Y	Y	Y	21	3.3	64 LQFP	3.95 <sup>2</sup>
TMS320LC2404APZA <sup>1</sup>	40	–	3 KB	–	32 KB	4	16	16 ch / 0.375	–	Y	Y	Y	–	41	3.3	100 LQFP	4.55 <sup>2</sup>
TMS320LC2406APZA <sup>1</sup>	40	–	5 KB	–	64 KB	4	16	16 ch / 0.375	–	Y	Y	Y	Y	41	3.3	100 LQFP	5.20 <sup>2</sup>
TMS320LF2401AVFA	40	512 B	2 KB	16 KB	–	2	7	5 ch / 0.5	–	Y	–	Y	–	13	3.3	32 LQFP	3.50
TMS320LF2402APGA <sup>1</sup>	40	512 B	2 KB	16 KB	–	2	8	8 ch / 0.5	–	Y	–	Y	–	21	3.3	64 PQFP	7.10
TMS320LF2403APAGA <sup>1</sup>	40	512 B	2 KB	32 KB	–	2	8	8 ch / 0.5	–	Y	Y	Y	Y	21	3.3	64 LQFP	8.25
TMS320LF2406APZA <sup>1</sup>	40	512 B	5 KB	64 KB	–	4	16	16 ch / 0.5	–	Y	Y	Y	Y	41	3.3	100 LQFP	8.35
TMS320LF2407APGEA <sup>1</sup>	40	512 B	5 KB	64 KB	–	4	16	16 ch / 0.5	Y	Y	Y	Y	Y	41	3.3	144 LQFP	8.85

<sup>1</sup> Non Pb-Free/Green version of MicroStar BGA™; All other devices are Pb-Free/Green.

<sup>2</sup> Minimum volume for LC240xA devices is 10 KU with NRE of \$9,000.

<sup>\*</sup> Prices are quoted in U.S. dollars and represent year 2007 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.

**C2000 Controller Literature and Related Technical Documentation**

All documentation and associated literature, user's guides, application notes and software can be found by clicking on the specific device in the parametric table found on the URLs below.

TMS320C28x™ Controller Generation

[www.ti.com/c28x](http://www.ti.com/c28x)

TMS320C24x™ Controller Generation

[www.ti.com/c24x](http://www.ti.com/c24x)



## C2000™ Controller Platform Hardware and Software Development Tools

Description	Part #	U.S. <sup>1</sup>
<b>Starter Kits</b>		
F28044 eZdsp Starter Kit <sup>2</sup>	TMDXEZ28044 (U.S. part number)	495
F2808 eZdsp™ Starter Kit <sup>2</sup> (socketed)	TMDSEZS2808 (U.S. part number)	495
Includes USB cable, User's Guide, Code Composer Studio™ (CCStudio) IDE for eZdsp, power supply	TMDSEZS2808-0E (European part number)	
F2812 eZdsp Starter Kit <sup>2</sup>	TMDSEZD2812 (U.S. part number)	395
Includes parallel port cable, User's Guide, CCStudio IDE for eZdsp, power supply	TMDSEZD2812-0E (European part number)	
F2812 eZdsp Starter Kit <sup>2</sup> (socketed)	TMDSEZS2812 (U.S. part number)	495
Includes parallel port cable, User's Guide, CCStudio IDE for eZdsp, power supply	TMDSEZS2812-0E (European part number)	
LF2407A eZdsp Starter Kit <sup>2</sup>	TMDSEZD2407 (U.S. part number)	345
	TMDSEZD2407-0E (European part number)	
LF2401A eZdsp Starter Kit <sup>2</sup>	TMDSEZD2401 (U.S. part number)	595
	TMDSEZD2401-0E (European part number)	
<b>Evaluation Modules</b>		
Power Factor Correction Adapter Board	PFC2808 <a href="http://www.tierelectronics.com">www.tierelectronics.com</a>	295
Phase Shifted Full Bridge DC/DC Adapter Board	PSFB2808 <a href="http://www.tierelectronics.com">www.tierelectronics.com</a>	295
LF2407A Evaluation Module (EVM), CCStudio IDE, XDS510PP-Plus Emulator <sup>3</sup>	TMDS3P701016A (U.S. part number)	1,995
	TMDS3P701016AE (European part number)	
F2812 Development Bundle <sup>3</sup>	TMDSEVP2812 (U.S. part number)	1,995
Includes eZdsp (socketed), CCStudio IDE, XDS510PP-Plus	TMDSEVP2812-0E (European part number)	
F2812 Development Bundle <sup>3</sup>	TMDSEVU2812 (U.S. part number)	2,295
Includes eZdsp (socketed), CCStudio IDE, XDS510™ USB Emulator	TMDSEVU2812-0E (European part number)	
<b>JTAG Emulators</b>		
JTAGjet-TMS-C2000 USB Emulator for Windows	<a href="http://www.signum.com">www.signum.com</a>	595
XDS510PP-Plus Parallel Port Pod with JTAG Cable for Windows	TMDSEMUPP (U.S. part number)	1,500
	TMDSEMUPP-0E (European part number)	
XDS510 USB-Based Emulator for Windows	TMDSEMUUSB	1,995
XDS560™ PCI-Based High-Performance JTAG Emulator	TMDSEMU560	3,995
XDS560 Blackhawk USB High-Performance JTAG Emulator	TMDSEMU560U (U.S. part number)	2,995
	TMDSEMU560U-0E (European part number)	
<b>Software Development Tools</b>		
Code Composer Studio Platinum Edition Development Tools bundled with Annual Software Subscription	TMDSCCSALL-1	3,595
Supports C6000™, C5000™, C2000, DaVinci™ and OMAP™ processor platforms		
C2000 DSP Code Composer Studio Development Tools Annual Software Subscription	TMDSSUB2000	495
Essential Guide to Getting Started with DSP CD-ROM	SPRC119D	Free
Includes C6000, C5000, C2000, DaVinci and OMAP processor CCStudio 120-Day Free Evaluation Tools <sup>4</sup>	<a href="http://www.ti.com/freetools">www.ti.com/freetools</a>	
TMS320C2000 Flash Programming Utilities	<a href="http://www.ti.com/c2000flashtools">www.ti.com/c2000flashtools</a>	Free
TMS320C2000 Digital Motor Control Software	<a href="http://www.ti.com/c2000appsw">www.ti.com/c2000appsw</a>	Free
TMS320C2000 Digital Power Software	<a href="http://www.ti.com/dpslib">www.ti.com/dpslib</a>	Free
TMS320C2000 Signal Processing Libraries	<a href="http://www.ti.com/c2000sigproclib">www.ti.com/c2000sigproclib</a>	Free

<sup>1</sup>Prices are quoted in U.S. dollars and represent year 2007 suggested resale pricing. All prices are subject to change.

*New tools are listed in red.*

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.

<sup>2</sup>Includes board-specific Code Composer Studio integrated development environment IDE, code-generation tools, on-board JTAG emulation, target board and target-specific device driver.

<sup>3</sup>Includes Code Composer Studio, code generation tools with C compiler/assembler/linker, target board and device drivers.

<sup>4</sup>Includes full-featured Code Composer Studio Development Tools, code generation tools (C/C++ compiler/assembler/linker), emulator and simulator configurations all limited to 120 days. Alternative Development Tools are available from third parties such as EWA Blackhawk DSP ([www.blackhawk-dsp.com](http://www.blackhawk-dsp.com)), Spectrum Digital ([www.spectrumdigital.com](http://www.spectrumdigital.com)), Technosoft ([www.technosoft.ch](http://www.technosoft.ch)) and Softronics ([www.softronx.com](http://www.softronx.com)).

Please see the features supported by platform matrix on page 93 for more details.



## Tools, Software and Support

### Motor-Specific Software Solutions [www.ti.com/c2000appsw](http://www.ti.com/c2000appsw)

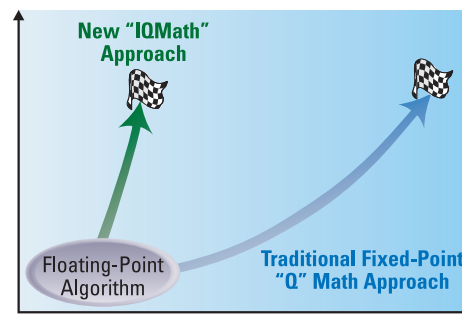
System	Motor Type	Sensored	Sensorless	Description	C24x™ Controller	C28x™ Controller
ACI1_1	1 ph AC Induction	•		Tacho I/P VHz / SinePWM/ Closed Loop (CL) Speed PID	•	
ACI3_1	3 ph AC Induction	•		Tacho I/P VHz / SinePWM / CL Speed PID	•	•
ACI3_2	3 ph AC Induction		•	MRAS (Speed Estimator) VHz / SinePWM / CL Speed PID	•	
ACI3_3	3 ph AC Induction	•		Tacho I/P FOC / SinePWM / CL Current PID for D, Q / CL Speed PID	•	•
ACI3_4	3 ph AC Induction		•	Direct Flux Estimator + Speed Estimator FOC / SinePWM / CL Current PID for D, Q / CL Speed PID	•	•
PMSM3_1	3 ph Permanent Magnet Synch	•		QEP FOC / SinePWM / CL Current PID for D, Q / CL Speed PID	•	•
PMSM3_2	3 ph Permanent Magnet Synch		•	SMO (Sliding Mode Observer) Position Estimator FOC / SinePWM / CL Current PID for D, Q / CL Speed PID	•	•
PMSM3_3	3 ph Permanent Magnet Synch	•		Resolver / FOC / CL Current PID for D, Q / CL Speed PID		•
PMSM3_4	3 ph Permanent Magnet Synch	•		QEP / FOC / Position Control		•
BLDC3_1	3 ph Trapezoidal Brushless DC	•		3 Hall Effect I/P Trapezoidal / CL Loop Current PID / CL Speed PID	•	•
BLDC3_2	3 ph Trapezoidal Brushless DC		•	BEMF / Zero Crossing Detection Trapezoidal / CL Loop Current PID / CL Speed PID	•	•
DCMOTOR	Brushed DC	•		Speed & Position / QEP without Index		•
Digital Motor Control Library	All Motor Types	•	•	Component Modules for Motor-Specific Applications	•	•

### IQMath: Develop in Easy-to-Use Floating Point on a Cost-Effective, Fixed-Point Machine

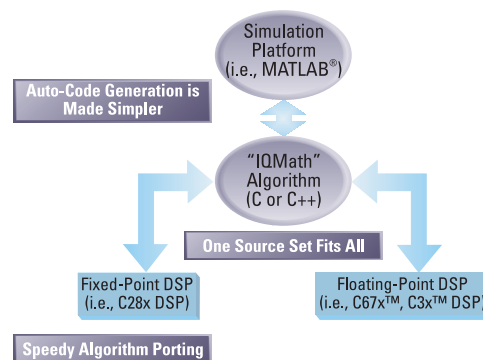
Control algorithms typically start life in a floating-point format. Until now, the conversion of such algorithms to run on a fixed-point machine was laborious and time consuming. TI's C28x™ IQMath Library makes this task easier, faster and enables:

- Seamless portability of code between fixed- and floating-point devices
- One source code set for simulation vs. target device
- Numerical resolution adjustability based on application requirement
- Numerical accuracy without sacrificing time and cycles
- Rapid conversion/porting and implementation of algorithms

For more information, visit [www.ti.com/iqmath](http://www.ti.com/iqmath)



Slash development time and reduce overall costs with TI's IQMath: floating-point development on a fixed-point machine.



TI's C28x IQMath Library makes code development easier, faster and enables seamless portability of code between fixed- and floating-point devices.



### Power Management Products for the C2000™ Controller Platform

Get samples, datasheets, Evaluation Modules (EVMs) and app reports at: [power.ti.com](http://power.ti.com)

#### Suggested Texas Instruments Power Management Solutions for the TMS320C24x™/TMS320C28x™ Controller Generations

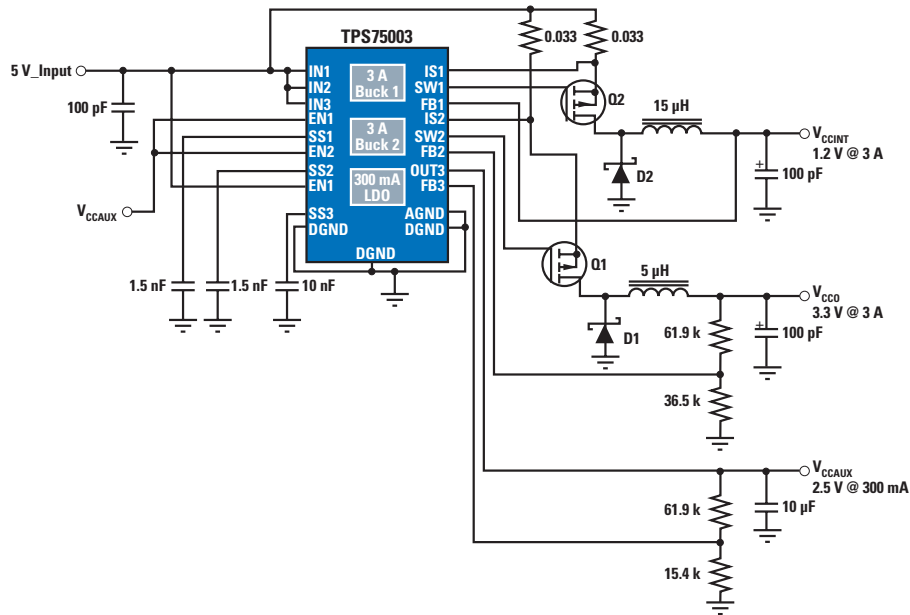
Core and I/O Voltages								
Input Voltage	LDO	Synchronous Controller (External FETs)	Non-Synchronous Controller (External FET and Diode)	Synchronous Integrated FET Converter	Non-Synchronous Integrated FET Converter	Non-Isolated Power Module	Isolated Power Module	Dual-Output Controller
3.3 V	TPS73701	TPS40041	TPS64200	TPS54110	MC33063	PTH04070		TPS62420
5 V	TPS73701	TPS40042	TPS40200	TPS54110	TPS40222	PTH04070		TPS75003
12 V	TLV1117	TPS40190	TPS40200	TPS62110	TPS5410	PTH08080		TPS5120
24 V	LM317	TPS40057	TPS40200*		TPS5410*	PTN78000*	PTB78560*	
48 V		TPS40061					PTMA403033*	

\*Due to  $V_{out}/V_{in}$  ratio core voltage may have to be stepped down from 3.3-V I/O

I/O supply 3.3 V, current up to 500 mA

Core supply down to 1.8 V, current up to 1 A

#### Example C2000 Controller Power Supply Design



For additional power supply designs for TI DSPs, please visit [www.ti.com/dsppower](http://www.ti.com/dsppower).

**Note:** The TI power devices recommended here are based on standard operating conditions. System designers should use device power estimation tools in conjunction with overall application level power requirements to ensure an adequate power supply design is used.



## Silicon

### TMS320C55x™ DSP Generation, Fixed Point

Industry's Best Power Efficiency

Get samples, datasheets, tools and app reports at: [www.ti.com/c5000](http://www.ti.com/c5000)

#### Specifications

- Broad portfolio of the industry's most power-efficient DSPs with standby power as low as 0.12 mW and performance up to 600 MIPs
- Lowest industry standby power greatly extends battery life
- Software compatible with all C5000™ DSPs
- Easy-to-use software and development tools speed time-to-market

#### Applications

Feature rich miniaturized portable digital audio products (MP3/AAC), (IP) PBX, hands-free car kit, portable medical devices, low-cost VOIP/DECT phone, portable instrumentation, fingerprint/pattern recognition and GPS receivers

#### Features

- Advanced automatic power management
- Configurable idle domains to extend your battery life
- Shortened debug for faster time-to-market
- Large on-chip RAM of 32 KB–320 KB

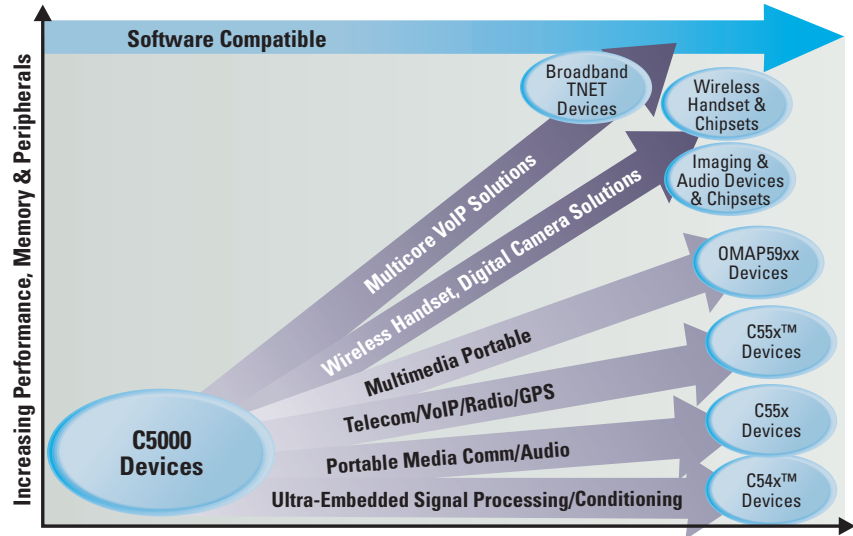
#### TMS320C5506 / C5509A DSP – Portable and Connected DSPs Optimized for Portable/ Industrial Medical Markets

- Dual MAC/108–200 MHz/  
216–400 MIPs
- USB 2.0 full-speed compliant  
(12 Mbps)
- Large on-chip SRAM
- Very low standby power of 0.12 mW

#### TMS320C5501 / C5502 DSPs – Price and Performance Leaders

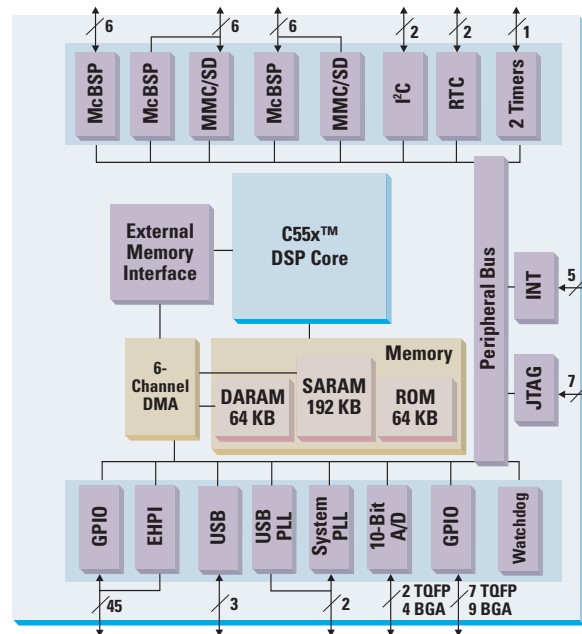
- 300-MHz clock rate
- 32-/64-KB RAM, 32-KB ROM
- Two/Three multi-channel buffered serial ports (McBSPs), I<sup>2</sup>C, general-purpose timers, watchdog timer, UART
- 16-/32-bit EMIF

#### TMS320C5510 DSP – Ideal for Memory-Intensive Applications



#### C5000 DSP Platform Roadmap

The C5000 DSPs span the applications spectrum with core performance extended to 300 MHz.



#### TMS320C5509A DSP Block Diagram

The C5509A DSP is the portable and connected DSP optimized for portable/industrial medical markets.





TMS320C55x™ DSP Generation

Part Number	RAM (Bytes)	ROM (Bytes)	DMA	DAT/PRO (ADDR) (Words)	USB	ADC	UART	I <sup>2</sup> C	RTC	McBSP <sup>2</sup>	MMC/ SD	Voltage (V)		COM	Timers <sup>3</sup>	MHz	MIPS	Packaging	1 KU (U.S.) <sup>1</sup>
TMS320VC5501GZZ300 <sup>3</sup>	32K	32K	6 ch	8M	–	–	Y	Y	–	2	–	1.26	3.3	HPI8	3 <sup>6</sup>	300	600	201 BGA <sup>7</sup>	4.50
TMS320VC5501PGF300 <sup>3</sup>	32K	32K	6 ch	8M	–	–	Y	Y	–	2	–	1.26	3.3	HPI8	3 <sup>6</sup>	300	600	176 LQFP	4.50
TMS320VC5502GZZ200 <sup>3</sup>	64K	32K	6 ch	8M	–	–	Y	Y	–	3	–	1.26	3.3	HPI16/8	3 <sup>6</sup>	200	400	201 BGA <sup>7</sup>	6.80
TMS320VC5502PGF200 <sup>3</sup>	64K	32K	6 ch	8M	–	–	Y	Y	–	3	–	1.26	3.3	HPI16/8	3 <sup>6</sup>	200	400	176 LQFP	6.80
TMS320VC5502PGF300 <sup>3</sup>	64K	32K	6 ch	8M	–	–	Y	Y	–	3	–	1.26	3.3	HPI16/8	3 <sup>6</sup>	300	600	176 LQFP	8.75
TMS320VC5502GZZ300 <sup>3</sup>	64K	32K	6 ch	8M	–	–	Y	Y	–	3	–	1.26	3.3	HPI16/8	3 <sup>6</sup>	300	600	201 BGA <sup>7</sup>	8.75
TMS320VC5503GHH	64K	64K	6 ch	8M	–	–	–	Y	Y	3	–	1.6	3.3	HPI16	2 <sup>6</sup>	200	400	179 BGA <sup>7</sup>	6.77
TMS320VC5503PGE	64K	64K	6 ch	8M	–	–	–	Y	Y	3	–	1.6	3.3	HPI16	2 <sup>6</sup>	200	400	144 LQFP	6.77
TMS320VC5506GHH	128K	64K	6 ch	8M	Y	–	–	Y	Y	3	–	1.2	3.3	–	2 <sup>6</sup>	200	400	179 BGA <sup>7</sup>	6.80
TMS320VC5506PGE	128K	64K	6 ch	8M	Y	–	–	Y	Y	3	–	1.2	3.3	–	2 <sup>6</sup>	200	400	144 LQFP	6.80
TMS320VC5507GHH	128K	64K	6 ch	8M	Y	Y	–	Y	Y	3	–	1.6	3.3	HPI16	2 <sup>6</sup>	200	400	179 BGA <sup>7</sup>	10.25
TMS320VC5507PGE	128K	64K	6 ch	8M	Y	Y	–	Y	Y	3	–	1.6	3.3	HPI16	2 <sup>6</sup>	200	400	144 LQFP	10.25
TMS320VC5509AGHH <sup>5</sup>	256K	64K	6 ch	8M	Y	Y	–	Y	Y	3	Y	1.6	3.3	HPI16	2 <sup>6</sup>	200	400	179 BGA <sup>7</sup>	15.65
TMS320VC5509APGE <sup>5</sup>	256K	64K	6 ch	8M	Y	Y	–	Y	Y	3	Y	1.6	3.3	HPI16	2 <sup>6</sup>	200	400	144 LQFP	15.65
TMS320VC5510AGGW1	320K	32K	6 ch	8M	–	–	–	–	–	3	–	1.6	3.3	HPI16	2	160	320	240 BGA <sup>7</sup>	15.70
TMS320VC5510AGGW2	320K	32K	6 ch	8M	–	–	–	–	–	3	–	1.6	3.3	HPI16	2	200	400	240 BGA <sup>7</sup>	18.35

<sup>1</sup> Prices are quoted in U.S. dollars and represent year 2007 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.

New devices are listed in red.

<sup>2</sup> Multi-channel buffered serial port (McBSP).

<sup>3</sup> 3 = Two general-purpose timers and one 32-bit DSP/BIOS™ kernel counter, 2 = Two general-purpose timers.

<sup>4</sup> Extended temperature device, –40 to 85°C case temperature operation.

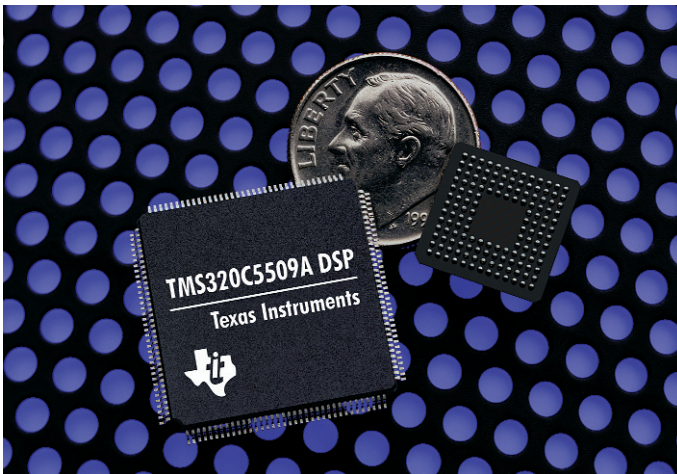
<sup>5</sup> JTAG disconnect option.

<sup>6</sup> Plus 1 additional programmable watchdog timer.

<sup>7</sup> MicroStar BGA™ package.

Note: All devices include software PLL.

Note: Enhanced plastic and Military DSP versions are available for selected DSPs.



MicroStar BGA™ Package Comparison

The ultra-small physical size (12 mm × 12 mm × 1.4 mm) of the C5000™ DSP MicroStar BGA (ball grid array) packaging can also help increase the performance per square inch for MIPS-intensive or space-constrained applications. The C5509A DSP is also pictured in a 144-pin LQFP.



## Silicon

### TMS320C54x™ DSP Generation, Fixed Point

Power-Efficient Performance DSPs

Get samples, datasheets, tools and app reports at: [www.ti.com/c5000](http://www.ti.com/c5000)

#### Specifications

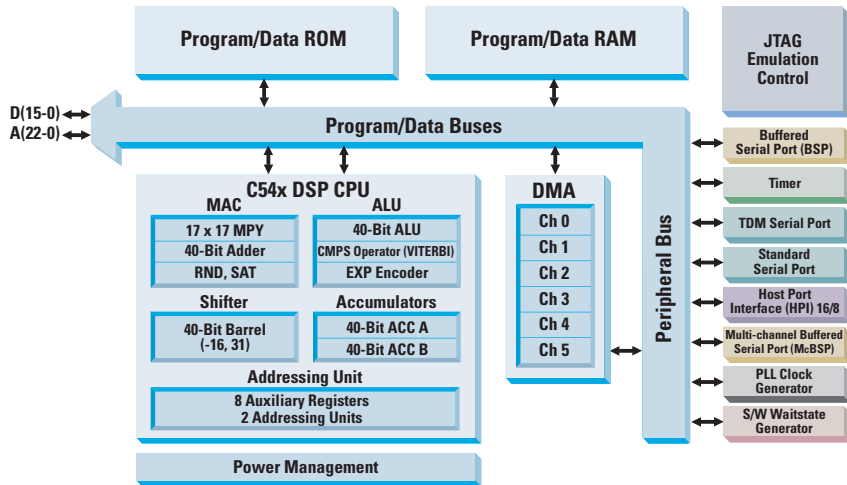
- 16-bit fixed-point DSPs
- Power dissipation as low as 40 mW
- Single- and multi-core products delivering 30–532 MIPS performance
- 1.2-, 1.8-, 2.5-, 3.3- and 5-V versions available
- Three power-down modes
- Integrated RAM and ROM configurations
- Auto-buffered serial port
- Multi-channel buffered serial port
- Host port interface
- Ultra-thin packaging (100-, 128-, 144- and 176-pin LQFPs; 143-, 144-, 176- and 169-pin MicroStar BGAs™)
- 6-channel DMA controller per core

#### Applications

Digital cellular communications, personal communications systems, pagers, personal digital assistants, digital cordless communications, wireless data communications, hands-free car kit, computer telephony, voice over packet, portable Internet audio, modems

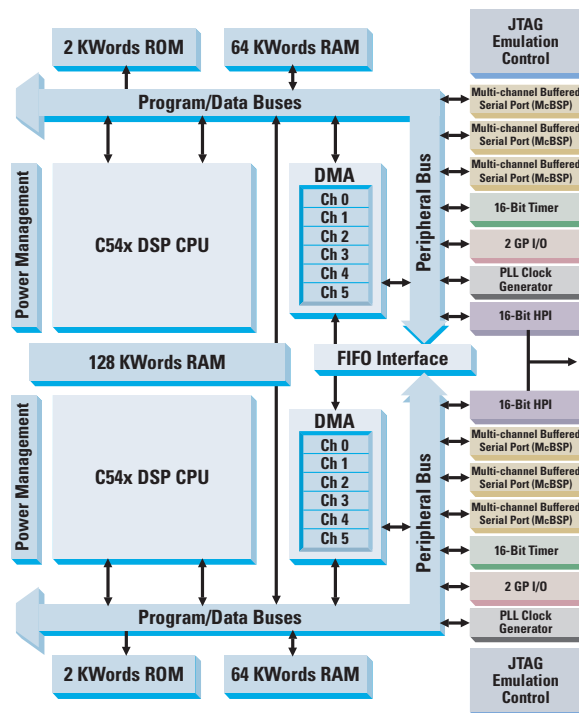
#### Features

- Integrated VITERBI accelerator
- 40-bit adder and two 40-bit accumulators to support parallel instructions
- 40-bit ALU with a dual 16-bit configuration capability for dual one-cycle operations
- 17 × 17 multiplier allowing 16-bit signed or unsigned multiplication
- Four internal buses and dual address generators enable multiple program and data fetches and reduce memory bottleneck
- Single-cycle normalization and exponential encoding
- Eight auxiliary registers and a software stack enable advanced fixed-point DSP C compiler
- Power-down modes for battery-powered applications



#### C54x™ DSP Generation Block Diagram

This block diagram of the C54x DSP is a comprehensive diagram showing all peripheral options. C54x DSPs are optimized to meet the performance, cost and low-power needs of wireless and wireline communications systems as well as emerging applications like IP phones, VoP and portable applications.



#### TMS320C5421 Multicore DSP Block Diagram

The C5420 and C5421 DSPs are dual-core DSPs targeted at carrier-class voice and video end equipments. The C5441 DSP features four C54x DSP cores on a single piece of silicon, offering 532 MIPS and is targeted at high-channel density solutions.



## TMS320C54x™ DSP Generation

Part Number	RAM	ROM	DAT/PRO	McBSP	Voltage (V)		COM	Timers	DMA	MHz	MIPS	Packaging	1 KU (\$U.S.) <sup>1</sup>
	(Bytes)	(Bytes)	(ADDR) (Bytes)		Core	I/O							
<b>Single Core DSPs</b>													
TMS320C54CSTPGE <sup>2</sup>	80K	256K	128K/16M	2	1.5	3.3	HPI 8/16	2	6	120	120	144 LQFP	8.35
TMS320C54CSTGGU <sup>2</sup>	80K	256K	128K/16M	2	1.5	3.3	HPI 8/16	2	6	120	120	144 BGA <sup>5</sup>	8.35
TMS320VC5401PGE50	16K	8K	128K/2M	2	1.8	3.3	HPI 8	2	6	50	50	144 LQFP	3.40
TMS320VC5401GGU50	16K	8K	128K/2M	2	1.8	3.3	HPI 8	2	6	50	50	144 BGA <sup>5</sup>	3.40
TMS320VC5402PGE100	32K	8K	128K/2M	2	1.8	3.3	HPI 8	2	6	100	100	144 LQFP	5.40
TMS320VC5402GGU100	32K	8K	128K/2M	2	1.8	3.3	HPI 8	2	6	100	100	144 BGA <sup>5</sup>	5.40
TMS320VC5402APGE16	32K	32K	128K/16M	3	1.6	3.3	HPI 8	1	6	160	160	144 LQFP	10.65
TMS320VC5402AGGU16	32K	32K	128K/16M	3	1.6	3.3	HPI 8	1	6	160	160	144 BGA <sup>5</sup>	10.65
TMS320VC5404PGE	32K	128K	128K/16M	3	1.5	3.3	HPI 8/16	2	6	120	120	144 LQFP	7.80
TMS320VC5404GGU	32K	128K	128K/16M	3	1.5	3.3	HPI 8/16	2	6	120	120	144 BGA <sup>5</sup>	7.80
TMS320UC5405GQW	16K	4K	64K/1M	2	1.8	3.6	HPI 8	2	6	80	80	143 BGA <sup>5</sup>	5.25
TMS320VC5407PGE	80K	256K	128K/16M	3	1.6	3.3	HPI 8/16	2	6	120	120	144 LQFP	8.75
TMS320VC5407GGU	80K	256K	128K/16M	3	1.6	3.3	HPI 8/16	2	6	120	120	144 BGA <sup>5</sup>	8.75
TMS320VC5409PGE-80	64K	32K	128K/16M	3	1.8	3.3	HPI 8/16	1	6	80	80	144 LQFP	8.35
TMS320VC5409GGU-80	64K	32K	128K/16M	3	1.8	3.3	HPI 8/16	1	6	80	80	144 BGA <sup>5</sup>	8.35
TMS320VC5409PGE100	64K	32K	128K/16M	3	1.8	3.3	HPI 8/16	1	6	100	100	144 LQFP	10.25
TMS320VC5409GGU100	64K	32K	128K/16M	3	1.8	3.3	HPI 8/16	1	6	100	100	144 BGA <sup>5</sup>	10.25
TMS320VC5409APGE12	64K	32K	128K/16M	3	1.5	3.3	HPI 8/16	1	6	120	120	144 LQFP	12.10
TMS320VC5409AGGU12	64K	32K	128K/16M	3	1.5	3.3	HPI 8/16	1	6	120	120	144 BGA <sup>5</sup>	12.10
TMS320VC5409APGE16	64K	32K	128K/16M	3	1.6	3.3	HPI 8/16	1	6	160	160	144 LQFP	13.45
TMS320VC5409AGGU16	64K	32K	128K/16M	3	1.6	3.3	HPI 8/16	1	6	160	160	144 BGA <sup>5</sup>	13.45
TMS320VC5410PGE100	128K	32K	128K/16M	3	2.5	3.3	HPI 8	1	6	100	100	144 LQFP	28.85
TMS320VC5410GGW100	128K	32K	128K/16M	3	2.5	3.3	HPI 8	1	6	100	100	176 BGA <sup>5</sup>	28.85
TMS320VC5410APGE12	128K	32K	128K/16M	3	1.5	3.3	HPI 8/16	1	6	120	120	144 LQFP	14.50
TMS320VC5410AGGU12	128K	32K	128K/16M	3	1.5	3.3	HPI 8/16	1	6	120	120	144 BGA <sup>5</sup>	14.50
TMS320VC5410APGE16	128K	32K	128K/16M	3	1.6	3.3	HPI 8/16	1	6	160	160	144 LQFP	16.10
TMS320VC5410AGGU16	128K	32K	128K/16M	3	1.6	3.3	HPI 8/16	1	6	160	160	144 BGA <sup>5</sup>	16.10
TMS320VC5416PGE120	256K	32K	128K/16M	3	1.5	3.3	HPI 8/16	1	6	120	120	144 LQFP	24.20
TMS320VC5416GGU120	256K	32K	128K/16M	3	1.5	3.3	HPI 8/16	1	6	120	120	144 BGA <sup>5</sup>	24.20
TMS320VC5416PGE160	256K	32K	128K/16M	3	1.6	3.3	HPI 8/16	1	6	160	160	144 LQFP	26.85
TMS320VC5416GGU160	256K	32K	128K/16M	3	1.6	3.3	HPI 8/16	1	6	160	160	144 BGA <sup>5</sup>	26.85
<b>Multicore DSPs</b>													
TMS320VC5420PGE200 <sup>3,4</sup>	400K	–	128K/512K	6	1.8	3.3	HPI 16	2	12	2 × 100	200	144 LQFP	59.25
TMS320VC5420GGU200 <sup>3,4</sup>	400K	–	128K/512K	6	1.8	3.3	HPI 16	2	12	2 × 100	200	144 BGA	59.25
TMS320VC5421PGE200 <sup>3</sup>	512K	8K	128K/512K	6	1.8	3.3	HPI 16	2	12	2 × 100	200	144 LQFP	60.70
TMS320VC5421GGU200 <sup>3</sup>	512K	8K	128K/512K	6	1.8	3.3	HPI 16	2	12	2 × 100	200	144 BGA	60.70

<sup>1</sup> Prices are quoted in U.S. dollars and represent year 2007 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.

<sup>2</sup> Client side telephony (CST) software bundle information on page 15.

<sup>3</sup> Multicore devices (VC542x = 2).

<sup>4</sup> Internal bootloader not available on VC5420 DSP.

<sup>5</sup> MicroStar BGA™ package.

Note: All devices include software PLL.

Note: Enhanced plastic and Military DSP versions are available for selected DSPs.



## Tools, Software and Support

### TMS320C55x™ and TMS320C54x™ DSP Generation Hardware and Software Development Tools

Description	Part #	\$U.S. <sup>1</sup>
<b>C5000 DSP Starter Kits (DSKs)</b>		
TMS320C55x™ Low-Power Optimization DSP Starter Kit (DSK)	TMDSDSK5509 (U.S. part number) TMDSDSK5509-0E (European part number)	495
<b>TMS320VC5407 DSP Hands-Free Kit Development Platform</b>	TMDSHFK5407	495
TMS320C54x™ DSP Starter Kit (DSK), TMS320C5416 DSP based <sup>2</sup>	TMDSDSK5416 (U.S. part number) TMDSDSK5416-0E (European part number)	395
TMS320C55x™ DSP Starter Kit (DSK), TMS320C5510 DSP based <sup>2</sup>	TMDSDSK5510 (U.S. part number) TMDSDSK5510-0E (European part number)	395
<b>JTAG Emulators</b>		
XDS560™ PCI-Based High-Performance JTAG Emulator	TMDSEMU560	3,995
XDS560 Blackhawk USB High-Performance JTAG Emulator	TMDSEMU560U (U.S. part number) TMDSEMU560U-0E (European part number)	2,995
XDS510PP-Plus – Parallel Port Emulator for Windows	TMDSEMUPP (U.S. part number) TMDSEMUPP-0E (European part number)	1,500
XDS510™ USB-Based Emulator for Windows	TMDSEMUUSB	1,995
<b>Software Development Tools</b>		
Code Composer Studio Platinum Edition v3.3 Development Tools Bundled with Annual Software Subscription Supports C6000™, C5000, C2000™, DaVinci™ and OMAP™ processor platforms	TMDSCCSALL-1	3,595
C6000, C5000, OMAP, DaVinci, C2000 DSP Code Composer Studio Development Tools Annual Software Subscription for Version 3.1 and higher	TMDSSUBALL	600
Essential Guide to Getting Started with DSP CD-ROM Includes C6000, C5000, C2000, DaVinci and OMAP processor CCStudio 120-Day Free Evaluation Tools <sup>3</sup>	SPRC119D <b>(www.ti.com/freetools)</b>	Free
C54x DSP Software Library	SPRC099	Free
C55x DSP Software Library	SPRC100	Free
C55x DSP Imaging Software Library	SPRC101	Free
C54x DSP Chip Support Library	SPRC132	Free
C55x DSP Chip Support Library	SPRC133	Free

<sup>1</sup> Prices are quoted in U.S. dollars and represent year 2007 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. New tools are listed in red.

<sup>2</sup> Includes a DSK version of Code Composer Studio™ Development Tools restricted for use only with the DSP target board included in the kit, power supply and cables.

Please see the features supported by platform matrix on page 93 for more details.

<sup>3</sup> Includes full-featured Code Composer Studio Development Tools, code generation tools (C/C++ compiler/assembler/linker), emulator and simulator configurations all limited to 120 days.

### C5000 DSP Literature and Related Technical Documentation

All documentation and associated literature, user's guides, application notes and software can be found by clicking on the specific device in the parametric table found on the URLs below.

TMS320C54x™ DSP Generation

[www.ti.com/c54x](http://www.ti.com/c54x)

TMS320C55x™ DSP Generation

[www.ti.com/c55x](http://www.ti.com/c55x)



**OMAP™ Processors, Fixed Point**  
System-Level DSPs

Get samples, datasheets, tools and app reports at: [www.omap.com](http://www.omap.com)

**Applications**

*Portable Data Terminals (PDT)*

- Portable medical devices
  - Portable defibrillation
  - Home medical test and analysis
  - PDT for patient/medical personal
- Asset and inventory management
  - Parcel tracking and location
  - Stock inventory and replenishment
  - Real-time data capture, analysis and interpretation
- Point of sale
  - Sales and membership processing
  - Merchandising and pricing management
  - Verification and authentication
- Enterprise PDT
  - Commercial and business applications
  - Enhanced employee productivity

**Key Features**

- Extensive peripheral set supporting glueless interface to multiple radio technologies (GSM/GPRS, WLAN, BT, RF)
- Industry-leading C55x™ DSP core offering portable data terminal-centric algorithms via TI DSP Third Party Network
- Multibus architecture for PDT system-level optimization
- On-chip frame buffer supporting multiple display variations
- Hardware encryption engine enabling industry-standard security applications
- Robust man/machine interface ARM9 core for multiple operating systems and application programs

**OMAP59xx Processors Support**

- Microsoft® Windows® CE
- Linux®
- Accelerated Technologies Nucleus™
- WindRiver Systems VxWorks™
- Texas Instruments DSP/BIOS™ kernel
- And many more

**Embedded OMAP Processors: OMAP5910 and OMAP5912**

**Addressing the Needs of Next-Generation Embedded Designers for Portable Data Terminal Applications**

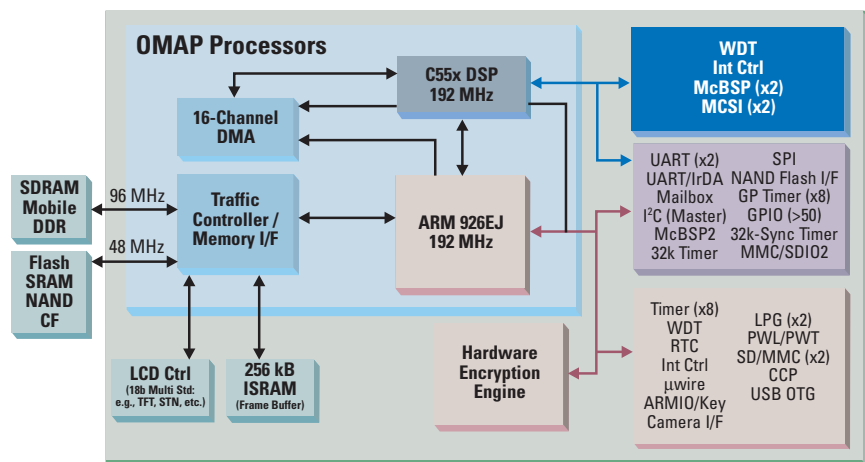
The dual-core OMAP59xx processor integrates a TMS320C55x™ DSP core with an ARM9 core on a single chip for the optimal combination of application performance and low power consumption. This unique architecture offers an attractive solution to both DSP and ARM® developers, by providing the low-power, real-time signal processing capabilities of a DSP coupled with the command and control functionality of an ARM.

TI's software development support, OMAP Technology Centers (OTCs), OMAP Developer's Network, and third party tools provide a user-friendly software development infrastructure. The OMAP59xx processors are ideal for designers working with devices that require embedded applications processing in a connected environment such as portable data terminals.

**Familiar Development Environment Speeds Design Cycle**

The OMAP59xx processor enables embedded developers to program using familiar development environments by supporting leading operating systems such as Microsoft Windows CE, Linux, Accelerated Technology's Nucleus, WindRiver's VxWorks, Green Hills INTEGRITY®, Enea OSE and TI's DSP/BIOS real-time scalable kernel among others.

This open development environment makes it possible for designers to deliver innovative products to the market faster, utilizing familiar tools, a standard application programming interface (API) and a seamless interface to the DSP through an optimized interprocessor communication mechanism. The built-in interprocessor communication mechanism eliminates the need for developers to program the RISC and DSP independently resulting in reduced programming efforts.



**OMAP5912 Peripheral Block Diagram**

OMAP5912 processor diagram with ARM926 and C55x DSP cores and peripherals.



## Silicon, Software and Support

### OMAP™ Processors

Part Number	CPU	Frequency (MHz)	RAM (Bytes)	ROM (Bytes)	External Memory I/F	DMA	Timers	Serial Ports	Misc	Voltage (V)		Packaging	1 KU (U.S.) <sup>1</sup>
										Core	I/O		
OMAP5910JGZG2	C55x	150	160K	32K	SDRAM <sup>3</sup> , ASYNC <sup>3</sup>	6 Ch	3 GP, 1 WDT	2 McBSP <sup>3</sup> , 2 MCSi <sup>3</sup>	3 Video HW Accel, 14 GPIO <sup>3</sup> , MMU	1.6	1.8/ 2.75/3.3 <sup>4</sup>	289 BGA <sup>5</sup> , 12 × 12 mm	25.00
	ARM9TDMI	150	192K <sup>2</sup>	SDRAM, ASYNC	9 Ch	1 OS, 3 GP, 1 WDT	3 Host or 2 Host/ 1 Function USB 1.1, 1 McBSP, $\mu$ wire, I <sup>2</sup> C, HDQ, 3 UARTs (1 IrDA) <sup>2</sup>	LCD, Camera, MMC/SD, RTC, Keypad, 10 GPIO, MMU					
OMAP5910JGDY2	C55x	150	160K	32K	SDRAM <sup>3</sup> , ASYNC <sup>3</sup>	6 Ch	3 GP, 1 WDT	2 McBSP <sup>3</sup> , 2 MCSi <sup>3</sup>	3 Video HW Accel, 14 GPIO <sup>3</sup> , MMU	1.6	1.8/ 2.75/3.3 <sup>4</sup>	289 BGA <sup>5</sup> , 19 × 19 mm	25.95
	ARM9TDMI	150	192K <sup>2</sup>	SDRAM, ASYNC	9 Ch	1 OS, 3 GP, 1 WDT	3 Host or 2 Host/ 1 Function USB 1.1, 1 McBSP, $\mu$ wire, I <sup>2</sup> C, HDQ, 3 UARTs (1 IrDA) <sup>2</sup>	LCD, Camera, MMC/SD, RTC, Keypad, 10 GPIO, MMU					
OMAP5912ZZG	C55x	192	160K	32K	SDRAM <sup>3</sup> , NAND Flash <sup>3</sup>	6 Ch	4 GP, 1 WDT	2 McBSP <sup>3</sup> , 2 MCSi <sup>3</sup> , 3 UARTs <sup>3</sup>	4 Video HW Accel, 24 KByte I-Cache	1.6	1.8/ 2.75/3.3 <sup>4</sup>	289 BGA, 12 × 12 mm Lead free	24.85
	ARM926EJ-S	192	256K <sup>2</sup>	SDRAM, ASYNC	17 Ch	1 OS, 3 GP, 1 WDT	Host/Function USB 1.1, USB On-the-Go (OTG), 1 McBSP, $\mu$ wire, I <sup>2</sup> C, HDQ, SPI, V-Link	Self-Powered RTC, LCD, CompactFlash™, Camera, 2 MMC/SD, Keyboard, DPPLL, PWT/PWL, 2 LED Pulse Generators, SoSSI					
OMAP5912ZDY	C55x	192	160K	32K	SDRAM <sup>3</sup> , NAND Flash <sup>3</sup>	6 Ch	4 GP, 1 WDT	2 McBSP <sup>3</sup> , 2 MCSi <sup>3</sup> , 3 UARTs <sup>3</sup>	4 Video HW Accel, 24 KByte I-Cache	1.6	1.8/ 2.75/3.3 <sup>4</sup>	289 BGA, 19 × 19 mm Lead free	24.85
	ARM926EJ-S	192	256K <sup>2</sup>	SDRAM, ASYNC	17 Ch	1 OS, 3 GP, 1 WDT	Host/Function USB 1.1, USB-On-the-Go (OTG), 1 McBSP, $\mu$ wire, I <sup>2</sup> C, HDQ, SPI, V-Link	Self-Powered RTC, LCD, CompactFlash, Camera, 2 MMC/SD, Keyboard, DPPLL, PWT/PWL, 2 LED Pulse Generators, SoSSI					

<sup>1</sup> Prices are quoted in U.S. dollars and represent year 2007 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.

<sup>2</sup> Shared with the C55x™ CPU.

<sup>3</sup> Shared with the ARM9.

<sup>4</sup> External memory interfaces may use 1.8-, 2.75- or 3.3-V nominal.

<sup>5</sup> MicroStar BGA™ package options – GZG: 12 × 12 mm (OMAP5910JGZG2) or GDY: 19 × 19 mm (OMAP5910JGDY2)

Note: Enhanced plastic and Military DSP versions are available for selected DSPs.

### OMAP Platform Tools and Software

To aid you in developing your application with an OMAP59xx processor, the following development tools and software are available:

- Code Composer Studio™ IDE for the OMAP platform integrates all host and target tools in a unified environment, which simplifies DSP configuration and optimization.
- A growing base of TI DSP-based software modules from third parties

including over 70 eXpressDSP™-compliant, interoperable algorithms.

### Support

OMAP Technology Centers (OTCs) are a network of third parties with extensive development experience on the OMAP platform. They have system-level expertise in operating systems, software development and hardware integration. OTCs work with customers to develop a custom integration package. Additionally, the OMAP Developer's Network includes

a number of independent companies and consultants that develop applications for the OMAP platform.

### Samples and Availability

Please contact an authorized TI distributor for further information.



### OMAP59xx Processors Literature and Related Technical Documentation

All documentation and associated literature, user's guides, application notes and software can be found by clicking on the specific device in the parametric table found on the URLs below.

OMAP59xx Processor Generation [www.ti.com/omaptechdocs](http://www.ti.com/omaptechdocs)

### OMAP59xx Processor On-Line Training

For more information on OMAP on-line training classes, go to: [www.ti.com/omaptraining](http://www.ti.com/omaptraining)

OMAP5910 Processor Product Overview	<a href="http://www.ti.com/omap5910">www.ti.com/omap5910</a>
OMAP Application Development Using DSP/BIOS™ Bridge for Symbian OS	<a href="http://www.ti.com/omap">www.ti.com/omap</a>
An Efficient Hardware and Software Architecture for Dual-Core OMAP Processor Systems	<a href="http://www.ti.com/omap5910">www.ti.com/omap5910</a>
Software Development for OMAP Processors: High-Level Operating Systems and Integration of DSP Algorithms	<a href="http://www.ti.com/omapdevelopers">www.ti.com/omapdevelopers</a>

### C5000™ DSP Platform Hardware and Software Development Tools

Description	Part #	\$U.S. <sup>1</sup>
<b>C5000 DSP Starter Kits (DSKs)</b>		
OMAP5912 OMAP™ Starter Kit (OSK) <sup>3</sup>	TMDSOSK5912 (U.S. part number) TMDSOSK5912-0E (European part number)	295
<b>OMAP Development Kits</b>		
OMAP Starter Kit (OSK) Bundle <sup>4</sup> with a Logic PD Kickstart Program	TMDSKSP5912-L (U.S. part number) TMDSKSP5912-LE (European part number)	7,200
OMAP Starter Kit (OSK) Bundle <sup>4</sup> with a Mistral Kickstart Program	TMDSKSP5912-M (U.S. part number) TMDSKSP5912-ME (European part number)	7,200
<b>JTAG Emulators</b>		
XDS560™ PCI-Based High-Performance JTAG Emulator	TMDSEMU560	3,995
XDS560 Blackhawk USB High-Performance JTAG Emulator	TMDSEMU560U (U.S. part number) TMDSEMU560U-0E (European part number)	2,995
XDS510PP-Plus – Parallel Port Emulator for Windows	TMDSEMUPP (U.S. part number) TMDSEMUPP-0E (European part number)	1,500
XDS510™ USB-Based Emulator for Windows	TMDSEMUUSB	1,995
<b>Software Development Tools</b>		
Code Composer Studio Platinum Edition v3.3 Development Tools Bundled with Annual Software Subscription Supports C6000™, C5000, C2000™, DaVinci™ and OMAP™ processor platforms	TMDSCCSALL-1	3,595
C6000, C5000, OMAP, DaVinci, C2000 DSP Code Composer Studio Development Tools Annual Software Subscription for Version 3.1 and higher	TMDSSUBALL	600
Essential Guide to Getting Started with DSP CD-ROM Includes C6000, C5000, C2000, DaVinci and OMAP processor CCStudio 120-Day Free Evaluation Tools <sup>5</sup>	SPRC119D ( <a href="http://www.ti.com/freetools">www.ti.com/freetools</a> )	Free

<sup>1</sup> Prices are quoted in U.S. dollars and represent year 2007 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.

<sup>2</sup> Includes a DSK version of Code Composer Studio™ Development Tools restricted for use only with the DSP target board included in the kit, power supply and cables. Please see the features supported by platform matrix on page 93 for more details.

<sup>3</sup> OSK includes board with OMAP5912 processor, board support library, Linux® kernel and GNU development tools from MontaVista™. CCStudio and emulator are sold separately.

<sup>4</sup> Includes Code Composer Studio Development Tools, DSP/BIOS™ kernel, code generation tools (C/C++/assembler/linker), XDS510™ and XDS560™ device drivers (emulation software), RTDX™, and simulators. Please see the features supported by platform matrix on page 93 for more details.

<sup>5</sup> Includes full-featured Code Composer Studio Development Tools, code generation tools (C/C++ compiler/assembler/linker), emulator and simulator configurations all limited to 120 days.



## Power Management Products

### Power Management Products for the C5000™ DSP Platform

Get samples, datasheets, Evaluation Modules (EVMs) and app reports at: [power.ti.com](http://power.ti.com)

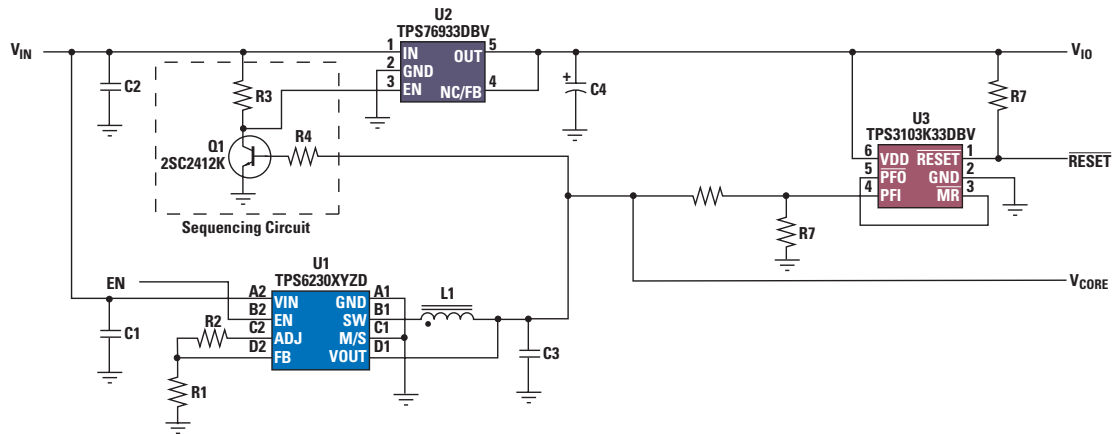
#### Suggested Texas Instruments Power Management Solutions for the C5000 DSP and OMAP Processor Platforms

Core and I/O Voltages				
Input Voltage	LDO	Non-Synchronous Controller (External FET and Diode)	Synchronous Integrated FET Converter	Dual-Output Converter
3.3 V	TPS736xx	TPS64200	TPS62300	TPS62400
5 V	TPS736xx	TPS64200	TPS62300	TPS62400
12 V	TLV1117	TPS40190	TPS62110	TPS5124

I/O supply 3.3 V, current up to 250 mA

Core supply down to 1.2 V, current up to 250 mA

#### Example C5000 DSP Power Supply Design



For additional power supply designs for TI DSPs, please visit [www.ti.com/dsppower](http://www.ti.com/dsppower).

**Note:** The TI power devices recommended here are based on standard operating conditions. System designers should use device power estimation tools in conjunction with overall application level power requirements to ensure an adequate power supply design is used.





**TMS320C64x™ DSP Generation, Fixed Point**

Highest-Performance and Performance Value DSPs

Get samples, datasheets, tools and app reports at: [www.ti.com/c6000](http://www.ti.com/c6000)

**Specifications**

- Broadest portfolio of high performance DSPs ranging from \$11.95 to 1 GHz
- Shipping the industry's first 1-GHz DSPs on a 90-nm process node
- Upward 100% object code compatibility within C6000™ DSP platform
- The easiest to use integrated development environment with the industry's best optimizing C compiler

**Applications**

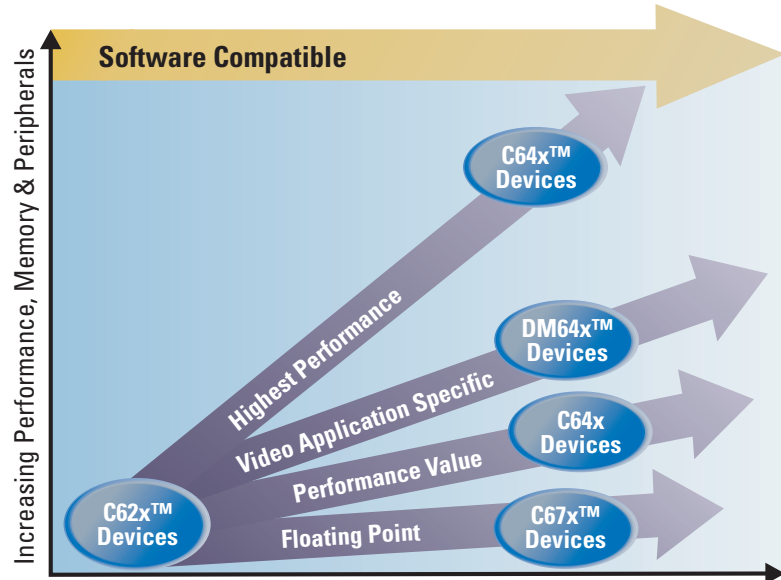
Wireless Infrastructure (adaptive antennas, basestations, gateways), Telecom Infrastructure (RAS, PBX, VoIP), Digital Video (conferencing, surveillance, encoders, statistical remultiplexor/broadband routers), Imaging (medical, machine vision/inspection, defense/radar/sonar)

**Features**

- VelocTI.2 architecture extensions with new instructions to accelerate performance in key applications
- Increased parallelism with quad 16-bit and octal 8-bit multiply-accumulate performance
- Improved orthogonality with frequently used instructions available in more functional units
- Double the bandwidth resulting from more registers, wider load/store data paths and enlarged 2-level cache

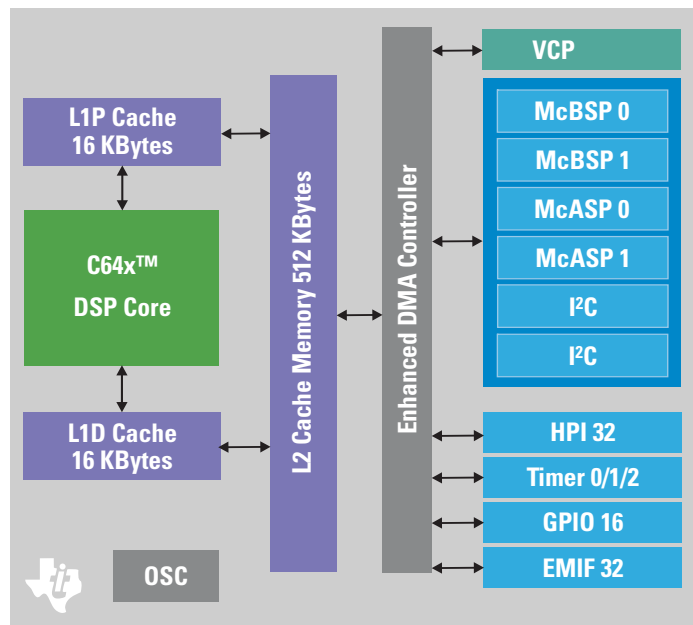
**Peripherals**

- Enhanced Direct Memory Access Controller
- Peripheral Component Interconnect
- Universal Test and Operation PHY Interface for ATM (UTOPIA)
- Viterbi Coprocessor
- Turbo Coprocessor
- External Memory Interfaces
- Multi-channel Buffered Serial Ports
- Host Port Interfaces
- Direct Memory Access Controller
- 32-bit Expansion Bus
- RapidIO®



**C6000™ DSP Platform Roadmap**

The C6000 DSP platform includes a wide range of devices that raise the bar in performance, set new levels of cost efficiency and offer on-chip peripheral integration to enable developers of high-performance systems to choose the device that best suits their specific application.



TMS320C6418 DSP Block Diagram



Silicon

## TMS320C64x™ DSP Generation – Performance Value Fixed-Point DSPs

Part Number	Internal RAM (Bytes)		Enhanced DMA (Channels)	COM	Timers	MHz	MIPS	Power (W) <sup>2</sup>		Voltage (V)		Packaging	1 KU (SU.S.) <sup>1</sup>
	L1 Program Cache/ L1 Data Cache/ L2 Unified RAM/Cache	McBSP						CPU and L1	Total	Core	I/O		
<b>Performance Value</b>													
TMS320C6410GTS400	16K/16K/128K	2	64	HPI 32/16 <sup>3</sup>	3	400	3200	0.58	1.0	1.2	3.3	288 BGA, 23 mm	16.85
TMS320C6413GTS500	16K/16K/256K	2	64	HPI 32/16 <sup>3</sup>	3	500	4000	0.58	1.1	1.2	3.3	288 BGA, 23 mm	25.65
TMS320C6412AGDK5	16K/16K/256K	2	64	PCI/HPI/EMAC <sup>4</sup>	3	500	4000	0.66	1.3	1.2	3.3	548 BGA, 23 mm	37.90
TMS320C6412AGDK6	16K/16K/256K	2	64	PCI/HPI/EMAC <sup>4</sup>	3	600	4800	0.93	1.9	1.4	3.3	548 BGA, 23 mm	41.70
TMS320C6412AGDK7	16K/16K/256K	2	64	PCI/HPI/EMAC <sup>4</sup>	3	720	5760	0.93	2.15	1.4	3.3	548 BGA, 23 mm	65.20
TMS320C6418GTS600	16K/16K/512K	2	64	HPI 32/16 <sup>3</sup>	3	600	4800 <sup>5</sup>	0.82	1.7	1.4	3.3	288 BGA, 23 mm	47.85
TMS320C6418ZTSA500	16K/16K/512K	2	64	HPI 32/16 <sup>3</sup>	3	500	4000 <sup>5</sup>	0.58	1.1	1.4	3.3	288 BGA, 23 mm	47.85
TMS320C6424AZWT400	32K/80K/128K	2	64	PCI/HPI/EMAC <sup>6</sup>	3	400	3200	TBD	TBD	1.05/1.2	1.8/3.3	361 PBGA, 16 mm	18.00
TMS320C6424AZWT500	32K/80K/128K	2	64	PCI/HPI/EMAC <sup>6</sup>	3	500	4000	TBD	TBD	1.2	1.8/3.3	361 PBGA, 16 mm	22.55
TMS320C6424AZWT600	32K/80K/128K	2	64	PCI/HPI/EMAC <sup>6</sup>	3	600	4800	TBD	TBD	1.2	1.8/3.3	361 PBGA, 16 mm	28.20
TMS320C6421AZWT400	16K/16K/64K	1	64	HPI/EMAC <sup>6</sup>	3	400	3200	TBD	TBD	1.05/1.2	1.8/3.3	361 PBGA, 16 mm	10.10
TMS320C6421AZWT500	16K/16K/64K	1	64	HPI/EMAC <sup>6</sup>	3	500	4000	TBD	TBD	1.2	1.8/3.3	361 PBGA, 16 mm	13.50
TMS320C6421AZWT600	16K/16K/64K	1	64	HPI/EMAC <sup>6</sup>	3	600	4800	TBD	TBD	1.2	1.8/3.3	361 PBGA, 16 mm	19.15

<sup>1</sup> Prices are quoted in U.S. dollars and represent year 2007 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.

New devices are listed in red.

<sup>2</sup> Assumes 60% CPU utilization, 50% EMIF utilization (133 MHz for 1.4 V, 100 MHz for 1.2 V), 50% writes, 64-bits, 50% bit switching, 2 2-MHz McBSP at 100% utilization, and 2 75-MHz timers at 100% utilization. See SPRAA59 for the TMS320C6410 and TMS320C6413 DSPs. See SPRA967 for the TMS320C6412A DSP. See SPRAA60 for the TMS320C6418 DSP.

<sup>3</sup> HPI is selectable, 32-bit or 16-bit.

<sup>4</sup> The C6412 can be configured to have either a 32-bit PCI or 32-bit HPI, or a 16-bit HPI with Ethernet MAC.

<sup>5</sup> Plus on-chip VITERBI (VCP) coprocessor.

<sup>6</sup> HPI interface is 16-bit.

Note: Check [www.ti.com](http://www.ti.com) for extended temperature and packaging options. Enhanced plastic and Military DSP versions are available for selected DSPs.

## TMS320C64x™ DSP Generation – Highest-Performance Fixed-Point DSPs

Part Number	Internal RAM (Bytes)		Enhanced DMA (Channels)	COM <sup>3</sup>	Timers	MHz	MIPS	Power (W) <sup>2</sup>		Voltage (V)		Packaging	1 KU (SU.S.) <sup>1</sup>
	L1 Program Cache/ L1 Data Cache/ L2 Unified RAM/Cache	McBSP						CPU and L1	Total	Core	I/O		
<b>Highest Performance</b>													
TMS320C6416TBLZ1	16K/16K/1M	2+Utopia <sup>5</sup>	64	PCI/HPI 32/16	3	1000	8000 <sup>7</sup>	0.44	1.65	1.2	3.3	532 BGA, 23 mm	223.50
TMS320C6416TGLZ8	16K/16K/1M	2+Utopia <sup>5</sup>	64	PCI/HPI 32/16	3	850	6800 <sup>7</sup>	TBD	TBD	1.2	3.3	532 BGA, 23 mm	165.15
TMS320C6416TBLZ7	16K/16K/1M	2+Utopia <sup>5</sup>	64	PCI/HPI 32/16	3	720	5760 <sup>7</sup>	0.44	1.36	1.2	3.3	532 BGA, 23 mm	112.20
TMS320C6416TGLZ6	16K/16K/1M	2+Utopia <sup>5</sup>	64	PCI/HPI 32/16	3	600	4800 <sup>7</sup>	0.39	1.1	1.1	3.3	532 BGA, 23 mm	89.75
TMS320C6415TBLZ1	16K/16K/1M	2+Utopia <sup>5</sup>	64	PCI/HPI 32/16	3	1000	8000	0.44	1.65	1.2	3.3	532 BGA, 23 mm	199.10
TMS320C6415TBLZ8	16K/16K/1M	2+Utopia <sup>5</sup>	64	PCI/HPI 32/16	3	850	6800	TBD	TBD	1.2	3.3	532 BGA, 23 mm	150.15
TMS320C6415TBLZ7	16K/16K/1M	2+Utopia <sup>5</sup>	64	PCI/HPI 32/16	3	720	5760	0.44	1.36	1.2	3.3	532 BGA, 23 mm	102.00
TMS320C6415TBLZ6	16K/16K/1M	2+Utopia <sup>5</sup>	64	PCI/HPI 32/16	3	600	4800	0.39	1.1	1.1	3.3	532 BGA, 23 mm	81.60
TMS320C6414TBLZ1	16K/16K/1M	3	64	HPI 32/16	3	1000	8000	0.44	1.65	1.2	3.3	532 BGA, 23 mm	188.45
TMS320C6414TBLZ8	16K/16K/1M	3	64	HPI 32/16	3	850	6800	TBD	TBD	1.2	3.3	532 BGA, 23 mm	142.70
TMS320C6414TBLZ7	16K/16K/1M	3	64	HPI 32/16	3	720	5760	0.44	1.36	1.2	3.3	532 BGA, 23 mm	96.95
TMS320C6414TBLZ6	16K/16K/1M	3	64	HPI 32/16	3	600	4800	0.39	1.1	1.1	3.3	532 BGA, 23 mm	77.55

<sup>1</sup> Prices are quoted in U.S. dollars and represent year 2007 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.

<sup>2</sup> Assumes 60% CPU utilization, 50% EMIF utilization (133 MHz for 1.4 V, 100 MHz for 1.2 V), 50% writes, 64-bits, 50% bit switching, 2 2-MHz McBSP at 100% utilization, and 2 75-MHz timers at 100% utilization. See SPRAA45 for TMS320C6414T, TMS320C6415T and TMS320C6416T DSPs.

<sup>3</sup> HPI is selectable, 32-bit or 16-bit.

<sup>4</sup> UTOPIA pins muxed with a second McBSP.

<sup>5</sup> UTOPIA pins muxed with a third McBSP.

<sup>6</sup> 64-bit configurable timers.

<sup>7</sup> Plus on-chip Turbo (TCP) and VITERBI (VCP) coprocessors.

Note: Check [www.ti.com](http://www.ti.com) for extended temperature and packaging options. Enhanced plastic and Military DSP versions are also available for selected DSPs.



## DaVinci™ Digital Media Processors

Device	CPU	Frequency (MHz)	L1/ SRAM	L2/ SRAM	ROM (Bytes)	External Memory	EDMA	Video Ports (Configurable)	Serial I/F	Connectivity I/F	Program/ Data	Voltage (V)		Packaging	Price <sup>1</sup>
			(Bytes)	(Bytes)		I/F					Storage	Core	I/O		
TMS320DM6446BZWT	C64x+, ARM9, DaVinci Video	594 (DSP) 297 (ARM)	112 K (DSP) 40 K (ARM)	64 K (DSP)	16 K (ARM)	1 16-/8-Bit EMIFA 1 32-/16-Bit DDR2	64 Ch	1 Input, 1 Output	ASP, I <sup>2</sup> C, SPI, 3 UARTs	USB 2.0, VLYNQ™, 10/100 EMAC	Async SRAM, DDR2 SDRAM, NAND Flash, SmartMedia/xD	1.2 1.8/ 3.3	1.8/ 3.3	361 BGA, 16 × 16 mm	39.50
TMS320DM6443BZWT	C64x+, ARM9, DaVinci Video	594 (DSP) 297 (ARM)	112 K (DSP) 40 K (ARM)	64 K (DSP)	16 K (ARM)	1 16-/8-Bit EMIFA 1 32-/16-Bit DDR2	64 Ch	1 Output	ASP, I <sup>2</sup> C, SPI, 3 UARTs	USB 2.0, VLYNQ, 10/100 EMAC	Async SRAM, DDR2 SDRAM, NAND Flash, SmartMedia/xD	1.2 1.8/ 3.3	1.8/ 3.3	361 BGA, 16 × 16 mm	33.85
TMS320DM6441ZWT	C64x+, ARM9, DaVinci Video	513/405 (DSP) 256/202 (ARM)	112 K (DSP) 40 K (ARM)	64 K (DSP)	16 K (ARM)	1 16-/8-Bit EMIFA 1 32-/16-Bit DDR2	64 Ch	1 Input, 1 Output	ASP, I <sup>2</sup> C, SPI, 3 UARTs	USB 2.0, VLYNQ, 10/100 EMAC	Async SRAM, DDR2 SDRAM, NAND Flash, SmartMedia/xD	1.2/ 1.05	1.8/ 3.3	361 BGA, 16 × 16 mm	27.05
TMX320DM6431 <sup>2</sup>	C64x+, DaVinci Video	300	64 K	64 K	64 K	1 8-Bit EMIFA, 1 16-Bit DDR2	64 Ch	1 Input	McASP, I <sup>2</sup> C, 1 UART, 1 McBSP, 1 HECC	10/100 EMAC	Async SRAM, DDR2 SDRAM, NAND Flash	1.05 1.8/ 3.3	1.8/ 3.3	361 BGA 16 × 16 mm, 376 BGA 23 × 23 mm	11.25
TMX320DM6433 <sup>2</sup>	C64x+, DaVinci Video	400 500 600	112 K	128 K	64 K	1 8-Bit EMIFA, 1 16-/32-Bit DDR2	64 Ch	1 Output	McASP, 1 McBSP, I <sup>2</sup> C, 1 UART	32-Bit PCI, VLYNQ, 10/100 EMAC, 16-Bit HPI	Async SRAM, DDR2 SDRAM, NAND Flash	1.05/ 1.2	1.8/ 3.3	361 BGA 16 × 16 mm, 376 BGA 23 × 23 mm	15.75 16.65 18.50
TMX320DM6435 <sup>2</sup>	C64x+, DaVinci Video	400 500 600	112 K	128 K	64 K	1 8-Bit EMIFA, 1 16-/32-Bit DDR2	64 Ch	1 Input	McASP, I <sup>2</sup> C, 1 McBSP, 2 UARTs, 1 HECC	VLYNQ, 10/100 EMAC, 16-Bit HPI	Async SRAM, DDR2 SDRAM, NAND Flash	1.05/ 1.2	1.8/ 3.3	361 BGA 16 × 16 mm, 376 BGA 23 × 23 mm	16.30 17.25 19.15
TMX320DM6437 <sup>2</sup>	C64x+, DaVinci Video	400 500 600	112K	128 K	64 K	1 8-Bit EMIFA, 1 16-/32-Bit DDR2	64 Ch	1 Input, 1 Output	McASP, I <sup>2</sup> C, 1 HECC, 2 McBSPs <sup>3</sup> , 2 UARTs	32-Bit PCI, VLYNQ, 10/100 EMAC, 16-Bit HPI	Async SRAM, DDR2 SDRAM, NAND Flash	1.05/ 1.2	1.8/ 3.3	361 BGA 16 × 16 mm, 376 BGA 23 × 23 mm	22.05 23.35 25.93

<sup>1</sup> Prices are quoted in U.S. dollars and represent year 2007 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.

<sup>2</sup> Available in the ZDU (376-pin plastic BGA) and ZWT (361-pin Pb-free PBGA) packages.

<sup>3</sup> McBSP can be configured as an SPI peripheral.

New devices are listed in red.

See page 21 for detailed information on DaVinci™ Technology.



Silicon

## TMS320DM64x™ DSP Generation – Video Application-Specific Fixed-Point DSPs

Part Number	Internal RAM (Bytes) L1 Program Cache/ L1 Data Cache/ L2 Unified RAM/Cache	Video Ports	McBSP	Enhanced DMA (Channels)	COM <sup>2</sup>	Timers	MHz	MIPS	Power (W)		Voltage (V)		Packaging	1 KU (U.S.) <sup>1</sup>
									CPU and L1 <sup>3</sup>	Total <sup>4</sup>	Core	I/O		
<b>Video Application Specific</b>														
TMS320DM640AGDK4	16K/16K/128K	1 8-bit	2	64	EMAC	3	400	3200	0.66	1.15	1.2	3.3	548 BGA, 23 mm	21.45
TMS320DM640AGNZ4	16K/16K/128K	1 8-bit	2	64	EMAC	3	400	3200	0.66	1.15	1.2	3.3	548 BGA, 27 mm	21.45
TMS320DM641AGDK5	16K/16K/128K	2 8-bit	2	64	HPI 16/EMAC	3	500	4000	0.66	1.30	1.2	3.3	548 BGA, 23 mm	27.80
TMS320DM641AGNZ5	16K/16K/128K	2 8-bit	2	64	HPI 16/EMAC	3	500	4000	0.66	1.30	1.2	3.3	548 BGA, 27 mm	27.80
TMS320DM641AGDK6	16K/16K/128K	2 8-bit	2	64	HPI 16/EMAC	3	600	4800	0.93	1.90	1.4	3.3	548 BGA, 23 mm	30.60
TMS320DM641AGNZ6	16K/16K/128K	2 8-bit	2	64	HPI 16/EMAC	3	600	4800	0.93	1.90	1.4	3.3	548 BGA, 27 mm	30.60
TMS320DM643AGDK5	16K/16K/256K	2 20-bit	1	64	HPI 32/EMAC <sup>6</sup>	3	500	4000	0.66	1.30	1.2	3.3	548 BGA, 23 mm	30.90
TMS320DM643AGNZ5	16K/16K/256K	2 20-bit	1	64	HPI 32/EMAC <sup>6</sup>	3	500	4000	0.66	1.30	1.2	3.3	548 BGA, 27 mm	30.90
TMS320DM643AGDK6	16K/16K/256K	2 20-bit	1	64	HPI 32/EMAC <sup>6</sup>	3	600	4800	0.93	1.90	1.4	3.3	548 BGA, 23 mm	33.70
TMS320DM643AGNZ6	16K/16K/256K	2 20-bit	1	64	HPI 32/EMAC <sup>6</sup>	3	600	4800	0.93	1.90	1.4	3.3	548 BGA, 27 mm	33.70
TMS320DM642AGDK5	16K/16K/256K	3 20-bit	2 <sup>5</sup>	64	PCI/HPI 32/EMAC <sup>6</sup>	3	500	4000	0.66	1.30	1.2	3.3	548 BGA, 23 mm	36.70
TMS320DM642AGNZ5	16K/16K/256K	3 20-bit	2 <sup>5</sup>	64	PCI/HPI 32/EMAC <sup>6</sup>	3	500	4000	0.66	1.30	1.2	3.3	548 BGA, 27 mm	36.70
TMS320DM642AGDK6	16K/16K/256K	3 20-bit	2 <sup>5</sup>	64	PCI/HPI 32/EMAC <sup>6</sup>	3	600	4800	0.93	1.90	1.4	3.3	548 BGA, 23 mm	40.35
TMS320DM642AGNZ6	16K/16K/256K	3 20-bit	2 <sup>5</sup>	64	PCI/HPI 32/EMAC <sup>6</sup>	3	600	4800	0.93	1.90	1.4	3.3	548 BGA, 27 mm	40.35
TMS320DM642AGDK7	16K/16K/256K	3 20-bit	2 <sup>5</sup>	64	PCI/HPI 32/EMAC <sup>6</sup>	3	720	5760	0.93	2.15	1.4	3.3	548 BGA, 23 mm	56.90
TMS320DM642AGNZ7	16K/16K/256K	3 20-bit	2 <sup>5</sup>	64	PCI/HPI 32/EMAC <sup>6</sup>	3	720	5760	0.93	2.15	1.4	3.3	548 BGA, 27 mm	56.90

<sup>1</sup> Prices are quoted in U.S. dollars and represent year 2007 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.

<sup>2</sup> HPI is selectable, 32-bit or 16-bit.

<sup>3</sup> Assumes 60% CPU utilization.

<sup>4</sup> Assumes 60% CPU utilization, 50% EMIF utilization (133 MHz for 1.4 V, 100 MHz for 1.2 V), 50% writes, 64-bits, 50% bit switching, 2 2-MHz McBSP at 100% utilization, and 2 50-MHz timers at 100% utilization. See SPRA962.

<sup>5</sup> The DM642 can be configured to have up to three serial ports in various video/McASP/McBSP combinations.

<sup>6</sup> The DM640 has an Ethernet MAC. The DM641 can be configured to have either a 16-bit HPI or Ethernet MAC. The DM643 can be configured to have either a 32-bit HPI or a 16-bit HPI and Ethernet MAC. The DM642 can be configured to have either a 32-bit PCI or 32-bit HPI or a 16-bit HPI and Ethernet MAC.

Note: Check [www.ti.com](http://www.ti.com) for extended temperature and packaging options. Enhanced plastic and Military DSP versions are available for selected DSPs.

## TMS320C64x™/TMS320DM64x™/TMS320DM64xx DSP Generations Hardware Development Tools

Description	Part Number	U.S. <sup>1</sup>
<b>Hardware Development Tools<sup>2</sup></b>		
TMS320C6416 DSP Starter Kit (DSK)	TMDSDSK6416-T (U.S. part number) TMDSDSK6416-TE (European part number)	495
Network and Video 1-GHz Development Kit (NVDK)	TMDXNVK6415-T (U.S. part number) TMDXNVK6415-TE (European part number)	4,495
Video Security over Internet Protocol Development Platform (VSIP) (NTSC) VSIP Development Platform (PAL)	TMDXVSK642 (U.S. part number) TMDXVSK642-0E (European part number)	15,000
Video Security over IP (VSIP) with ATEME Emulator (NTSC) Video Security over IP (VSIP) with ATEME Emulator (PAL)	TMDXVSK642-3 TMDXVSK642-3E	16,000
TMS320DM642 Digital Media Development Kit (DM642 DMDK)	TMDSDMK642 (U.S. part number) TMDSDMK642-0E (European part number)	6,495
<b>Evaluation Modules (EVMs)</b>		
Digital Video Evaluation Module (DVEVM)	TMDXEVM6446 (U.S. part number) TMDXEVM6446-0E (European part number)	2,495
TMS320DM642 Evaluation Module	TMDSEVM642 (U.S. part number) TMDSEVM642-0E (European part number)	1,995
<b>TMS320C6424 Evaluation Module</b>	TMDXEVM6424 (U.S. part number)	495
<b>TMS320DM6437 Digital Video Development Platform</b>	TMDXVDP6437 (U.S. part number)	495

<sup>1</sup> Prices are quoted in U.S. dollars and represent year 2007 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. **New tools are listed in bold red.**

<sup>2</sup> A TMS320C6413 EVM is available from Spectrum Digital ([www.spectrumdigital.com](http://www.spectrumdigital.com)), Spectrum Digital part number 701884.



## TMS320C64x™/TMS320DM64x™/TMS320DM64xx DSP Generations Hardware and Software Development Tools (Continued)

Description	Part Number	U.S. <sup>1</sup>
<b>JTAG Emulators</b>		
XDS560™ PCI-Based High-Performance JTAG Emulator	TMDSEMU560	3,995
XDS560 Blackhawk USB High-Performance JTAG Emulator	TMDSEMU560U (U.S. part number) TMDSEMU560U-0E (European part number)	2,995
XDS510PP-Plus – Parallel Port Emulator for Windows	TMDSEMUPP (U.S. part number) TMDSEMUPP-0E (European part number)	1,500
XDS510™ USB-Based Emulator for Windows	TMDSEMUUSB	1,995
<b>Software Development Tools</b>		
<b>Digital Video Software Development Kit (DVSDK)</b> with MontaVista™ Pro Linux, Code Composer Studio™ IDE and XDS560 Emulator	TMDXSDK6446-L (U.S. part number) TMDXSDK6446-3L (U.S. part number)	6,995 10,995
Code Composer Studio Platinum v 3.3 Development Tools Bundled with Annual S/W Subscription Supports C6000™, C5000™, C2000™, DaVinci™ and OMAP™ processor platforms	TMDSCCSALL-1	3,595
C6000, C5000, C2000, DaVinci and OMAP processor CCStudio Development Tools Annual Software Subscription for Version 3.10 and higher	TMDSSUBALL	600
Essential Guide to Getting Started with DSP CD-ROM Includes C6000, C5000, C2000, DaVinci and OMAP processor CCStudio 120-Day Free Evaluation Tools <sup>2</sup>	SPRC119D ( <a href="http://www.ti.com/freetools">www.ti.com/freetools</a> )	Free
TMS320C6000 DSP Chip Support Library	SPRC090	Free
TMS320C64x™ DSP Library	SPRC092	Free
TMS320C64x DSP Image Library	SPRC094	Free

<sup>1</sup> Prices are quoted in U.S. dollars and represent year 2007 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. **New tools are listed in bold red.**

<sup>2</sup> Includes full-featured Code Composer Studio Development Tools, code generation tools (C/C++ compiler/assembler/linker) and simulator all limited to 120 days.

## DAVINCI™ WHITE PAPERS AND RESOURCES

Learn about all the possibilities of a whole new world enabled by digital video technology!

### DaVinci™ White Papers

View the wide variety of DaVinci white papers and articles to see the possibilities for designing and developing digital video and audio end-equipment devices and applications using DaVinci technology.

[www.ti.com/davinciwhitepaper](http://www.ti.com/davinciwhitepaper)

### DaVinci Technology Training

Discover how DaVinci technology benefits digital video or learn how to develop a complete video system centered around TMS320DM644x processors. Register today for the DaVinci workshops or download the many DaVinci on-line training sessions.

[www.ti.com/davincitraining](http://www.ti.com/davincitraining)

### DaVinci News

Read the latest news about DaVinci products, development tools, optimized software, training, support and more.

[www.ti.com/davincinews](http://www.ti.com/davincinews)



## Silicon

### TMS320C645x™ DSP Generation, Fixed Point

Highest-Performance DSPs

Get samples, datasheets, tools and app reports at: [www.ti.com/c6000](http://www.ti.com/c6000)

#### Specifications

- Serial RapidIO® for DSP-to-DSP, DSP-to-switch and DSP-to-FPGA interconnectivity
- New core enables 20 percent higher cycle performance
- 20–30 percent smaller code size from 16-bit compact instructions and SPLOOP buffer

#### Applications

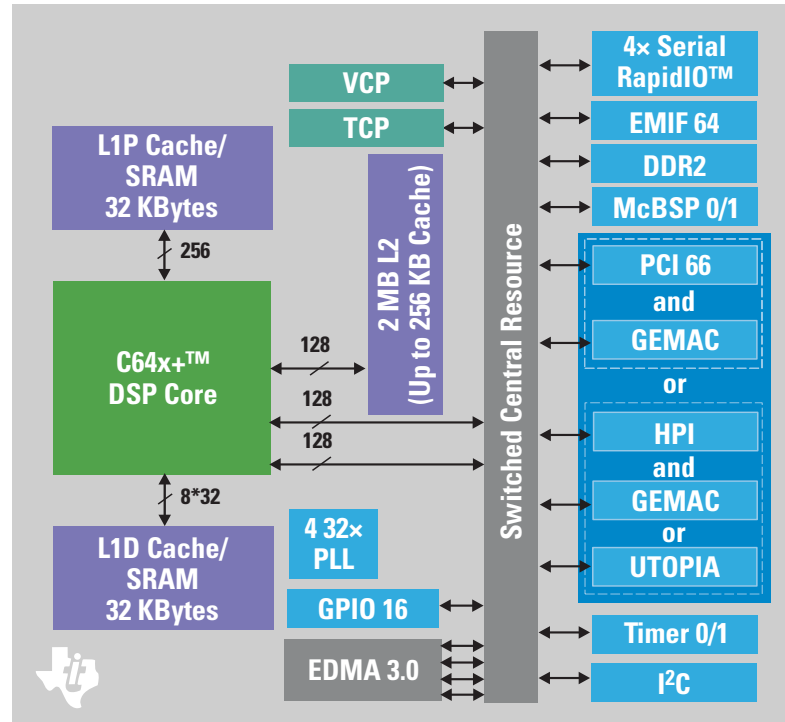
Video and Voice Transcoding, Video Conferencing Servers, High-Definition (HD) Video Encoding and Mixer Systems, Wireless Basestation Transceivers, HD Radio, Medical Imaging, photo labs and printing, video transceiving and transrating, video transcoding

#### Features

- Based on the new TMS320C64x+™ core
  - 720 MHz, 850 MHz, 1 GHz
- Memory
  - 32 KB L1D, 32 KB L1P Cache/SRAM
  - 2 MB L2, 256 K Cache/SRAM, remainder SRAM only
- Acceleration
  - Viterbi Decoder co-processor (VCP)
  - Turbo Decoder co-processor (TCP)

#### Peripherals

- Serial RapidIO: 10-Gb/s full duplex
- Other high-bandwidth peripherals: Gigabit Ethernet MAC, UTOPIA, PCI-66, HPI
- Two EMIFs: 32-bit DDR2, 64-bit EMIF



#### TMS320C6455/TMS320C6454 DSP Block Diagram

Enables high-performance multiprocessing via Serial RapidIO plus other high-bandwidth peripherals.

#### New TMS320C64x+™ DSP Core Benefits and Features

Benefits	Supporting Architecture Features
20% higher cycle performance improves overall system performance	<ul style="list-style-type: none"> <li>Doubled multiplication bandwidth</li> <li>Instruction set enhancements for FFT, FIR and DCT</li> <li>New EDMA 3.0 engine</li> </ul>
20–30% smaller code size reduces system cost	<ul style="list-style-type: none"> <li>16-bit compact instructions</li> <li>SPLOOP buffer</li> </ul>
Enhanced development	<ul style="list-style-type: none"> <li>Real-time bandwidth management</li> <li>Memory protection</li> </ul>
Better debug	<ul style="list-style-type: none"> <li>Exception handling</li> <li>Cache coherency visibility</li> </ul>

**TMS320C645x DSP Generation – Highest-Performance Fixed-Point DSPs**

Part Number	Internal RAM (Bytes)	McBSP	Enhanced DMA (Channels)	COM <sup>3</sup>	Timers	MHz	MIPS	Power (W) <sup>2</sup>		Voltage (V)		Packaging	1 KU (U.S.) <sup>1</sup>
	L1 Program Cache/ L1 Data Cache/ L2 Unified RAM/Cache							CPU and L1	Total	Core	I/O		
<b>Highest Performance</b>													
TMS320C6455BZTZ	32K/32K/2M	2+Utopia <sup>4</sup>	64	Serial RapidIO®/HPI/ PCI/Gigabit EMAC	2 <sup>5</sup>	1000	8000 <sup>6</sup>	TBD	TBD	1.2	3.3, 1.8, 1.5, 1.2	697 BGA, 24 mm	278.45
TMS320C6455BZTZ8	32K/32K/2M	2+Utopia <sup>4</sup>	64	Serial RapidIO/HPI/ PCI/Gigabit EMAC	2 <sup>5</sup>	850	6800 <sup>6</sup>	TBD	TBD	1.2	3.3, 1.8, 1.5, 1.2	697 BGA, 24 mm	224.55
TMS320C6455BZTZ7	32K/32K/2M	2+Utopia <sup>4</sup>	64	Serial RapidIO/HPI/ PCI/Gigabit EMAC	2 <sup>5</sup>	720	5760 <sup>6</sup>	TBD	TBD	1.2	3.3, 1.8, 1.5, 1.2	697 BGA, 24 mm	179.65
<b>TMS320C6454BZTZ</b>	32K/32K/1M	2	64	HPI/PCI/ Gigabit EMAC	2 <sup>5</sup>	1000	8000	TBD	TBD	1.2	3.3, 1.8, 1.5, 1.2	687 BGA, 24 mm	213.45
<b>TMS320C6454BZTZ8</b>	32K/32K/1M	2	64	HPI/PCI/ Gigabit EMAC	2 <sup>5</sup>	850	6800	TBD	TBD	1.2	3.3, 1.8, 1.5, 1.2	687 BGA, 24 mm	157.20
<b>TMS320C6454BZTZ7</b>	32K/32K/1M	2	64	HPI/PCI/ Gigabit EMAC	2 <sup>5</sup>	720	5760	TBD	TBD	1.2	3.3, 1.8, 1.5, 1.2	687 BGA, 24 mm	106.20

<sup>1</sup> Prices are quoted in U.S. dollars and represent year 2007 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.

*New devices are listed in red.*

<sup>2</sup> Assumes 60% CPU utilization, 50% EMIF utilization (133 MHz for 1.4 V, 100 MHz for 1.2 V), 50% writes, 64-bits, 50% bit switching, 2 2-MHz McBSP at 100% utilization, and 2 75-MHz timers at 100% utilization. See SPRAAE8 for TMS320C6455 and TMS320C6454 DSPs.

<sup>3</sup> HPI is selectable, 32-bit or 16-bit.

<sup>4</sup> UTOPIA pins muxed with a second McBSP.

<sup>5</sup> 64-bit configurable timers.

<sup>6</sup> Plus on-chip Turbo (TCP) and VITERBI (VCP) coprocessors.

Note: Check [www.ti.com](http://www.ti.com) for extended temperature and packaging options. Enhanced plastic and Military DSP versions are also available for selected DSPs.

**TMS320C645x DSP Generation Hardware and Software Development Tools**

Description	Part Number	U.S. <sup>1</sup>
<b>Hardware Development Tool</b>		
TMS320C6455 DSP Starter Kit (DSK)	TMDXDSK6455 (U.S. part number) TMDXDSK6455-0E (European part number)	495
<b>Evaluation Module (EVM)</b>		
TMS320C6455 DSP Evaluation Module with SRIO	TMDXEVM6455 (U.S. part number) TMDXEVM6455-0E (European part number)	1,795
<b>JTAG Emulators</b>		
XDS560™ PCI-Based High-Performance JTAG Emulator	TMDSEMU560	3,995
XDS560 Blackhawk USB High-Performance JTAG Emulator	TMDSEMU560U (U.S. part number) TMDSEMU560U-0E (European part number)	2,995
XDS510PP-Plus – Parallel Port Emulator for Windows	TMDSEMUPP (U.S. part number) TMDSEMUPP-0E (European part number)	1,500
XDS510™ USB-Based Emulator for Windows	TMDSEMUUSB	1,995
<b>Software Development Tools</b>		
Code Composer Studio Platinum v 3.3 Development Tools Bundled with Annual S/W Subscription Supports C6000™, C5000™, C2000™, DaVinci™ and OMAP™ processor platforms	TMDSCCSALL-1	3,595
C6000, C5000, C2000, DaVinci and OMAP processor CCStudio Development Tools Annual Software Subscription for Version 3.10 and higher	TMDSSUBALL	600
Essential Guide to Getting Started with DSP CD-ROM Includes C6000, C5000, C2000, DaVinci and OMAP processor CCStudio 120-Day Free Evaluation Tools <sup>2</sup>	SPRC119D ( <a href="http://www.ti.com/freetools">www.ti.com/freetools</a> )	Free
TMS320C6000 DSP Chip Support Library	SPRC090	Free

<sup>1</sup> Prices are quoted in U.S. dollars and represent year 2007 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.

<sup>2</sup> Includes full-featured Code Composer Studio Development Tools, code generation tools (C/C++ compiler/assembler/linker) and simulator all limited to 120 days.



## Silicon

### TMS320C62x™ DSP Generation, Fixed Point TMS320C67x™ DSP Generation, Floating Point

High-Performance DSPs

Get samples, datasheets, tools and app reports at: [www.ti.com/c6000](http://www.ti.com/c6000)

#### Features

- 100% code-compatible DSPs priced as low as U.S. \$5.75
- Advanced VLIW architecture
- Up to eight 32-bit instructions executed each cycle
- Eight independent, multi-purpose functional units and up to sixty-four 32-bit registers
- Industry's most advanced DSP C compiler and Assembly Optimizer maximize efficiency and performance

#### C672x DSP

- Lowest price floating-point device in the market
- Sixty four 32-bit registers
- Large (32 KB) program cache
- Flexible boot options
- dMAX DMA engine tuned for audio performance

#### C671x DSP

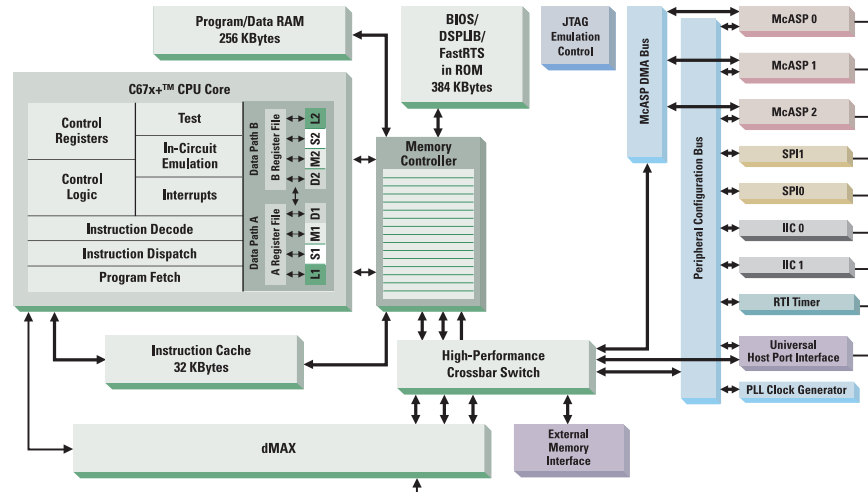
- L1/L2 cache architecture
- Thirty two 32-bit registers
- EDMA DMA engine

#### C62x™ DSP

- Sixteen-bit multiply, 32-bit instruction
- Up to 7 Mbit on-chip memory
- 32-bit PCI interface (C6205 DSP only)

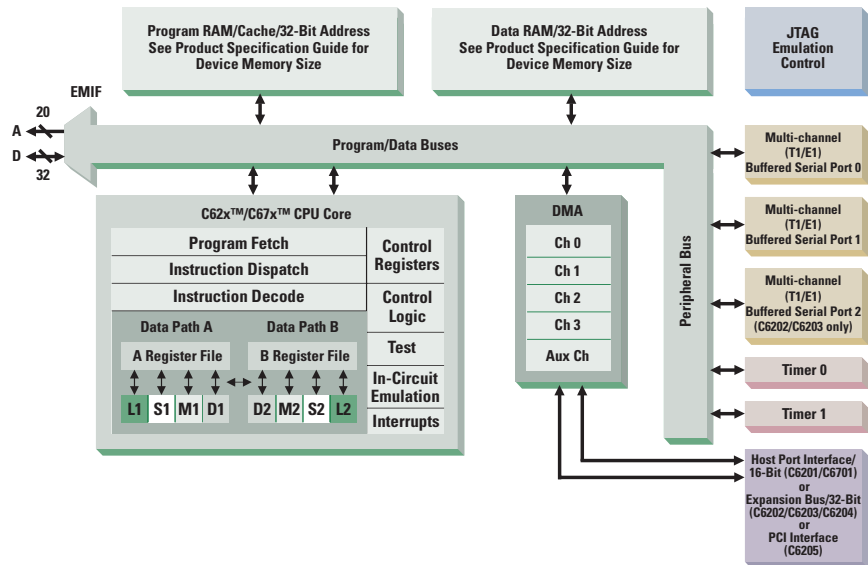
#### Applications

Professional audio products, mixers, effects boxes, audio synthesis, instrument/amplifier modeling, audio conferencing, audio broadcast, audio encoders, emerging audio applications, biometrics, medical, industrial applications, digital imaging, 3D graphics, speech recognition and voice over packet



#### TMS320C6727 DSP Block Diagram

TI's latest floating-point DSPs include the TMS320C6722, TMS320C6726 and the TMS320C6727 DSPs. These DSPs are ideal for a host of professional audio, musical instruments, broadcast audio and commercial audio applications. These devices will also perform exceptionally well in a variety of industrial, biometric, control and medical applications.



#### TMS320C6201 / C6701 / C6202 / C6203 / C6204 / C6205 DSP Block Diagram

The fixed-point C6201 DSP is pin-for-pin compatible with the floating-point C6701 DSP offering easy code transfer resulting in significant savings in development, resource and manufacturing costs. Pin compatibility between the C6202, C6203 and C6204 DSPs allow for easy migration between several memory, price and performance options. The C6205 DSP is the first TI DSP with on-chip PCI.





TMS320C62x™ DSP Generation – Fixed-Point DSPs

Part Number	RAM (Bytes)		McBSP	DMA	COM	MHz	Cycle (ns)	MIPS	Typical Activity		Voltage (V)		Packaging	1 KU (U.S.) <sup>1</sup>
	Data	Prog							Total Internal Power (W) (Full Device Speed)	Core	I/O			
TMS320C6204GHK200 <sup>2</sup>	64K	64K	2	4	Exp. Bus/32	200	5	1600	0.8	1.5	3.3	288 BGA, 16 mm	9.70	
TMS320C6204GLW200	64K	64K	2	4	Exp. Bus/32	200	5	1600	0.8	1.5	3.3	340 BGA, 18 mm	21.90	
TMS320C6205GHK200 <sup>2</sup>	64K	64K	2	4	PCI/32	200	5	1600	0.8	1.5	3.3	288 BGA, 16 mm	10.45	
TMS320C6211BGFN150 <sup>2</sup>	4K/4K/64K <sup>3</sup>		2	16 <sup>4</sup>	HPI/16	150	6.7	1200	0.9	1.8	3.3	256 BGA, 27 mm	22.55	
TMS320C6211BGFN167	4K/4K/64K <sup>3</sup>		2	16 <sup>4</sup>	HPI/16	167	6	1336	1.0	1.8	3.3	256 BGA, 27 mm	28.20	
TMS320C6202BGNZ250 <sup>2</sup>	128K	256K	3	4	Exp. Bus/32	250	4	2000	0.9	1.5	3.3	352 BGA, 27 mm	58.60	
TMS320C6202BGNZ250	128K	256K	3	4	Exp. Bus/32	250	4	2000	0.9	1.5	3.3	384 BGA, 18 mm	58.60	
TMS320C6202BGNZ300	128K	256K	3	4	Exp. Bus/32	300	3.3	2400	1.0	1.5	3.3	352 BGA, 27 mm	70.30	
TMS320C6202BGNZ300	128K	256K	3	4	Exp. Bus/32	300	3.3	2400	1.0	1.5	3.3	384 BGA, 18 mm	70.30	
TMS320C6203BGNZ300	512K	384K	3	4	Exp. Bus/32	300	3.3	2400	1.3	1.5	3.3	352 BGA, 27 mm	74.70	
TMS320C6203BGNZ300	512K	384K	3	4	Exp. Bus/32	300	3.3	2400	1.3	1.5	3.3	384 BGA, 18 mm	74.70	
TMS320C6203BGNZ173 <sup>2</sup>	512K	384K	3	4	Exp. Bus/32	173	5.78	1384	1.1	1.5 <sup>5</sup>	3.3	352 BGA, 27 mm	63.30	
TMS320C6203BGNZ173	512K	384K	3	4	Exp. Bus/32	173	5.78	1384	1.1	1.5 <sup>5</sup>	3.3	384 BGA, 18 mm	63.30	
TMS320C6201GJC200 <sup>2</sup>	64K	64K	2	4	HPI/16	200	5	1600	1.3	1.8	3.3	352 BGA, 35 mm	86.60	
TMS320C6201GJL200 <sup>2</sup>	64K	64K	2	4	HPI/16	200	5	1600	1.3	1.8	3.3	352 BGA, 27 mm	86.60	

<sup>1</sup> Prices are quoted in U.S. dollars and represent year 2007 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.

<sup>2</sup> Extended temperature versions available for C6201, C6202, C6203, C6204, C6205 and C6211 for additional charge.

<sup>3</sup> The C6211 DSPs 72 KBytes of cache memory is comprised of 4 KBytes data cache,

<sup>4</sup> Enhanced DMA.

4 KBytes program cache and 64 KBytes unified cache memory.

<sup>5</sup> Device may operate at 300 MHz with 1.7-V core.

Note: All devices include two timers.

Note: Enhanced plastic and Military DSP versions are available for selected DSPs.

TMS320C67x™ DSP Generation – Floating-Point DSPs

Device	RAM (Bytes)		McBSP	McASP	DMA	COM	SPI/ I <sup>2</sup> C	MHz	Cycle (ns)	MFLOPS	Typical Activity		Voltage (V)		Package(s)	Price <sup>1</sup>
	Data/Prog										Total Internal Power (W) (Full Device Speed)	Core	I/O			
TMS320C6712DGDGP150	4K/4K/64K <sup>2</sup>		2	—	16 <sup>3</sup>	—	—	150	6.7	900	0.7	1.2	3.3	272 BGA, 27 mm	13.15	
TMS320C6720RFP200 <sup>5</sup>	32K/64K/384K <sup>2</sup>		—	2	dMAX	—	2/2	200	5	1200	0.8	1.2	3.3	144 PQFP, 22 mm	6.50	
TMS320C6722BRFP200 <sup>4,5</sup>	32K/128K/384K <sup>7</sup>		—	2	dMAX	—	2/2	200	5	1200	0.8	1.2	3.3	144 PQFP, 22 mm	10.15	
TMS320C6722RFPA225 <sup>4,5,6</sup>	32K/128K/384K <sup>7</sup>		—	2	dMAX	—	2/2	225	4.4	1350	0.8	1.2	3.3	144 PQFP, 22 mm	11.80	
TMS320C6722BRFP250 <sup>4,5</sup>	32K/128K/384K <sup>7</sup>		—	2	dMAX	—	2/2	250	4	1500	0.9	1.2	3.3	144 PQFP, 22 mm	11.75	
TMS320C6711DGDGP200	4K/4K/64K <sup>2</sup>		2	—	16 <sup>3</sup>	HPI/16	—	200	5	1200	0.9	1.2	3.3	272 BGA, 27 mm	16.35	
TMS320C6726RFPA225 <sup>4,5,6</sup>	32K/256K/384K <sup>7</sup>		—	3 <sup>8</sup>	dMAX	—	2/2	225	4.4	1350	0.8	1.2	3.3	144 PQFP, 22 mm	15.20	
TMS320C6726RFP250 <sup>4,5</sup>	32K/256K/384K <sup>7</sup>		—	3 <sup>8</sup>	dMAX	—	2/2	250	4	1500	0.9	1.2	3.3	144 PQFP, 22 mm	15.20	
TMS320C6713BPYP200	4K/4K/256K <sup>2</sup>		2 <sup>9</sup>	2 <sup>9</sup>	16 <sup>3</sup>	HPI/16	—	200	5	1200	1.0	1.2	3.3	208 TQFP, 28 mm	19.00	
TMS320C6727GDHA250 <sup>4,5,10</sup>	32K/256K/384K <sup>7</sup>		—	3	dMAX	UHPI	2/2	300	3.3	1800	1.1	1.2	3.3	256 BGA, 17 mm	21.50	
TMS320C6727BZDH275 <sup>4,5</sup>	32K/256K/384K <sup>7</sup>		—	3	dMAX	UHPI	2/2	275	3.63	1650	1.0	1.2	3.3	256 BGA, 17 mm	19.00	
TMS320C6727BZDH300 <sup>4,5,10</sup>	32K/256K/384K <sup>7</sup>		—	3	dMAX	UHPI	2/2	300	3.3	1800	1.1	1.2	3.3	256 BGA, 17 mm	21.50	
TMS320C6727BZDH350 <sup>5</sup>	32K/256K/384K <sup>2</sup>		—	3	dMAX	UHPI	2/2	350	2.86	2100	1.5	1.4	3.3	256 BGA, 17 mm	29.35	
TMS320C6713BPYP225	4K/4K/256K <sup>2</sup>		2 <sup>9</sup>	2 <sup>9</sup>	16 <sup>3</sup>	HPI/16	—	225	4.4	1350	1.0	1.2	3.3	208 TQFP, 28 mm	22.20	
TMS320C6713BGDP225	4K/4K/256K <sup>2</sup>		2 <sup>9</sup>	2 <sup>9</sup>	16 <sup>3</sup>	HPI/16	—	225	4.4	1350	1.1	1.2	3.3	272 BGA, 27 mm	24.95	
TMS320C6713BGDP300	4K/4K/256K <sup>2</sup>		2 <sup>9</sup>	2 <sup>9</sup>	16 <sup>3</sup>	HPI/16	—	300	3.3	1800	1.6	1.4	3.3	272 BGA, 27 mm	33.15	
TMS320C6701GJC150	64K/64K		2	—	4	HPI/16	—	150	6.7	900	1.3	1.8	3.3	352 BGA, 35 mm	82.25	
TMS320C6701GJL16719V	64K/64K		2	—	4	HPI/16	—	167	6	1000	1.4	1.9	3.3	352 BGA, 35 mm	125.00	

<sup>1</sup> Prices are quoted in U.S. dollars and represent year 2007 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. New products are listed in red.

<sup>2</sup> Format represents cache memory architecture: [data cache] / [program cache] / [unified cache].

<sup>9</sup> The C6713 DSP can be configured to have up to three serial ports in various McASP/ McBSP combinations by not utilizing the HPI. Other configurable serial options include I<sup>2</sup>C and additional GPIO.

<sup>3</sup> Enhanced DMA.

<sup>4</sup> Extended temperature versions available for C6722, C6726, C6727, C6713, C6711D DSPs.

<sup>10</sup> Also available in 256-pin BGA, 17-mm (GDH) package.

<sup>5</sup> RFP and ZDH packages are Pb-Free.

<sup>6</sup> The "A" designation is for industrial temperature range.

Note: All devices include two timers.

<sup>7</sup> Format represents program cache/program or data memory/ROM.

Note: Enhanced plastic and Military DSP versions are available for selected DSPs.

<sup>8</sup> McASP2 DIT only.



## Tools, Software and Support

### TMS320C62x™/TMS320C67x™ DSP Generation Hardware and Software Development Tools

Description	Part Number	\$.U.S. <sup>1</sup>
<b>Hardware Development Tools</b>		
TMS320C6713 DSP Starter Kit (DSK)	TMDSDSK6713 (U.S. part number) TMDSDSK6713-0E (European part number)	395
Professional Audio Development Kit (PADK)	TMDXPDK6727 (U.S. part number) TMDXPDK6727-0E (European part number)	1,995
Professional Audio Development Bundle	TMDXPDB6727 (U.S. part number) TMDXPDB6727-0E (European part number)	5,995
<b>JTAG Emulators</b>		
XDS560™ PCI-Based High-Performance JTAG Emulator	TMDSEMU560	3,995
XDS560 Blackhawk USB High-Performance JTAG Emulator	TMDSEMU560U (U.S. part number) TMDSEMU560U-0E (European part number)	2,995
XDS510PP-Plus – Parallel Port Emulator for Windows	TMDSEMUPP (U.S. part number) TMDSEMUPP-0E (European part number)	1,500
XDS510™ USB-Based Emulator for Windows	TMDSEMUUSB	1,995
<b>Software Development Tools</b>		
Code Composer Studio Platinum v 3.3 Development Tools Bundled with Annual S/W Subscription Supports C6000™, C5000™, C2000™, DaVinci™ and OMAP™ processor platforms	TMDSCCSALL-1	3,595
C6000, C5000, C2000, DaVinci and OMAP processor CCStudio Development Tools Annual Software Subscription for Version 3.10 and higher	TMDSSUBALL	600
Essential Guide to Getting Started with DSP CD-ROM Includes C6000, C5000, C2000, DaVinci and OMAP processor CCStudio 120-Day Free Evaluation Tools <sup>2</sup>	SPRC119D ( <a href="http://www.ti.com/freetools">www.ti.com/freetools</a> )	Free
TMS320C6000 DSP Chip Support Library	SPRC090	Free
TMS320C62x™ DSP Library	SPRC091	Free
TMS320C62x DSP Image Library	SPRC093	Free
TMS320C67x™ DSP Library	SPRC121	Free
TMS320C67x DSP Fast Run-Time Support Library (Fast RTS)	SPRC060	Free

<sup>1</sup> Prices are quoted in U.S. dollars and represent year 2007 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.

<sup>2</sup> Includes full-featured Code Composer Studio Development Tools, code generation tools (C/C++ compiler/assembler/linker) and simulator all limited to 120 days.

### C6000 DSP Literature and Related Technical Documentation

All documentation and associated literature, user's guides, application notes and software can be found by clicking on the specific device in the parametric table found on the URLs below.

TMS320C62x™ DSP Generation	<a href="http://www.ti.com/c62x">www.ti.com/c62x</a>	TMS320DM64x™ DSP Generation	<a href="http://www.ti.com/dm64x">www.ti.com/dm64x</a>
TMS320C64x™ DSP Generation	<a href="http://www.ti.com/c64x">www.ti.com/c64x</a>	TMS320DM643x DSP Generation	<a href="http://www.ti.com/dm643x">www.ti.com/dm643x</a>
TMS320C67x™ DSP Generation	<a href="http://www.ti.com/c67x">www.ti.com/c67x</a>	TMS320DM644x DSP Generation	<a href="http://www.ti.com/dm644x">www.ti.com/dm644x</a>



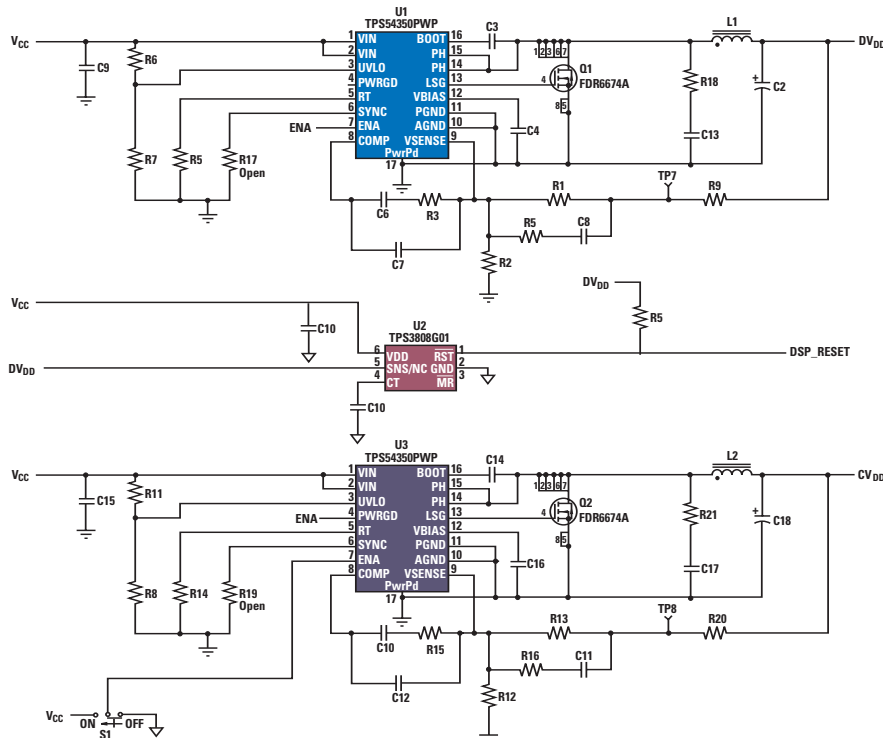
Power Management Products for the C6000™ DSP Platform

Get samples, datasheets, Evaluation Modules (EVMs) and app reports at: [power.ti.com](http://power.ti.com)

Suggested Power Management Solutions for the TMS320C62x™/TMS320C64x™/TMS320C67x™ DSP Generations									
Core and I/O Voltages									
Input Voltage	Output Current	LDO	Synchronous Controller (External FETs)	Non-Synchronous Controller (External FET and Diode)	Synchronous Integrated FET Converter	Non-Synchronous Integrated FET Converter	Non-Isolated Power Module	Isolated Power Module	PMU Multiple-Output Controller
3.3 V	3 A	TPS74401	TPS40009	TPS64200	TPS54317		PTH04T260		TPS75003
	6 A	TPS75901	TPS40009		TPS54610		PTH04T230		
5 V	3 A	TPS74401	TPS40009	TPS40200	TPS54317	TPS54350	PTH04T260		TPS75003
	6 A	TPS75901	TPS40009		TPS54610	TPS54550	PTH04T230		
12 V	3 A		TPS40190	TPS40200	TPS54350	TPS54350	PTH08T260		TPS5124
	6 A		TPS40190		TPS54550	TPS54550	PTH08T230		
24 V	3 A		TPS40057	TPS40200		TPS5430*	PTN78020*	PTB78560*	
	6 A		TPS40057					PTB78560*	
48 V	3 A		TPS40061	TPS40200*				PTMA403033*	
	6 A		TPS40061					PTB48560*	

\*Due to Vout/Vin ratio core voltage may have to be stepped down from 3.3-V I/O.

Example C6000 DSP Power Supply Design



For additional power supply designs for TI DSPs, please visit [www.ti.com/dsppower](http://www.ti.com/dsppower).

**Note:** The TI power devices recommended here are based on standard operating conditions. System designers should use device power estimation tools in conjunction with overall application level power requirements to ensure an adequate power supply design is used.



## Linear and Logic Products

### Analog Switch

- Provide a high-speed bidirectional bus interface between DSPs, CPUs, industry standard buses, memory and peripherals.
- TI's analog switches are designed to pass (or isolate) analog signals (both voltage and current) and support analog applications such as audio and video data transmission.
- TI's TS product family encompasses a variety analog switches with different ON resistances, bandwidth, charge injection, and total harmonic distortion to target any application.

### Voltage Level Translation

- Interfacing any low-voltage component with legacy, high-voltage devices
- Protects a DSP that has non-over-voltage tolerant inputs.
- These dual-supply devices allow for bidirectional level translation between different voltage nodes from 1.2 V to 3.6 V and 1.65 V to 5.5 V.

### I/O Expansion

- TI's I<sup>2</sup>C I/O expanders allow system layout to be greatly simplified.
- Two-wire bus reduces PCB complexity through trace reduction and routing simplification.

### Bus Interface Products

- The LVC and ALVC families offer V<sub>CC</sub> fully specified to match the needs of the TMS320™ DSP family: 3.3 V, 2.5 V and 1.8 V.
- Broad range of surface mount packaging options from SOIC to BGA.
- Propagation delays of 3 ns and below.
- Bus hold on data inputs decreases system component count by eliminating the need for external pull-up/pull-down resistors.

### Analog Switches for TMS320 DSPs

Device	R <sub>on</sub> (max)	R <sub>on</sub> Flatness (max)	R <sub>on</sub> Mismatch (max)	V <sub>+</sub> (V) (min)	V <sub>+</sub> (V) (max)	ON Time (ns) (max)	OFF Time (ns) (max)	Pins / Package
<b>SPST</b>								
TS5A3166	0.9	0.15	—	1.65	5.5	7	11.5	5/SC70, SOT-23, WCSP
TS5A3167	0.9	0.15	—	1.65	5.5	7	11.5	5/SC70, SOT-23, WCSP
TS5A4594	8	1.5	—	2.7	5.5	17	14	5/SC70, SOT-23
TS5A4595	8	1.5	—	2.7	5.5	17	14	5/SC70, SOT-23
TS5A4596	8	1.5	—	2.7	5.5	17	14	5/SC70, SOT-23
TS5A4597	8	1.5	—	2.7	5.5	17	14	5/SC70, SOT-23
TS5A1066	10	5	—	1.65	5.5	5.5	4.5	5/SC70, SOT-23, WCSP
<b>SPST x 2</b>								
TS5A23166	0.9	0.25	0.1	1.65	5.5	7.5	11	8/US8, WCSP
TS5A23167	0.9	0.25	0.1	1.65	5.5	7.5	11	8/US8, WCSP
TS3A4741	0.9	0.4	0.05	1.65	3.6	14	9	8/MSOP
TS5A2066	10	5	1	1.65	5.5	5.8	3.6	8/SM8, US8, WCSP
<b>SPST x 4</b>								
TS3A4751	0.9	0.4	0.05	1.65	3.6	14	9	14/TSSOP
<b>SPDT</b>								
TS5A6542	0.75	0.25	0.25	2.25	5.5	25	20	8/WCSP
TS5A4624	0.9	0.25	0.1	1.65	5.5	22	8	6/SC70
TS5A3153	0.9	0.15	0.1	1.65	5.5	16	15	8/US8, WCSP
TS5A3154	0.9	0.15	0.1	1.65	5.5	8	12.5	8/US8, WCSP
<b>SPST x 4</b>								
TS3A4751	0.9	0.4	0.05	1.65	3.6	14	9	14/TSSOP
<b>SPDT</b>								
TS5A6542	0.75	0.25	0.25	2.25	5.5	25	20	8/WCSP
TS5A4624	0.9	0.25	0.1	1.65	5.5	22	8	6/SC70
TS5A3153	0.9	0.15	0.1	1.65	5.5	16	15	8/US8, WCSP
TS5A3154	0.9	0.15	0.1	1.65	5.5	8	12.5	8/US8, WCSP
TS5A3159A	0.9	0.25	0.1	1.65	5.5	30	20	6/SC70, SOT-23, WCSP
TS5A3159	1.1	0.15	0.1	1.65	5.5	35	20	6/SC70, SOT-23
TS5A3160	0.9	0.25	0.1	1.65	5.5	6	13	6/SC70, SOT-23
TS5A3157	10	5	0.2	1.65	5.5	8.5	6.5	6/SC70, SOT-23, WCSP
TS5A63157	10	2	0.14	1.65	5.5	5	3.4	6/SC70, SOT-23
TS5A2053	13.8	4.5	4.5	1.65	5.5	6.8	4.1	8/SM8, US8
<b>SPDT x 2</b>								
TS5A23159	0.9	0.25	0.1	1.65	5.5	13	8	10/MSOP, QFN
TS5A23160	0.9	0.25	0.1	1.65	5.5	5.5	10	10/MSOP
TS5A23157	10	4(typ)	0.15 (typ)	1.65	5.5	5.7	3.8	10/MSOP, QFN
<b>SPDT x 4</b>								
TS3A5018	10	7	0.8	1.65	3.6	8	6.5	16/SOIC, SSOP (QSOP), TSSOP, TVSOP, QFN
<b>SP3T</b>								
TS5A3359	0.9	0.25	0.1	1.65	5.5	21	10.5	8/US8
TS5A3357	15	6.5 (typ)	0.1 (typ)	1.65	5.5	6.5	3.7	8/SM8, US8
<b>SP4T x 2</b>								
TS3A5017	12	9	2	2.3	3.6	9.5	3.5	16/SOIC, SSOP (QSOP), TSSOP, TVSOP, QFN



### Voltage Level Translation for TMS320 DSPs

Device	Bit Width	V <sub>CCA</sub> (V)	V <sub>CCB</sub> (V)	Smallest Package
SN74AVC1T45 <sup>1</sup>	1	1.2 to 3.6	1.2 to 3.6	6-pin NanoStar™/NanoFree™
SN74LVC1T45	1	1.65 to 5.5	1.65 to 5.5	6-pin NanoStar/NanoFree
SN74AVC2T45 <sup>1</sup>	2	1.2 to 3.6	1.2 to 3.6	8-pin NanoStar/NanoFree
SN74LVC2T45	2	1.65 to 5.5	1.65 to 5.5	8-pin NanoStar/NanoFree
SN74AVC4T245 <sup>1</sup>	4	1.2 to 3.6	1.2 to 3.6	16-pin QFN
SN74AVC8T245 <sup>1</sup>	8	1.2 to 3.6	1.2 to 3.6	24-pin QFN
SN74LVC8T245 <sup>1</sup>	8	1.65 to 5.5	1.65 to 5.5	24-pin QFN
SN74AVC16T245 <sup>1</sup>	16	1.2 to 3.6	1.2 to 3.6	56-ball VFBGA
SN74AVCA164245 <sup>1</sup>	16	1.4 to 3.6	1.4 to 3.6	56-ball VFBGA
SN74AVCB164245 <sup>1</sup>	16	1.4 to 3.6	1.4 to 3.6	56-ball VFBGA
SN74LVC16T245 <sup>1</sup>	16	1.65 to 5.5	1.35 to 5.5	56-ball VFBGA
SN74AVC20T245 <sup>1</sup>	20	1.2 to 3.6	1.2 to 3.6	56-ball VFBGA
SN74AVC24T245 <sup>1</sup>	24	1.2 to 3.6	1.2 to 3.6	83-ball VFBGA
SN74AVC32T245 <sup>1</sup>	32	1.2 to 3.6	1.2 to 3.6	96-ball VFBGA
SN74AVCB324245 <sup>1</sup>	32	1.2 to 3.6	1.2 to 3.6	96-ball VFBGA

<sup>1</sup> Bus hold option available.

### I/O Expansion for TMS320 DSPs

Device	Max Frequency (kHz)	I <sup>2</sup> C Address	V <sub>CC</sub> Range (V)	Bit Channel Width	Additional Features					I/O Type	
					Low Power	Interrupt	Reset	Configuration Registers	5-V Tolerant I/O	Totem Pole	Open Drain
PCA9536	400	1000 001	2.3 to 5.5	4-bit				✓	✓	✓	
PCF8574	100	0100 xxx	2.5 to 6.0	8-bit		✓				✓	
PCF8574A	100	0111 xxx	2.5 to 6.0	8-bit		✓				✓	
PFA9557	400	0011 xxx	2.3 to 5.5	8-bit	✓		✓	✓	✓	✓	✓
PCF8575	400	0100 xxx	2.5 to 5.5	16-bit		✓				✓	
PCF8575C	400	0100 xxx	4.5 to 5.5	16-bit		✓					✓
PCA9535	400	0100 xxx	2.3 to 5.5	16-bit	✓	✓		✓	✓	✓	
PCA9539	400	1110 1xx	2.3 to 5.5	16-bit	✓	✓	✓	✓	✓	✓	
PCA9555	400	0100 xxx	2.3 to 5.5	16-bit		✓		✓	✓	✓	

### Bus Interface for TMS320 DSPs

Device	Description	Supply Voltage	t <sub>pd max</sub> (ns)	Package (Number of Pins)
SN74ALVC16244A	16-bit buffer/driver with 3-state outputs	3.3 V	3	TSSOP, SSOP(48)/VFBGA(56)
SN74ALVCH16244	16-bit buffer/driver with 3-state outputs	3.3 V	3	TSSOP, TVSOP, SSOP(48)/VFBGA(56)
SN74ALVCH16245	16-bit bus transceiver with 3-state outputs	3.3 V	3	TSSOP, TVSOP, SSOP(48)/VFBGA(56)
SN74ALVCH16373	16-bit transparent D-type latch with 3-state outputs	3.3 V	3.6	TSSOP, SSOP(48)/VFBGA(56)
SN74ALVCH16374	16-bit edge-triggered D-type flip-flop with 3-state outputs	3.3 V	4.2	TSSOP, SSOP(48)/VFBGA(56)
SN74ALVC16835	18-bit Universal Bus driver with 3-state outputs	3.3 V	3.6	TSSOP, TVSOP, SSOP, VFBGA(56)
SN74ALVCH16835	18-bit Universal Bus driver with 3-state outputs	3.3 V	3.6	TSSOP, TVSOP, SSOP, VFBGA(56)
SN74ALVCH162244	16-bit buffer/driver with 3-state outputs	3.3 V	4.2	TSSOP, SSOP(48)
SN74ALVCH162374	16-bit edge-triggered D-type flip-flop with 3-state outputs	3.3 V	4.6	TSSOP, SSOP(48)
SN74ALVC162835	18-bit Universal Bus driver with 3-state outputs	3.3 V	4.2	TSSOP, TVSOP, SSOP(56)
SN74ALVCH162835	18-bit Universal Bus driver with 3-state outputs	3.3 V	4.2	TSSOP, TVSOP, SSOP(56)
SN74LVC16244A	16-bit buffer/driver with 3-state outputs	3.3 V	4.1	TSSOP, TVSOP, SSOP(48)/VFBGA(56)
SN74LVCH16244A	16-bit buffer/driver with 3-state outputs	3.3 V	4.1	TSSOP, TVSOP, SSOP(48)/VFBGA(56)
SN74LVC16245A	16-bit bus transceiver with 3-state outputs	3.3 V	4	TSSOP, TVSOP, SSOP(48)/VFBGA(56)
SN74LVCH16245A	16-bit bus transceiver with 3-state outputs	3.3 V	4	TSSOP, TVSOP, SSOP(48)/VFBGA(56)
SN74LVC16373A	16-bit transparent D-type latch with 3-state outputs	3.3 V	4.2	TSSOP, TVSOP, SSOP(48)/VFBGA(56)
SN74LVCH16373A	16-bit transparent D-type latch with 3-state outputs	3.3 V	4.2	TSSOP, TVSOP, SSOP(48)/VFBGA(56)
SN74LVC16374A	16-bit edge-triggered D-type flip-flop with 3-state outputs	3.3 V	4.5	TSSOP, TVSOP, SSOP(48)/VFBGA(56)
SN74LVCH16374A	16-bit edge-triggered D-type flip-flop with 3-state outputs	3.3 V	4.5	TSSOP, TVSOP, SSOP(48)/VFBGA(56)



## Linear and Logic Products

### Little Logic

- Ability to place a single gate in critical locations provides for simplified routing and board space savings
- Single gates also provide easy state change for control inputs
- The NanoStar™ package provides the industry's smallest logic package

### Little Logic for TMS320 DSPs

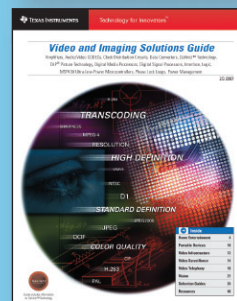
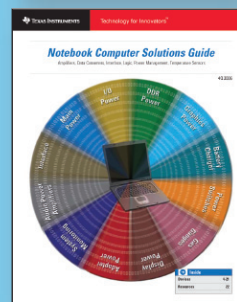
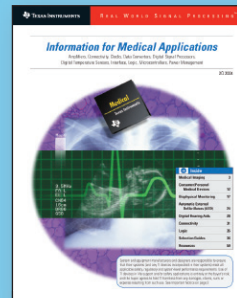
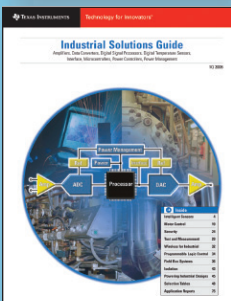
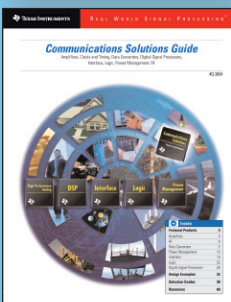
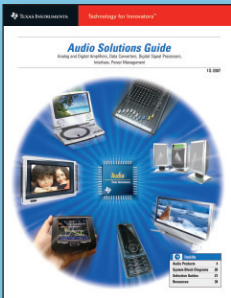
Device	Description	Supply Voltage	t <sub>pd</sub> max (ns)	Package (Number of Pins)
SN74AUC1G00	Single 2-input positive-NAND gate	1.8 V	2.5	SOT, DSBGA (5)
SN74AUC1G04	Single inverter gate	1.8 V	2.5	SOT, DSBGA (5)
SN74AUC1G07	Single buffer/driver with open-drain output	1.8 V	2.5	SOT, DSBGA (5)
SN74AUC1G08	Single 2-input positive-AND gate	1.8 V	2.5	SOT, DSBGA (5)
SN74AUC1G14	Single Schmitt-Trigger inverter	1.8 V	2.8	SOT, DSBGA (5)
SN74AUC1G32	Single 2-input positive-OR gate	1.8 V	2.5	SOT, DSBGA (5)
SN74AUC1G79	Single positive-edge-triggered D-type flip-flop	1.8 V	1.9	SOT, DSBGA (5)
SN74AUC1G125	Single bus buffer gate with 3-state output	1.8 V	2.5	SOT (5), DSBGA (5)
SN74AUP1G08	Low-power single 2-input positive-AND gate	3.3 V	4.2	SOT (5)
SN74AUP1G57	Low-power configurable multiple-function gate	3.3 V	5.3	SOT (6)
SN74AUP1G58	Low-power configurable multiple-function gate	3.3 V	5.3	SOT (6)
SN74AUP1G97	Low-power configurable multiple-function gate	3.3 V	5.3	SOT (6)
SN74AUP1G98	Low-power configurable multiple-function gate	3.3 V	5.3	SOT (6)

# TI has designs for your applications

[www.ti.com/solutions](http://www.ti.com/solutions)

Get the resources you need with these application-focused Solutions Guides:

- Audio
- Communications
- Industrial
- Medical
- Notebook PC
- Video and Imaging



## ADCs, DACs, Codecs and Special Functions



### Data Converters Plug-In for Texas Instruments Code Composer Studio™ IDE

TI's Data Converter Plug-In (DCP) is a free development tool that allows the creation of initialization data and configuration software for TI data converters from within the Integrated Development Environment (IDE) of Code Composer Studio. It provides easy-to-use windows for "point-and-click" data converter configuration from within the IDE, preventing illegal combinations of settings. The DCP dialog allows the user to select all the different settings for the data converter from a single screen and to automatically generate the interface software with a single mouse click. The generated well-documented C-source files contain all functions necessary to talk to the external data converter and to set up all of the registers internal to this device. The minimum function set includes read/write functions (single words and blocks of data), initialization functions and data structures and some device-specific functions like power down.

The generated code is to a great extent hardware independent, so it can be used together with the analog evaluation modules (EVMs) from our modular EVM system, our DSP Starter Kits (DSKs) or with your own custom board.

To download your free 3.5 version of the Data Converter Plug-In for Code Composer Studio IDE, please go to [www.ti.com/sc/dcplug-in](http://www.ti.com/sc/dcplug-in)

New devices are added to the tool on a regular basis.

Device	Description	C28x™	C54x™	C55x™	C67x™	C64x™
<b>ADCs</b>						
ADS1216	24-Bit, 8-ch, 0.78kSPS, 5 V	—	X	X	X	—
ADS1217	24-Bit, 8-ch, 0.78kSPS, 3.3 V	—	X	X	X	—
ADS1218	24-Bit, 8-ch, 0.78kSPS, with flash	—	X	X	X	—
ADS1240	24-Bit, 4-ch, 15SPS	—	X	—	X	—
ADS1241	24-Bit, 8-ch, 15SPS	—	X	—	X	—
ADS1251	24-Bit, 1-ch (diff), 20kSPS	—	X	X	X	—
ADS1252	24-Bit, 1-ch (diff), 40kSPS	—	X	X	X	—
ADS1253	24-Bit, 4-ch (diff), 20kSPS, 1.8–3.6 V	—	X	—	X	—
ADS1254	24-Bit, 4-ch (diff), 40kSPS, 5 V	—	X	—	X	—
ADS1258	24-Bit, 16-ch, 125kSPS, fast channel cycling	—	—	X <sup>1</sup>	X <sup>1</sup>	X <sup>1</sup>
ADS1271	24-Bit, 1-ch, 105kSPS	—	—	—	X <sup>1</sup>	—
ADS1601	16-Bit, 1-ch, 1.25MSPS	—	—	X <sup>1</sup>	X <sup>1</sup>	X <sup>1</sup>
ADS1602	16-Bit, 1-ch, 2.5MSPS	—	—	X <sup>1</sup>	X <sup>1</sup>	X <sup>1</sup>
ADS1605	16-Bit, 1-ch (diff), 5MSPS, 3.3-V I/O, 5-V analog	—	—	X <sup>1</sup>	X <sup>1</sup>	X <sup>1</sup>
ADS1606	16-Bit, 1-ch (diff), 5MSPS, 16-word FIFO	—	—	X <sup>1</sup>	X <sup>1</sup>	X <sup>1</sup>
ADS1610	16-Bit, 1-ch (diff), 10MSPS, 3.3-V I/O, 5-V analog	—	—	X <sup>1</sup>	X <sup>1</sup>	X <sup>1</sup>
ADS1625	18-Bit, 1-ch (diff), 1.25MSPS, 3.3-V I/O, 5-V analog	—	—	X <sup>1</sup>	X <sup>1</sup>	X <sup>1</sup>
ADS1626	18-Bit, 1-ch (diff), 1.25MSPS, 16-word FIFO	—	—	X <sup>1</sup>	X <sup>1</sup>	X <sup>1</sup>
ADS7804	12-Bit, 1-ch, 100kSPS, +/-10-V input range	X	X	X <sup>1</sup>	X <sup>1</sup>	X <sup>1</sup>
ADS7805	16-Bit, 1-ch, 100kSPS, +/-10-V input range	X	X	X <sup>1</sup>	X <sup>1</sup>	X <sup>1</sup>
ADS7829	12-Bit, 1-ch, 125kSPS, 2.7 V, microPower	—	X	X <sup>1</sup>	X <sup>1</sup>	X <sup>1</sup>
ADS7841	12-Bit, 4-ch, 200kSPS	—	X <sup>1</sup>	X <sup>1</sup>	X <sup>1</sup>	X <sup>1</sup>
ADS7844	12-Bit, 8-ch, 200kSPS	—	X <sup>1</sup>	—	—	—
ADS7861	12-Bit, 2+2-ch, 500kSPS, simultaneous sampling	X	X	X	X	X
ADS7864	12-Bit, 3x2-chs, 500kSPS, simultaneous sampling	—	—	—	X <sup>1</sup>	X <sup>1</sup>
ADS7881	12-Bit, 1-ch, 4MSPS, int. reference	—	—	X <sup>1</sup>	X <sup>1</sup>	X <sup>1</sup>
ADS7891	14-Bit, 1-ch, 3MSPS, int. reference	—	—	X <sup>1</sup>	X <sup>1</sup>	X <sup>1</sup>
ADS803	12-Bit, 1-ch, 5MSPS	—	—	X <sup>1</sup>	X <sup>1</sup>	X <sup>1</sup>
ADS804	12-Bit, 1-ch, 10MSPS	—	—	X <sup>1</sup>	X <sup>1</sup>	X <sup>1</sup>
ADS805	12-Bit, 1-ch, 20MSPS	—	—	X <sup>1</sup>	X <sup>1</sup>	X <sup>1</sup>
ADS8320	16-Bit, 1-ch, 100kSPS, 2.7–5.25 V	—	X	X <sup>1</sup>	X <sup>1</sup>	X <sup>1</sup>
ADS8321	16-Bit, 1-ch, 100kSPS, 4.75–5.25 V	—	X	X <sup>1</sup>	X <sup>1</sup>	X <sup>1</sup>
ADS8322	16-Bit, 1-ch (diff), 500kSPS, 5 V	—	—	X <sup>1</sup>	X <sup>1</sup>	X <sup>1</sup>
ADS8323	16-Bit, 1-ch (diff), 500kSPS, 5 V	—	—	X <sup>1</sup>	X <sup>1</sup>	X <sup>1</sup>
ADS8324	14-Bit, 1-ch, 50kSPS, 1.8–3.6 V	—	X	X <sup>1</sup>	X <sup>1</sup>	X <sup>1</sup>
ADS8325	16-Bit, 1-ch, 100kSPS, 2.7–5.5 V	—	X	X <sup>1</sup>	X <sup>1</sup>	X <sup>1</sup>
ADS8361	16-Bit, 2+2-ch, 500kSPS, simultaneous sampling	X	X	X	X	X
ADS8364	16-Bit, 6-ch, 250kSPS	—	X	—	X	X
ADS8370	16-Bit, 1-ch, 600kSPS, unipolar pseudo diff, int. ref.	—	—	X <sup>1</sup>	X <sup>1</sup>	X <sup>1</sup>
ADS8371	16-Bit, 1-ch, 750kSPS, unipolar input micro power	—	—	X <sup>1</sup>	X <sup>1</sup>	X <sup>1</sup>
ADS8372	16-Bit, 1-ch (diff), 600kSPS, pseudo bipolar, int. ref.	—	—	X <sup>1</sup>	X <sup>1</sup>	X <sup>1</sup>
ADS8380	1-Bit, 1-ch, 600kSPS, unipolar pseudo diff, int. ref.	—	—	X <sup>1</sup>	X <sup>1</sup>	X <sup>1</sup>
ADS8381	18-Bit, 1-ch, 580kSPS	—	—	X <sup>1</sup>	X <sup>1</sup>	X <sup>1</sup>
ADS8382	18-Bit, 1-ch (diff), 600kSPS, pseudo bipolar, int. ref.	—	—	X <sup>1</sup>	X <sup>1</sup>	X <sup>1</sup>
ADS8383	18-Bit, 1-ch, 500kSPS	—	—	X <sup>1</sup>	X <sup>1</sup>	X <sup>1</sup>
ADS8401	16-Bit, 1-ch, 1.25MSPS, unipolar input	X	—	X <sup>1</sup>	X <sup>1</sup>	X <sup>1</sup>
ADS8402	16-Bit, 1-ch, 1.25MSPS, bipolar input	X	—	X <sup>1</sup>	X <sup>1</sup>	X <sup>1</sup>
ADS8405	16-Bit, 1-ch, 1.25MSPS, unipolar input	X	—	X <sup>1</sup>	X <sup>1</sup>	X <sup>1</sup>
ADS8406	16-Bit, 1-ch, 1.25MSPS, bipolar input	X	—	X <sup>1</sup>	X <sup>1</sup>	X <sup>1</sup>
ADS8411	16-Bit, 1-ch, 2MSPS, unipolar input	—	—	X <sup>1</sup>	X <sup>1</sup>	X <sup>1</sup>
ADS8412	16-Bit, 1-ch, 2MSPS, bipolar input	—	—	X <sup>1</sup>	X <sup>1</sup>	X <sup>1</sup>
ADS8422	16-Bit, 1-ch, 4MSPS, pseudo-bipolar, differential input	—	—	X <sup>1</sup>	X <sup>1</sup>	X <sup>1</sup>



## ADCs, DACs, Codecs and Special Functions

Device	Description	C28x™	C54x™	C55x™	C67x™	C64x™
<b>ADCs (Cont'd)</b>						
ADS8481	16-Bit, 1-ch, 1MSPS, pseudo-differential, unipolar input	—	—	X <sup>1</sup>	X <sup>1</sup>	X <sup>1</sup>
ADS8482	16-Bit, 1-ch, 1MSPS, pseudo-bipolar, fully differential input	—	—	X <sup>1</sup>	X <sup>1</sup>	X <sup>1</sup>
ADS8504	12-Bit, 1-ch, 250kSPS, +/-10-V input range	X	X	X <sup>1</sup>	X <sup>1</sup>	X <sup>1</sup>
ADS8505	16-Bit, 1-ch, 250kSPS, +/-10-V input range	X	X	X <sup>1</sup>	X <sup>1</sup>	X <sup>1</sup>
PCM1804	24-Bit, stereo, 192kHz, audio ADC	—	X	X	X <sup>1</sup>	X <sup>1</sup>
PCM4202	24-Bit, stereo, 192kHz, audio ADC	—	X	X	X <sup>1</sup>	X <sup>1</sup>
PCM4204	24-Bit, 4-ch, 216kHz, audio ADC	—	—	—	X <sup>1</sup>	—
THS10064	10-Bit, 4-ch, 6MSPS, 16-word FIFO	X	X	X <sup>1</sup>	X <sup>1</sup>	X <sup>1</sup>
THS1007	10-Bit, 4-ch, 8MSPS	—	—	—	—	—
THS10082	10-Bit, 2-ch, 8MSPS, 16-word FIFO	X	X	X <sup>1</sup>	X <sup>1</sup>	X <sup>1</sup>
THS1009	10-Bit, 2-ch, 8MSPS	—	—	—	—	—
THS1206	12-Bit, 4-ch, 6MSPS, 16-word FIFO	X	X	X <sup>1</sup>	X <sup>1</sup>	X <sup>1</sup>
THS1207	12-Bit, 4-ch, 8MSPS	—	—	—	—	—
THS12082	12-Bit, 2-ch, 8MSPS, 16-word FIFO	X	X	X <sup>1</sup>	X <sup>1</sup>	X <sup>1</sup>
THS1209	12-Bit, 2-ch, 8MSPS	—	—	—	—	—
THS1401	14-Bit, 1-ch, 1MSPS	—	—	—	—	—
THS1403	14-Bit, 1-ch, 3MSPS	—	—	—	—	—
THS1408	14-Bit, 1-ch, 8MSPS	—	—	—	—	—
THS14F01	14-Bit, 1-ch, 1MSPS, 32-word FIFO	—	—	—	—	—
THS14F03	14-Bit, 1-ch, 3MSPS, 32-word FIFO	—	—	—	—	—
TLC1514	10-Bit, 4-ch, 400kSPS	—	—	—	—	—
TLC1518	10-Bit, 8-ch, 400kSPS	—	—	—	—	—
TLC2551	12-Bit, 1-ch, 400kSPS, 5 V	—	X	—	—	—
TLC2552	12-Bit, 2-ch, 175kSPS, 5 V	—	X	—	—	—
TLC2554	12-Bit, 4-ch, 400kSPS	—	—	—	—	—
TLC2555	12-Bit, 1-ch, 175kSPS, 5 V	—	X	—	—	—
TLC2558	12-Bit, 8-ch, 400kSPS	—	—	—	—	—
TLC2574	12-Bit, 4-ch, 200kSPS, 5 V	—	X	—	—	—
TLC2578	12-Bit, 8-ch, 200kSPS, 5 V	—	X	—	—	—
TLC3541	14-Bit, 1-ch, 200kSPS, 5V	—	X	—	X	—
TLC3544	14-Bit, 4-ch, 200kSPS, 5 V	—	X	—	—	—
TLC3545	14-Bit, 1-ch (diff), 200kSPS, 5 V	—	X	—	X	—
TLC3548	14-Bit, 8-ch, 200kSPS, 5 V	—	X	—	—	—
TLC3574	14-Bit, 4-ch, 200kSPS, 5 V	—	X	—	—	—
TLC3578	14-Bit, 8-ch, 200kSPS, 5 V	—	X	—	—	—
TLC4541	16-Bit, 1-ch, 200kSPS, 5 V	—	X	—	X	—
TLC4545	16-Bit, 1-ch (diff), 200kSPS, 5 V	—	X	—	X	—
TLV1504	10-Bit, 4-ch, 200kSPS	—	X	—	X	—
TLV1508	10-Bit, 8-ch, 200kSPS	—	X	—	X	—
TLV1570	10-Bit, 8-ch, 1.25MSPS	—	X	—	X	—
TLV1571	10-Bit, 1-ch, 1.25MSPS	—	X	—	X <sup>1</sup>	—
TLV1572	10-Bit, 1-ch, 1.25MSPS, 2.5–5.5 V	—	X	—	—	—
TLV1578	10-Bit, 8-ch, 1.25MSPS	—	X	—	X <sup>1</sup>	—
TLV2541	12-Bit, 1-ch, 200kSPS, 2.7–5.5 V	—	X	—	—	—
TLV2542	12-Bit, 2-ch, 140–200kSPS, 2.7–5.5 V	—	X	—	—	—
TLV2544	12-Bit, 4-ch, 200kSPS	—	X	—	X <sup>1</sup>	—
TLV2545	12-Bit, 1-ch, 140–200kSPS, 2.7–5.5 V	—	X	—	—	—
TLV2548	12-Bit, 8-ch, 200kSPS	—	X	—	X <sup>1</sup>	—
TLV2553	12-Bit, 11-ch, 200kSPS, 2.7–5 V	X	X	X	X	X
TLV2556	12-Bit, 11-ch, 200kSPS, 2.7–5V, int. reference	X	X	X	X	X

<sup>1</sup> Includes DMA support.

NOTE: An X indicates that the data converter plug-in generates the interface software for the specified TMS320 DSP generation, which not only configures the data converter, but also the DSP peripheral the device is connected to (e.g., the serial port or the memory interface). If no X is present, only the register settings, but no interface functions, are generated.



## ADCs, DACs, Codecs and Special Functions



Device	Description	C28x™	C54x™	C55x™	C67x™	C64x™
<b>DACs</b>						
DAC1220	16-Bit, 1-ch, 2 ms	—	—	—	—	—
DAC1221	16-Bit, 1-ch, 2 ms	—	—	—	—	—
DAC7512	12-Bit, 1-ch, 10us, 2.7–5.5 V, int. reference	—	—	—	—	—
DAC7513	12-Bit, 1-ch, 10us, 2.7–5.5 V	—	—	—	—	—
DAC7551	12-Bit, 1-ch, 5us, ultra-low glitch	X	—	X <sup>1</sup>	X <sup>1</sup>	X <sup>1</sup>
DAC7552	12-Bit, 2-ch, 5us, ultra-low glitch	X	—	X <sup>1</sup>	X <sup>1</sup>	X <sup>1</sup>
DAC7554	12-Bit, 4-ch, 5us, 2.7–5.5 V	X	X <sup>1</sup>	X <sup>1</sup>	X <sup>1</sup>	X <sup>1</sup>
DAC8501	16-Bit, 1-ch, 10us, 2.7–5.5 V, MDAC	X	X	X	X	X
DAC8531	16-Bit, 1-ch, 10us, 2.7–5.5 V	X	X	X	X	X
DAC8532	16-Bit, 2-ch, 10us, 2.7–5.5 V	X	X	X	X	X
DAC8534	16-Bit, 4-ch, 10us, 2.7–5.5 V	X	X	X	X	X
DAC8551	16-Bit, 1-ch, 5us, ultra-low glitch	X	—	X <sup>1</sup>	X <sup>1</sup>	X <sup>1</sup>
DAC8552	16-Bit, 2-ch, 10us, ultra-low glitch	X	—	X <sup>1</sup>	X <sup>1</sup>	X <sup>1</sup>
DAC8554	16-Bit, 4-ch, 10us, ultra-low glitch	X	—	X <sup>1</sup>	X <sup>1</sup>	X <sup>1</sup>
DAC8580	16-Bit, 1-ch, 1us	—	—	X <sup>1</sup>	X <sup>1</sup>	X <sup>1</sup>
DAC8814	16-Bit, 4-ch, 2MSPS	—	—	X <sup>1</sup>	X <sup>1</sup>	X <sup>1</sup>
TLC5618A	12-Bit, 2-ch, 2.5us, 5 V	—	X	—	X <sup>2</sup>	—
TLV320DAC23	24-Bit, stereo, 96kHz, audio DAC	—	—	—	—	—
TLV5604	10-Bit, 4-ch, 3us, 2.7–5.5 V	—	—	—	—	—
TLV5606	10-Bit, 1-ch, 3us, 2.7–5.5 V	—	X	—	X <sup>2</sup>	—
TLV5608	10-Bit, 8-ch, 1us, 2.7–5.5 V	—	—	—	—	—
TLV5610	12-Bit, 8-ch, 1us, 2.7–5.5 V	—	—	—	—	—
TLV5614	12-Bit, 4-ch, 3us, 2.7–5.5 V	—	—	—	—	—
TLV5616	12-Bit, 1-ch, 3us, 2.7–5.5 V	—	X	—	X <sup>2</sup>	—
TLV5617A	10-Bit, 2-ch, 2.5us, 2.7–5.5 V	—	X	—	X <sup>2</sup>	—
TLV5618A	12-Bit, 2-ch, 2.5us, 2.7–5.5 V	—	X	—	X <sup>2</sup>	—
TLV5623	8-Bit, 1-ch, 3us, 2.7–5.5 V	—	X	—	X <sup>2</sup>	—
TLV5624	8-Bit, 1-ch, 1us, 2.7–5.5 V, int. reference	—	X	—	X <sup>2</sup>	—
TLV5625	8-Bit, 2-ch, 2.5us, 2.7–5.5 V	—	X	—	X <sup>2</sup>	—
TLV5626	8-Bit, 2-ch, 1us, 2.7–5.5 V, int. reference	—	X	—	X <sup>2</sup>	—
TLV5629	8-Bit, 8-ch, 1us, 2.7–5.5 V	—	—	—	—	—
TLV5630	12-Bit, 8-ch, 1us, 2.7–5.5 V, int. reference	—	—	—	—	—
TLV5631	10-Bit, 8-ch, 1us, 2.7–5.5 V, int. reference	—	—	—	—	—
TLV5632	8-Bit, 8-ch, 1us, 2.7–5.5 V	—	—	—	—	—
TLV5636	12-Bit, 1-ch, 1us, 2.7–5.5 V, int. reference	—	X	—	X <sup>2</sup>	—
TLV5637	10-Bit, 2-ch, 1us, 2.7–5.5 V, int. reference	—	X	—	X <sup>2</sup>	—
TLV5638	12-Bit, 2-ch, 1us, 2.7–5.5 V, int. reference	—	X	—	X <sup>2</sup>	—

<sup>1</sup> Includes DMA support.

<sup>2</sup> These DACs share the same driver. Result data may need to be masked.



## ADCs, DACs, Codecs and Special Functions

Device	Description	C28x™	C54x™	C55x™	C67x™	C64x™
<b>Codecs</b>						
AIC111	16-Bit, 1-channel, 40kSPS, 1.3V, micro-power	—	X	—	—	—
PCM3002	20-Bit, stereo, 48kHz	—	X	—	X	—
TLV320AIC10	16-Bit, 1-channel, 22kSPS, voiceband codec	—	—	—	X	—
TLV320AIC11	16-Bit, 1-channel, 22kSPS, voiceband codec, 1.1–3.6 V I/O	—	—	—	X	—
TLV320AIC12	16-Bit, 1-channel, 26/104kSPS, voiceband codec	—	X	X	X	X
TLV320AIC13	16-Bit, 1-channel, 26/104kSPS, voiceband codec, 1.1 V I/O	—	X	X	X	X
TLV320AIC14	16-Bit, 1-channel, 26/104kSPS, voiceband codec	—	X	X	X	X
TLV320AIC15	16-Bit, 1-channel, 26/104kSPS, voiceband codec, 1.1 V I/O	—	X	X	X	X
TLV320AIC20	16-Bit, 2-channel, 26/104kSPS, voiceband codec, 3.3 V I/O	—	X	X	X	X
TLV320AIC21	16-Bit, 1-channel, 26/104kSPS, voiceband codec, 1.1 V I/O	—	X	X	X	X
TLV320AIC22C	16-Bit, 2-channel, 16kHz, dual VOIP codec	—	X	X	X	—
TLV320AIC23B	24-Bit, stereo, 96kHz, stereo audio codec	—	X <sup>1</sup>	X <sup>1</sup>	X <sup>1</sup>	X <sup>1</sup>
TLV320AIC24	16-Bit, 1-channel, 26/104kSPS, voiceband codec, 3.3 V I/O	—	X	X	X	X
TLV320AIC25	16-Bit, 1-channel, 26/104kSPS, voiceband codec, 1.1 V I/O	—	X	X	X	X
<b>Application Specific</b>						
AFE1230	16-Bit, 1-channel, 2.5Mbps, G.SHDSL analog front end	—	—	X	—	—
AFEDRI8201	16-Bit, 1-channel, 80MHz, ADC front end for AM/FM and HD radios	—	—	X	—	—
AMC7820	12-Bit, 8-channel, 100kSPS, analog monitoring and control circuitry	—	X	—	X	—
AMC7823	12-Bit, 8-channel, 200kSPS, analog monitoring and control circuitry	X	—	—	—	—

<sup>1</sup> Includes DMA support.

<sup>2</sup> These DACs share the same driver. Result data may need to be masked.

## TMS470 Microcontrollers: 32-Bit RISC ARM7TDMI®-Based



Building upon the success of its popular MCU products, TI—the largest, most experienced licensee of Advanced RISC Machines (ARM®) Ltd. cores—is now offering the TMS470 platform of microcontrollers to the mass market. Having gained extensive experience through its development in wireless, imaging and industrial markets, TI is a proven supplier of ARM core-based devices.

### Architecture

The TMS470 is derived from the 32-bit ARM7TDMI® core.\* This industry-standard architecture includes two instruction sets—32-bit instructions for fast execution and 16-bit instructions for high code density. It allows unlimited switching between instruction sets and also provides run-time decompression. This gives the designer ultimate flexibility when designing for high-speed operation or high-density code.

### Product Portfolio

The TMS470 microcontroller platform has devices ranging from 64 KB to 1 MB of Flash memory and a wide variety of intelligent peripherals including up to 32 timer channels, 16 channels of 10-bit analog-to-digital converters and a variety of communication interfaces.

TMS470 microcontrollers are targeted for applications requiring the highest levels of performance and quality with the flexibility of a scalable architecture and a rich peripheral set. Typical applications include industrial systems, medical instrumentation, consumer electronics, data processing and many other general-purpose embedded applications.

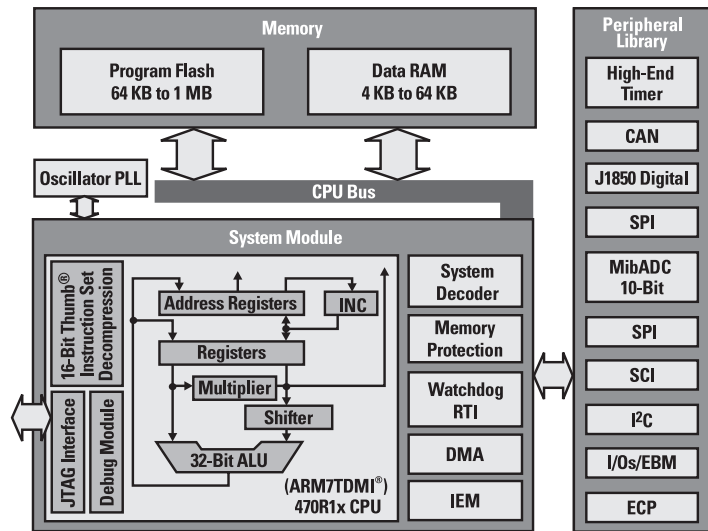
TI's TMS470 ARM7TDMI-based MCUs bring you a complete microcontroller solution with quality, reliability and support.

\*T = Thumb® extension, D = Debug module, M = Multiplier and I = JTAG Interface.

### Key Benefits

- Reliability
  - Proven supplier of ARM core-based devices
  - Used in safety-critical applications
- Performance
  - Up to 60 MHz
  - High-performance peripherals
- Integration
  - Wide offering of peripherals
  - Leading process technologies

- Scalability
  - Industry-standard architecture
  - Large portfolio of devices with Flash memory options from 64 KB to 1 MB
- Ease of Use
  - Easy-to-use tools speed time-to-market
  - Devices available today



### TMS470R1x Block Diagram

The TMS470R1x generation of MCUs utilizes the ARM7TDMI® core combined with intelligent peripherals and embedded memory to address a wide range of application needs.

Device <sup>1</sup>	Speed (MHz)	Memory			Peripherals				I/O 3.3 V	LQFP Package (pins)
		Flash/ROM (KB)	RAM (KB)	High-End Timer	Mib ADC	SPI/SCI	CAN	Other		
TMS470R1A64 <sup>2</sup>	48	64/64	8	13	8 ch, 10-bit	2/2	SCC	—	40	80
TMS470R1A128 <sup>2</sup>	48	128/128	8	16	16 ch, 10-bit	2/2	SCC	—	50	100
TMS470R1A256 <sup>2</sup>	48	256/256	12	16	16 ch, 10-bit	2/2	SCC	—	50	100
TMS470R1A288	48	288	16	12	12 ch, 10-bit	2/2	2 × SCC	MSM, 3 × I <sup>2</sup> C, DMA, EBM	93	100/144
TMS470R1A384	48	384	32	12	12 ch, 10-bit	2/2	2 × SCC	3 × I <sup>2</sup> C, DMA, EBM	94	100/144
TMS470R1B512	60	512	32	32	16 ch, 10-bit	3/2	2 × HECC	DMA	87	144
TMS470R1B768	60	768	48	32	16 ch, 10-bit	5/2	3 × HECC	DMA	87	144
TMS470R1B1M	60	1024	64	12	12 ch, 10-bit	2/3	2 × HECC	5 × I <sup>2</sup> C, DMA, EBM, MSM	93	144

<sup>1</sup> All devices have operating temperature range of -40° to 125°C, except TMS470R1B1M has temperature range of -40° to 85°C.

<sup>2</sup> Also available with ROM: TMS470R1C64, C128 and C256.


**MSP430 Microcontrollers: Ultra-Low-Power, 16-Bit RISC**
**Key Features**

- Ultra-low-power architecture extends battery life:
  - 0.1µA RAM retention
  - 0.8µA real-time clock mode
  - 250µA/MIPS active
- Wide range of integrated intelligent peripherals offload the CPU
- Modern 16-bit RISC CPU enables new applications at a fraction of the code size
- In-system programmable Flash permits flexible code changes, field upgrades and data logging
- Complete integrated development environment starting at U.S. \$99
- Device pricing as low as U.S. \$0.49

**Key Applications**

- Utility metering
- Portable instrumentation
- Intelligent sensing

**MSP-FET430 Flash Emulation Tool**

- JTAG-based real-time in-system emulation
- Target board, interface box, cable and samples
- CD-ROM includes IDE, assembler, linker, simulator and 8-KB C-compiler

The Flash Emulation Tool (FET) supports complete in-system development and is available for all the MSP430 Flash devices. Programming, assembler/C source-level debug, single stepping, multiple hardware breakpoints, full-speed operation and peripheral access are all fully supported in-system using JTAG. The FET comes complete with everything required to complete an entire project for only U.S. \$99.

(C) ROM (F) Flash	Program (kB)	SRAM (B)	I/O	16-Bit Timers		USART	
Flash-ROM-Based x1xx Family and 16-Bit Watchdog (V <sub>CC</sub> 1.8–3.6 V)							
MSP430F1101A	1	128	14	3	–	–	
MSP430C1101	1	128	14	3	–	–	
MSP430F1111A	2	128	14	3	–	–	
MSP430C1111	2	128	14	3	–	–	
MSP430F1121A	4	256	14	3	–	–	
MSP430C1121	4	256	14	3	–	–	
MSP430F1122	4	256	14	3	–	–	
MSP430F1132	8	256	14	3	–	–	
MSP430F122	4	256	22	3	–	1	
MSP430F123	8	256	22	3	–	1	
MSP430F1222	4	256	22	3	–	1	
MSP430F1232	8	256	22	3	–	1	
MSP430F133	8	256	48	3	3	1	
MSP430C1331	8	256	48	3	3	1	
MSP430F135	16	512	48	3	3	1	
MSP430C1351	16	512	48	3	3	1	
MSP430F147	32	1024	48	3	7	2	
MSP430F1471	32	1024	48	3	7	2	
MSP430F148	48	2048	48	3	7	2	
MSP430F1481	48	2048	48	3	7	2	
MSP430F149	60	2048	48	3	7	2	
MSP430F1491	60	2048	48	3	7	2	
MSP430F155	16	512	48	3	3	1	
MSP430F156	24	1024	48	3	3	1	
MSP430F157	32	1024	48	3	3	1	
MSP430F167	32	1024	48	3	7	2	
MSP430F168	48	2048	48	3	7	2	
MSP430F169	60	2048	48	3	7	2	
MSP430F1610	32	5120	48	3	7	2	
MSP430F1611	48	10240	48	3	7	2	
MSP430F1612	55	5120	48	3	7	2	
Device	Program (kB)	SRAM (B)	I/O	16-Bit Timers		Brown-Out Reset	
Flash-Based F2xx Family With 16 MIPS and 16-Bit Watchdog (V <sub>CC</sub> 1.8–3.6 V)							
<b>MSP430F2001</b>	1	128	10	2	–	✓	
<b>MSP430F2011</b>	2	128	10	2	–	✓	
<b>MSP430F2002</b>	1	128	10	2	–	✓	
<b>MSP430F2012</b>	2	128	10	2	–	✓	
<b>MSP430F2003</b>	1	128	10	2	–	✓	
<b>MSP430F2013</b>	2	128	10	2	–	✓	
MSP430F2101	1	128	16	3	–	✓	
MSP430F2111	2	128	16	3	–	✓	
MSP430F2121	4	256	16	3	–	✓	
MSP430F2131	8	256	16	3	–	✓	
<b>MSP430F2232</b>	8	512	32	3	3	✓	
<b>MSP430F2252</b>	16	512	32	3	3	✓	
<b>MSP430F2272</b>	32	1024	32	3	3	✓	
<b>MSP430F2234</b>	8	512	32	3	3	✓	
<b>MSP430F2254</b>	16	512	32	3	3	✓	
<b>MSP430F2274</b>	32	1024	32	3	3	✓	
<b>MSP430F2330</b>	8	1024	32	3	3	✓	
<b>MSP430F2350</b>	16	2048	32	3	3	✓	
<b>MSP430F2370</b>	32	2048	32	3	3	✓	

<sup>1</sup>Suggested resale price in U.S. dollars in quantities of 1,000.

## MSP430 Microcontrollers: Ultra-Low-Power, 16-Bit RISC



	I <sup>2</sup> C	DMA	SVS	Brown-Out Reset	MPY	Comp_A	Temp Sensor	ADC Ch/Res	Additional Analog	Packages	Price <sup>1</sup>
-	-	-	-	-	-	✓	-	Slope	-	20 DGV, DW, PW, 24 RGE	0.99
-	-	-	-	-	-	✓	-	Slope	-	20 DW, PW, 24 RGE	0.60
-	-	-	-	-	-	✓	-	Slope	-	20 DGV, DW, PW, 24 RGE	1.35
-	-	-	-	-	-	✓	-	Slope	-	20 DW, PW, 24 RGE	1.10
-	-	-	-	-	-	✓	-	Slope	-	20 DGV, DW, PW, 24 RGE	1.70
-	-	-	-	-	-	✓	-	Slope	-	20 DW, PW, 24 RGE	1.35
-	-	-	-	✓	-	-	✓	5/10	-	20 DW, PW, 32 RHB	2.00
-	-	-	-	✓	-	-	✓	5/10	-	20 DW, PW, 32 RHB	2.25
-	-	-	-	-	-	✓	-	Slope	-	28 DW, PW, 32 RHB	2.15
-	-	-	-	-	-	✓	-	Slope	-	28 DW, PW, 32 RHB	2.30
-	-	-	-	✓	-	-	✓	8/10	-	28 DW, PW, 32 RHB	2.40
-	-	-	-	✓	-	-	✓	8/10	-	28 DW, PW, 32 RHB	2.50
-	-	-	-	-	-	✓	✓	8/12	-	64 PM, PAG, RTD	3.00
-	-	-	-	-	-	✓	-	Slope	-	64 PM, RTD	2.00
-	-	-	-	-	-	✓	✓	8/12	-	64 PM, PAG, RTD	3.60
-	-	-	-	-	-	✓	-	Slope	-	64 PM, RTD	2.30
-	-	-	-	-	✓	✓	✓	8/12	-	64 PM, PAG, RTD	5.05
-	-	-	-	-	✓	✓	-	Slope	-	64 PM, RTD	4.60
-	-	-	-	-	✓	✓	✓	8/12	-	64 PM, PAG, RTD	5.75
-	-	-	-	-	✓	✓	-	Slope	-	64 PM, RTD	5.30
-	-	-	-	-	✓	✓	✓	8/12	-	64 PM, PAG, RTD	6.05
-	-	-	-	-	✓	✓	-	Slope	-	64 PM, RTD	5.60
✓	✓	✓	✓	✓	-	✓	✓	8/12	(2) DAC12	64 PM, RTD	4.95
✓	✓	✓	✓	✓	-	✓	✓	8/12	(2) DAC12	64 PM, RTD	5.55
✓	✓	✓	✓	✓	-	✓	✓	8/12	(2) DAC12	64 PM, RTD	5.85
✓	✓	✓	✓	✓	✓	✓	✓	8/12	(2) DAC12	64 PM, RTD	6.75
✓	✓	✓	✓	✓	✓	✓	✓	8/12	(2) DAC12	64 PM, RTD	7.45
✓	✓	✓	✓	✓	✓	✓	✓	8/12	(2) DAC12	64 PM, RTD	7.95
✓	✓	✓	✓	✓	✓	✓	✓	8/12	(2) DAC12	64 PM, RTD	8.25
✓	✓	✓	✓	✓	✓	✓	✓	8/12	(2) DAC12	64 PM, RTD	8.65
✓	✓	✓	✓	✓	✓	✓	✓	8/12	(2) DAC12	64 PM, RTD	8.95
SVS	USCI <sup>2</sup>	USI <sup>3</sup>	DMA	MPY	Comp_A+	Temp Sensor	ADC Ch/Res	Additional Analog	Package(s)	Price <sup>1</sup>	
-	-	-	-	-	✓	-	Slope	-	14 PW, N, 16 RSA	0.55	
-	-	-	-	-	✓	-	Slope	-	14 PW, N, 16 RSA	0.70	
-	-	✓	-	-	-	✓	8/10	-	14 PW, N, 16 RSA	0.99	
-	-	✓	-	-	-	✓	8/10	-	14 PW, N, 16 RSA	1.15	
-	-	✓	-	-	-	✓	4/16	-	14 PW, N, 16 RSA	1.50	
-	-	✓	-	-	-	✓	4/16	-	14 PW, N, 16 RSA	1.65	
-	-	-	-	-	✓	-	Slope	-	20 DGV, DW, PW, 24 RGE	0.90	
-	-	-	-	-	✓	-	Slope	-	20 DGV, DW, PW, 24 RGE	0.99	
-	-	-	-	-	✓	-	Slope	-	20 DGV, DW, PW, 24 RGE	1.35	
-	-	-	-	-	✓	-	Slope	-	20 DGV, DW, PW, 24 RGE	1.70	
-	✓	-	-	-	-	✓	12/10	-	38 DA, 40 RHA	2.40	
-	✓	-	-	-	-	✓	12/10	-	38 DA, 40 RHA	2.70	
-	✓	-	-	-	-	✓	12/10	-	38 DA, 40 RHA	3.10	
-	-	-	✓	-	-	-	12/10	(2) OPAMP	38 DA, 40 RHA	2.75	
-	-	-	✓	-	-	-	12/10	(2) OPAMP	38 DA, 40 RHA	3.10	
-	-	-	✓	-	-	-	12/10	(2) OPAMP	38 DA, 40 RHA	3.55	
-	✓	-	-	✓	✓	-	Slope	-	40 RHA	2.30	
-	✓	-	-	✓	✓	-	Slope	-	40 RHA	2.65	
-	✓	-	-	✓	✓	-	Slope	-	40 RHA	2.95	

<sup>2</sup>USCI channel 1 supports UART/LIN, IrDA and SPI; USCI channel 2 supports I<sup>2</sup>C and SPI.

<sup>3</sup>USI supports I<sup>2</sup>C or SPI.

New devices appear in bold red.


**MSP430 Microcontrollers: Ultra-Low-Power, 16-Bit RISC**
**MSP430 Ultra-Low-Power Microcontrollers (Continued)**Flash/ROM-Based x4xx Family With LCD Controller and 16-Bit Watchdog (V<sub>CC</sub> 1.8–3.6 V)

(C) ROM (F) Flash	Program (KB)	SRAM (B)	I/O	16-Bit Timers		Brown-Out Reset	SVS	USART <sup>2</sup>	USCI <sup>3</sup>	LCD Segments	DMA	MPY	Comp_A	Temp Sensor	ADC Ch/Res	Additional Analog	Package(s)	Price <sup>1</sup>
				A	B													
MSP430F412	4	256	48	3	—	✓	✓	—	—	96	—	—	✓	—	slope	—	64 PM, RTD	\$2.60
MSP430C412	4	256	48	3	—	✓	✓	—	—	96	—	—	✓	—	slope	—	64 PM, RTD	\$1.90
MSP430F413	8	256	48	3	—	✓	✓	—	—	96	—	—	✓	—	slope	—	64 PM, RTD	\$2.95
MSP430C413	8	256	48	3	—	✓	✓	—	—	96	—	—	✓	—	slope	—	64 PM, RTD	\$2.10
MSP430F415	16	512	48	3,5	—	✓	✓	—	—	96	—	—	✓	—	slope	—	64 PM	\$3.40
MSP430F417	32	1024	48	3,5	—	✓	✓	—	—	96	—	—	✓	—	slope	—	64 PM	\$3.90
MSP430FW423	8	256	48	3,5	—	✓	✓	—	—	96	—	—	✓	—	slope	Flow-meter	64 PM	\$3.75
MSP430FW425	16	512	48	3,5	—	✓	✓	—	—	96	—	—	✓	—	slope	Flow-meter	64 PM	\$4.05
MSP430FW427	32	1024	48	3,5	—	✓	✓	—	—	96	—	—	✓	—	slope	Flow-meter	64 PM	\$4.45
MSP430F4250	16	256	32	3	—	✓	—	—	—	56	—	—	—	✓	5/16	DAC12	48 DL, RGZ	\$3.10
MSP430F4260	24	256	32	3	—	✓	—	—	—	56	—	—	—	✓	5/16	DAC12	48 DL, RGZ	\$3.45
MSP430F4270	32	256	32	3	—	✓	—	—	—	56	—	—	—	✓	5/16	DAC12	48 DL, RGZ	\$3.80
MSP430F423	8	256	14	3	—	✓	✓	1	—	128	—	✓	—	✓	3/16	—	64 PM	\$4.50
MSP430F425	16	512	14	3	—	✓	✓	1	—	128	—	✓	—	✓	3/16	—	64 PM	\$4.95
MSP430F427	32	1024	14	3	—	✓	✓	1	—	128	—	✓	—	✓	3/16	—	64 PM	\$5.40
MSP430FE423	8	256	14	3	—	✓	✓	1	—	128	—	✓	—	✓	3/16	E meter	64 PM	\$4.85
MSP430FE425	16	512	14	3	—	✓	✓	1	—	128	—	✓	—	✓	3/16	E meter	64 PM	\$5.45
MSP430FE427	32	1024	14	3	—	✓	✓	1	—	128	—	✓	—	✓	3/16	E meter	64 PM	\$5.95
MSP430F435	16	512	48	3	3	✓	✓	1	—	128/160	—	—	✓	✓	8/12	—	80 PN, 100 PZ	\$4.45
MSP430F436	24	1024	48	3	3	✓	✓	1	—	128/160	—	—	✓	✓	8/12	—	80 PN, 100 PZ	\$4.70
MSP430F437	32	1024	48	3	3	✓	✓	1	—	128/160	—	—	✓	✓	8/12	—	80 PN, 100 PZ	\$4.90
MSP430FG437	32	1024	48	3	3	✓	✓	1	—	128	✓	—	✓	✓	12/12	(2) DAC12, (3) OPAMP	80 PN	\$6.50
MSP430FG438	48	2048	48	3	3	✓	✓	1	—	128	✓	—	✓	✓	12/12	(2) DAC12, (3) OPAMP	80 PN	\$7.35
MSP430FG439	60	2048	48	3	3	✓	✓	1	—	128	✓	—	✓	✓	12/12	(2) DAC12, (3) OPAMP	80 PN	\$7.95
MSP430F447	32	1024	48	3	7	✓	✓	2	—	160	—	✓	✓	✓	8/12	—	100 PZ	\$5.75
MSP430F448	48	2048	48	3	7	✓	✓	2	—	160	—	✓	✓	✓	8/12	—	100 PZ	\$6.50
MSP430F449	60	2048	48	3	7	✓	✓	2	—	160	—	✓	✓	✓	8/12	—	100 PZ	\$7.05
<b>MSP430FG4616</b>	92	4096	80	3	7	✓	✓	1	✓	160	✓	✓	✓	✓	12/12	(2) DAC12, (3) OPAMP	100 PZ	\$9.45
<b>MSP430FG4617</b>	92	8192	80	3	7	✓	✓	1	✓	160	✓	✓	✓	✓	12/12	(2) DAC12, (3) OPAMP	100 PZ	\$9.95
<b>MSP430FG4618</b>	116	8192	80	3	7	✓	✓	1	✓	160	✓	✓	✓	✓	12/12	(2) DAC12, (3) OPAMP	100 PZ	\$10.35
<b>MSP430FG4619</b>	120	4096	80	3	7	✓	✓	1	✓	160	✓	✓	✓	✓	12/12	(2) DAC12, (3) OPAMP	100 PZ	\$9.95

<sup>1</sup>Suggested resale price in U.S. dollars in quantities of 1,000.<sup>2</sup>USART includes UART and SPI.<sup>3</sup>USCI channel 1 supports UART/LIN, IrDA and SPI; USCI channel 2 supports I<sup>2</sup>C and SPI.

New products are listed in bold red.



TI provides a complete interface products portfolio that empowers customers to differentiate their products and accelerate time-to-market. TI's hardware and software portfolios include 1394a and 1394b, USB full-speed and USB 2.0 high-speed, PCI-to-PCI bridges, PCI Express and PCI CardBus interfaces. Our expertise in high-speed, mixed-signal circuits, system-on-a-chip integration and advanced product development ensure that you receive the silicon, support tools, software and technical documentation to create and deliver the best products on time and at competitive prices. TI's Interface Business Unit (IBU) leverages these technologies and outstanding customer application support to serve the broad-based catalog market.

#### Enabling Faster Time-to-Market

- Industry leading, high performance
- Proven system-level reference designs
- Available development and evaluation kits

#### Providing System-Level Solutions

- Extensive industry compatibility and validation testing
- Production test, driver and application software
- Detailed technical applications documentation

### XIO2200 PCI Express-to-1394b Chip

The XIO2200 is a single-function PCI Express-to-PCI translation bridge where the PCI bus interface is internally connected to a 1394a Open-Host Controller Link-Layer controller with a two-port 1394a PHY. The device is capable of transferring data between the PCI Express bus and the 1394 bus at 100, 200 and 400 Mbps. The XIO2200 provides two 1394 ports that have separate cable bias (TPBIAS). The device also supports the IEEE Std. 1394a-2000 power-down features for battery-operated applications and arbitration enhancements.

#### Key Benefits

- One-chip solution for 1394a ExpressCards
- Advanced power-management features
- Software-programmable and hardware-autonomous power-management features for lower-power applications such as ExpressCard
- Compact footprint, 176-ball MicroStar BGA™
- EEPROM configuration support to load the global unique ID for the 1394 fabric

### TUSB3410 USB-to-Serial Bridge

The TUSB3410 provides an easy way to move a serial-based legacy device to a fast, flexible USB interface by bridging between a USB port and an enhanced UART serial port. The TUSB3410 contains all the necessary logic to communicate with the host computer using the USB bus.

#### Key Features

- USB full-speed-compliant: data rate of 12 Mbps
- 8052 microcontroller with 16 Kbytes of RAM that can be loaded from the host or from external onboard memory via an I<sup>2</sup>C bus

- Integrated, enhanced UART features including:
  - Programmable software/hardware flow control
  - Automatic RS-485 bus transceiver control, with and without echo
  - Software-selectable baud rate from 50 to 921.6 kbaud
  - Built-in, two-channel DMA controller for USB/UART bulk I/O
- Evaluation module to jump-start USB development or for use as a complete USB-to-RS-232 converter

### TUSB6250 Low-Power USB 2.0-to-ATA Bridge Solution

The TUSB6250 bridge for USB 2.0-compliant PC peripheral storage products provides world-class throughput, enhancing the read/write performance of high-density storage media. A highly programmable and configurable architecture allows you to make use of a wide variety of off-the-shelf ATA/ATAPI devices. Industry-leading low power consumption — just 80 mA at 3.3 V — makes cable-powered drives a reality. For self-powered drives, the TUSB6250's low power consumption provides sufficient leftover power to

recharge an onboard battery. Applications include hard disk drives (HDDs) as well as PC peripherals that use HDDs as their storage media (e.g., digital audio players and personal video recorders).

#### Key Features

- Low active power: 80 mA at 3.3 V (typ)
- Ultra-low standby power: 200  $\mu$ A at 3.3 V
- Single 3.3-V supply operation with integrated 1.8-V regulator



## Interface Products

### PCI2040 PCI-to-DSP Bridge Controller

The TI PCI2040 is a PCI–DSP bridge that provides a glueless connection between the 8-bit host port on the TMS320C54x™ DSP or the 16-bit HPI port on the TMS320C6000™ DSP to the high-performance PCI bus. It provides a PCI bus target interface compliant with the *PCI Local Bus Specification*.

The PCI2040 provides several external interfaces: the PCI bus interface with compact PCI support, interface with

support for up to four DSPs, a serial ROM interface, a general-purpose input/output and a 16-bit general-purpose bus to provide a glueless interface to TI JTAG test bus controller (TBC). The PCI2040 universal target-only PCI interface is compatible with 3.3-V or 5-V signaling environments.

#### Features

The PCI2040 supports these other key features:

- PCI bus target only, supporting both single-word reads and writes
- Write transaction posting for improved PCI bus performance
- Up to four DSP devices on HPI
- Allows direct access to program and control external devices connected to PCI2040
- Serial ROM interface for loading subsystem ID and subsystem vendor ID
- Up to 33-MHz PCI bus frequency

## USB

Device	Speed	Ports	I <sup>2</sup> C	Voltage (V)	Package	Description	Price <sup>1</sup>
<b>USB Hub Controllers</b>							
TUSB2036	Full (1.1)	2/3	No	3.3	32 LQFP	2/3-port hub for USB with optional serial EEPROM interface	1.15
TUSB2046B	Full (1.1)	4	No	3.3	32 LQFP	4-port hub for USB with optional serial EEPROM interface	1.20
TUSB2077A	Full (1.1)	7	No	3.3	48 LQFP	7-port USB hub with optional serial EEPROM interface	1.95
TUSB2136	Full (1.1)	1/2	Yes	3.3	64 LQFP	2-port hub with integrated general-purpose function controller	3.25
TUSB5052	Full (1.1)	1-5	Yes	3.3	100 LQFP	5-port hub with integrated bridge to two serial ports	5.10

Device	Speed	Voltage (V)	Remote Wakeup	Package	Description	Price <sup>1</sup>
<b>USB Peripherals</b>						
TUSB3210	Full	3.3	Yes	64 LQFP	USB full-speed general-purpose device controller	2.50
TUSB3410	Full	3.3	Yes	32 LQFP	USB-to-serial converter (RS-232, RS-485)	2.25
TUSB6250	Full, High	3.3	Yes	80 TQFP	USB 2.0 high-speed, low-power ATA/ATAPI bridge solution	2.80

Device	Speed	Voltage (V)	Package	Local Bus Interface	Description	Price
<b>USB On-The-Go (OTG) Devices</b>						
<b>TUSB6010</b>	High	1.5, 1.8 & 3.3	80 MicroStar BGA™	16-Bit Muxed NOR	USB 2.0 high-speed on-the-go to local bus interface controller	Call

Device	Speed	Voltage (V)	Package	Singled-Ended Input	Description	Price
<b>USB Transceivers</b>						
<b>TUSB1105</b>	Full, Low	1.6, 3.6	16RTZ, 16RGT	Yes	USB transceivers	Call
<b>TUSB1106</b>	Full, Low	1.6, 3.6	16RTZ, 16PW	No	USB transceivers	Call
<b>TUSB2551</b>	Full, Low	1.6, 3.6	14PW, 16RGT	No	USB transceivers	Call

<sup>1</sup>Suggested resale price in U.S. dollars in quantities of 1,000.

Preview devices appear in bold blue.

**USB Port Protection**—Transient voltage suppressor protects USB 1.1 devices from ESD and electrical noise transients.

Device	Description	Temp Range °C	Price*
<b>USB Transceivers</b>			
SN65220	Single suppressor	–40 to 85	0.33
SN65240	Dual suppressor	–40 to 85	0.41
SN75240	Dual suppressor	0 to 70	0.38

\*Suggested resale price in U.S. dollars in quantities of 1,000.

**Resources** For a complete list of resources (evaluation modules, data sheets and application notes), visit [interface.ti.com](http://interface.ti.com)

Literature Number	Description
<b>Application Notes</b>	
SLLA122	Selection and Specification of Crystals for Texas Instruments USB 2.0 Devices
SLLA154	VIDs, PIDs and Firmware: Design Decisions When Using TI USB Device Controllers
SLLU043	TUSB3410 UART Evaluation Board
SLLA170B	USB/Serial Applications Using TUSB3410/5052 and the VCP S/W
SLLAA276	MSP430 USB Connectivity Using TUSB3410





### ESD Protection Solution

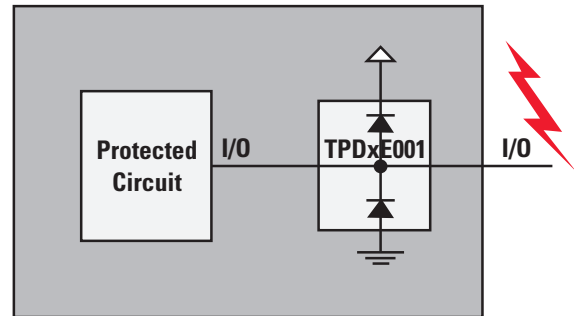
For any external interface connector port ESD strike is a constant threat for the device reliability. Many low-voltage core chip or system ASIC offer only device-level HBM ESD protection which doesn't address the system-level ESD spike events. A standalone ESD solution is a space- and cost-effective solution to protect the system interconnects from external ESD strikes. Here are some key performance specs for TI ESD solutions:

- System-level ESD protection for high-speed application:

- ±15kV—Human body model
- ±14kV—IEC 61000-4-2, contact discharge
- ±15kV—IEC 61000-4-2, air-gap discharge
- Less than 1.4-pF I/O pin capacitance
- Low leakage current suitable for precision measurement
- Operating supply voltage range: +0.9 V to +5.5 V
- Space-saving package solutions

### Applications:

- USB 2.0
- Cell phone
- Glucose meter
- Digital camera
- Notebook
- PDA



TPDxE001 Application Schematics

### ESD Protection ICs

Device	# of Bits	V <sub>DD</sub>	Signal Level	Cap	ESD (Contact)	Leakage	Package	Price
TPD2E001	2	0.9 V–5.5 V	0 V–V <sub>DD</sub>	1.5 pF	±8 kV	1 nA	DRL, DRY	Call
TPD3E001	3	0.9 V–5.5 V	0 V–V <sub>DD</sub>	1.5 pF	±8 kV	1 nA	DRL, DRY	Call
TPD4E001	4	0.9 V–5.5 V	0 V–V <sub>DD</sub>	1.5 pF	±8 kV	1 nA	DRL, DRS	Call
TPD6E001	6	0.9 V–5.5 V	0 V–V <sub>DD</sub>	1.5 pF	±8 kV	1 nA	RSE, RSF	Call
TPD4E002	4	N/A	0 V–6 V	14 pF	±15 kV	100 nA	DRL	Call

### XIO

Device	Voltage	PCI Express	PCI Bus Masters	Pin/Packages	Description	Price <sup>1</sup>
XIO2000	3.3/1.5	x1	6	201 MicroStar BGA™	Fully compliant single-function PCI Express to PCI translation bridge	14.95
XIO2200	3.3/1.5	x1	N/A	176 MicroStar BGA	Single-function PCI Express to PCI translation bridge where the PCI bus interface is internally connected to a 1394a open host controller link-layer controller with a two-port 1394a PHY	15.05

<sup>1</sup>Suggested resale price in U.S. dollars in quantities of 1,000.



## Interface Products

## PCI

Device	Intel-Compatible Part No.	Speed (MHz)	Expansion Interface (bits)	Hot-Swap	MicroStar BGA™ Packaging	Voltage (V)	Package	Description	Price <sup>1</sup>
<b>PCI Bridges</b>									
HPC3130	—	33	32	—	No	3.3	128 LQFP, 120 QFP	Hot-plug controller	10.95
HPC3130A	—	66	64	—	No	3.3	144 LQFP, 128 LQFP, 120 QFP	Hot-plug controller	10.95
PCI2040	—	33	—	—	Yes	3.3, 5	144 BGA, 144 LQFP	PCI-to-DSP bridge controller, compliant with Compact PCI Hot-Swap Specification 1.0	10.55
PCI2050B	21150bc	66	32	Yes	Yes	3.3, 5	208 LQFP, 208 QFP, 257 BGA	32-bit, 66-MHz, 9-master PCI-to-PCI bridge	9.50
PCI2250	21152ab	33	32	Friendly	No	3.3, 5	176 LQFP, 160 QFP	32-bit, 33-MHz PCI-to-PCI bridge, Compact PCI hot-swap friendly, 4-master	6.10
PCI2060	—	66	32	Yes	Yes	3.3, 5	257 BGA	32-bit, 66-MHz, 9-master, asynchronous PCI-to-PCI bridge	9.50

<sup>1</sup>Suggested resale price in U.S. dollars in quantities of 1,000.

Device	Voltage (V)	D3 Cold Wake	Integrated 1394	Flash Support	Package	Description	Price <sup>1</sup>
<b>PCI CardBus Controllers</b>							
PCI1620	3.3	Yes	No	Yes <sup>2</sup>	209 BGA, 208 LQFP	PC card, Flash media and SmartCard controller	Web
PCI1520	3.3	Yes	No	No	209 BGA, 208 LQFP	2-slot PC CardBus controller	Web
PCI4520	3.3	Yes	Yes	No	257 BGA	2-slot PC and integrated 1394a-2000 OHCI two-port PHY/link-layer controller	Web
PCI7610	3.3	Yes	Yes	Yes <sup>2</sup>	209 BGA, 208 LQFP	Integrated PC card, SmartCard, Flash media, 1394a-2000 OHCI 2-port PHY/link-layer controller	Web
PCI7510	3.3	Yes	Yes	No	209 BGA, 208 LQFP	Integrated PC card, SmartCard and 1394 controller	Web
PCI7410	3.3	Yes	Yes	Yes <sup>2</sup>	209 BGA, 208 LQFP	PC card, SmartCard, Flash media, integrated 1394a-2000 OHCI 2-port PHY/link-layer controller	Web
PCI4510	3.3	Yes	Yes	No	209 BGA, 208 LQFP	PC card and Integrated 1394a-2000 OHCI two-port PHY/link-layer controller	Web
PCI1510	3.3	Yes	No	No	144 BGA, 144 LQFP	Single-Slot PC CardBus controller	Web
PCI7620	3.3	Yes	Yes	Yes <sup>3</sup>	288 BGA	Integrated 2-slot PC card w/SmartCard, Flash media, 1394a-2000 OHCI 2-port PHY/link-layer controller	Web
PCI7420	3.3	Yes	Yes	Yes <sup>3</sup>	288 BGA	Integrated 2-slot PC card, dedicated Flash media socket and 1394a-2000 OHCI 2-port PHY/link-layer controller	Web
PCI6620	3.3	Yes	No	Yes <sup>3</sup>	288 BGA	Integrated 2-slot PC card with SmartCard and dedicated Flash media controller	Web
PCI6420	3.3	Yes	Yes	Yes <sup>3</sup>	288 BGA	Integrated 2-slot PC card and dedicated Flash media controller	Web
PCI7621	3.3	Yes	Yes	Yes <sup>4</sup>	288 BGA	Integrated 2-slot PC card, dedicated Flash media socket and 1394a-2000 OHCI 2-port PHY/link-layer controller	Web
PCI7421	3.3	Yes	Yes	Yes <sup>4</sup>	288 BGA	Integrated 2-slot PC card, dedicated Flash media socket and 1394a-2000 OHCI 2-port PHY/link-layer controller	Web
PCI6621	3.3	Yes	No	Yes <sup>4</sup>	288 BGA	Integrated 2-slot PC card with SmartCard and dedicated Flash media controller	Web
PCI6421	3.3	Yes	No	Yes <sup>4</sup>	288 BGA	Integrated 2-slot PC card and dedicated Flash media controller	Web
PCI7611	3.3	Yes	Yes	Yes <sup>4</sup>	288 BGA	Integrated PC card, SmartCard, Flash media, 1394a-2000 OHCI 2-port PHY/link-layer controller	Web
PCI7411	3.3	Yes	Yes	Yes <sup>4</sup>	288 BGA	PC card, Flash media, Integrated 1394a-2000 OHCI 2-port PHY/link-layer controller	Web
PCI6611	3.3	Yes	No	Yes <sup>4</sup>	288 BGA	Integrated 1-slot PC card with SmartCard and dedicated Flash media controller	Web
PCI6411	3.3	Yes	No	Yes <sup>4</sup>	288 BGA	Integrated 1-slot PC card and dedicated Flash media controller	Web
PCI4510R	3.3	Yes	Yes	No	288 BGA	PC card and integrated 1394a-2000 OHCI 2-port PHY/link-layer controller	Web
PCI1510R	3.3	Yes	No	No	288 BGA	Single-slot PC CardBus controller	Web
PCI7515	3.3	Yes	Yes	No	257 BGA	Integrated 1-slot PC card controller with 1 1394a-2000 OHCI port and 1 dedicated SmartCard interface	Web
PCI6515	3.3	Yes	No	No	257 BGA	Integrated 1-slot PC card and 1 dedicated SmartCard interface	Web
PCI4515	3.3	Yes	Yes	No	257 BGA	Integrated 1-slot PC card controller with 1 1394a-2000 OHCI port	Web
PCI1515	3.3	Yes	No	No	257 BGA	Integrated 1-slot PC card controller, pin compatible with PCI4515, PCI6515 and PCI7515	Web

Note: Parts highlighted in the same color are pin compatible.

<sup>1</sup>Please check [www.ti.com](http://www.ti.com) for the most current pricing information.

<sup>3</sup>SD/MMC MemoryStick/MemoryStick Pro.

<sup>2</sup>SD/MMC MemoryStick™/MemoryStick Pro SmartMedia™ xD.

<sup>4</sup>SD/MMC SDIO MemoryStick/MemoryStick Pro SmartMedia xD.

**eXpressDSP™ Software and Development Tools****eXpressDSP Software and Development Tools**

Complete, Open, Real-Time Software Environment for TI DSPs



TI's real-time eXpressDSP Software and Development Tool strategy includes tightly knit ingredients that will empower developers to tap the full potential of TMS320™ DSPs. Each element is designed to simplify DSP 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 DSPs. eXpressDSP tools enable innovators and inventors to speed new products to market and turn ideas into reality. For more information, visit [www.ti.com/digitalmediasoftware](http://www.ti.com/digitalmediasoftware) and [www.ti.com/expressdspools](http://www.ti.com/expressdspools)

**Standardization and Software Reuse Move DSP 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 (Code Composer Studio™ Development Tools)
- 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 Third Party Network
- Available on TMS320C6000™, TMS320C5000™, TMS320C2000™ DSPs, OMAP™ and DaVinci™ 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 DSP software environment to simplify and streamline the DSP product development process. It provides access to a large number of reusable software components, host tooling (Code Composer Studio Development Tools) and target-side content to reduce development time. For information on eXpressDSP Software and Development Tools, visit [www.ti.com/dsp](http://www.ti.com/dsp)

**Code Composer Studio Development Tools**

- Comprehensive IDE includes tools for editing, debugging, compiling, code profiling and more
- Sophisticated project manager enables team-based development

- Fast simulators provide deeper visibility for quick and precise problem resolution
- Analysis tools boost performance and simplify tedious tasks
- Advanced Code Tuning tools take weeks out of the optimization process

**XDS560™ Emulator**

- Real-time JTAG-based emulator supporting high-speed RTDX™-enabled devices
- Speeds time-to-market with real-time data transfer rates of over 2 MBytes/second
- Increases productivity with faster start up for larger applications
- Quickly finds and fixes intermittent real-time problems
- Upward compatible with XDS510™ emulators

**eXpressDSP Software**

eXpressDSP DSP/BIOS Kernel

- No run-time royalty – free with Code Composer Studio Development Tools
- Integrated with Code Composer Studio Development Tools
- Includes preemptive multitasking scheduler and real-time analysis

**eXpressDSP-Compliant Algorithms**

- Available for a myriad of applications
- Written to the eXpressDSP Algorithm Interface Standard (xDAIS)
- Available from TI third parties
- TI digital media software, developed by TI, available through Authorized Software Providers

**TI DSP Third Party Network**

- Worldwide community of respected companies offering products and services that support TI DSPs
- Products and services include a broad range of end-equipment solutions, embedded software, engineering services and development tools that help customers accelerate development efforts and cut time-to-market
- For more information on the Third Party Network, please visit [www.ti.com/3p](http://www.ti.com/3p)





## Code Composer Studio™ Development Tools for eXpressDSP™ Software

### Code Composer Studio Software Development Tools

Integrated Development Environment

Get more information about Code Composer Studio Development Tools at: [www.ti.com/ccstudio](http://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 TMS320C6000™, TMS320C5000™, TMS320C2000™ DSP, DaVinci™ and OMAP™ processor platforms.

#### Features and Benefits

- Unified IDE supports C2000™, C5000™, C6000™ DSP, DaVinci and OMAP processor platforms in one installation providing development tool savings, multiprocessor support and ease of platform migration
- Real-time analysis tools for monitoring program interactions without halting the processor
- A scalable, real-time, royalty-free DSP/BIOS™ kernel
- Advanced Code Tuning tools streamline optimization process to meet power/performance and code size goals
- Data visualization for viewing signals in multiple graphical formats
- Easily manage large multi-user, multi-site and multi-processor projects
- Fast simulators provide deeper visibility for quick and precise problem resolution
- Integrated CodeWright editor provides quick startup and numerous time-saving features
- Component Manager offers flexibility to evaluate or lock down compiler and DSP/BIOS versions for the life of the project
- Robust, resilient host-to-target connect/disconnect enables hot swapping and eliminates restarts during debug
- Rewind lets developers step forward and backward in their source code to quickly find and fix bugs
- Unified Breakpoint Manager gives developers a single control panel to manage software and hardware breakpoint configurations

#### Code Composer Studio Development Tools Overview

CCStudio IDE includes the features necessary to take you through each step of the application development flow. All of the features are provided in an integrated product allowing developers to focus their energy on innovation. CCStudio IDE has an open architecture that allows TI and third parties to extend the IDE's functionality by seamlessly plugging in additional specialized tools. Such familiar tools and interfaces allow users to get started faster than ever before and add functionality to their application thanks to sophisticated productivity tools.

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](http://www.ti.com/freetools)

#### Industry-Leading C/C++ Compiler

Unlike other processors that rely on public domain (GNU) technology, TI's Code Composer Studio compiler takes advantage of limited registers and makes tight DSP-specific loops. With more than 25 years experience and several patents, the robust and reliable compiler and optimizer technologies allow developers to spend less time hand-coding and more time concentrating on delivering new applications.

Code Composer Studio tools include the only compiler that optimizes code at the program level, which is often critical to performance. The compiler also contains many DSP-specific optimizations such as software pipelining, conversion/predicate execution, memory address cloning and memory address dependence elimination.

The screenshot displays the Code Composer Studio IDE with several key components labeled:

- Project Manager:** Located on the left side, showing a tree view of the project files.
- CodeWright Editor:** The central window displaying the source code in C.
- DSP/BIOS Configuration Window:** Located at the top right, used for configuring the target hardware and software.
- Memory Window:** Located on the right side, showing memory addresses and their contents.
- Disassembly Window:** Located at the bottom left, showing the assembly code generated from the source.
- Watch Window:** Located at the bottom left, used for monitoring variable values during execution.
- Output Window:** Located at the bottom center, showing the output of the compiler and linker.
- Data Visualization:** Located at the bottom center, showing graphical plots of data.
- GEL:** Located at the bottom right, used for sending commands to the target device.

Code Composer Studio Development Tools feature all tools used in the development cycle working tightly together. Edit, build, debug and visualize.

## Code Composer Studio™ Development Tools for eXpressDSP™ Software



### Tuning Tools

Advanced tools designed specifically for the optimization process are used to improve execution time, utilize cache more efficiently and decrease memory usage. These tools are wrapped with an interactive advisor that walks the user through the tuning process specific to the goals set by the developer.

### Debug Within the IDE

CCStudio 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. Global breakpoints are also available for multiprocessor systems. Developers can debug code quickly by selectively stepping into, over or out of C function or assembly subroutines. CCStudio's Debug Rewind capability lets users also step backwards in their source code to quickly find and observe application behavior during a simulation. A ProbePoint™, unique to CCStudio development tools, is a sophisticated form of a breakpoint. It

allows developers to define a point in the algorithm where oscilloscope-type functions can be performed. Unlike a breakpoint, program execution resumes after hitting a ProbePoint and performs the connected activity (e.g., inject or extract signal data, observe signals, execute GEL script). CCStudio IDE also supports popular external scripting languages such as Perl and VBA to help developers automate application testing and validation.

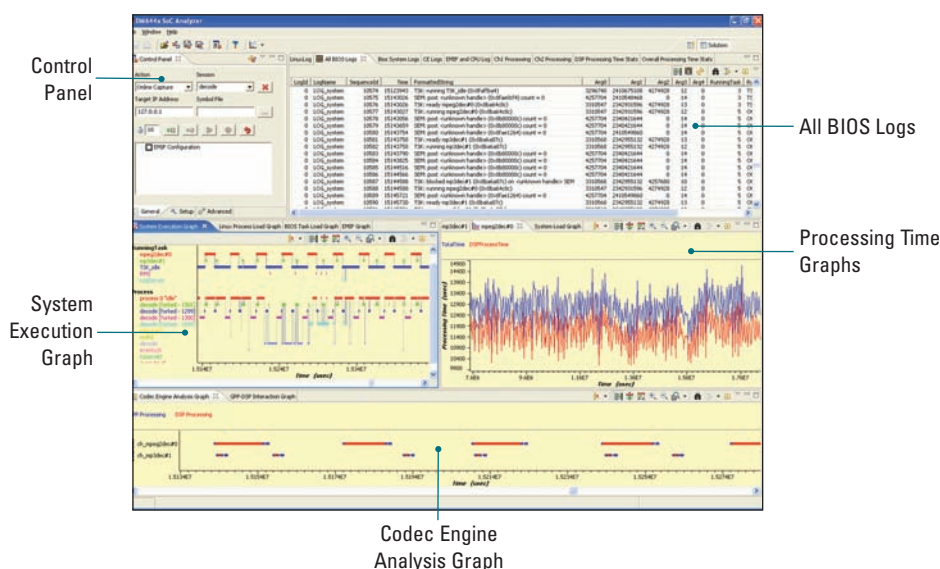
### Multi-Target Debug

CCStudio IDE supports the development of complex systems with multiple boards or multiple processors on a single target board. CCStudio'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 Parallel Debug Manager 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 Parallel Debug Manager lets developers open up separate debug windows for any CPU on

any board in the system. CCStudio's unified IDE supports TMS320C2000™, TMS320C5000™, TMS320C6000™ DSP, DaVinci™ and OMAP™ processor platforms in one simple installation enabling a variety of configurations such as multiple DSP, heterogeneous DSP combinations, SOC and discreet DSP/Microcontroller groupings.

### System Analysis

CCStudio also delivers standalone system-level analysis tools for DaVinci processor systems. These system analysis tools enabled by eXpressDSP data visualization technology provide developers with a birds-eye view of system-level interactions. The TMS320DM644x SoC Analyzer helps developers identify bottlenecks that were previously very difficult to find. The SoC Analyzer is non-invasive and aids in analyzing and identify problems by capturing and graphically displaying system interactions, local and load distributions and data throughput. As the tasks run on both the DSP and ARM® cores of the TMS320DM644x processors, the analyzer captures and displays the data on a single timeline. This provides a complete system view of the application and



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](http://www.ti.com/freetools)

*TMS320DM644x SoC Analyzer displays critical system level data flow in a configurable multi-view standalone tool.*



## Code Composer Studio™ Development Tools for eXpressDSP™ Software

eliminates the tedious process of manually collecting and comparing data on each core before optimization begins.

### Real-Time Data Exchange (RTDX™)

Once algorithms are integrated into applications, the real-time behavior of the system must be observed. CCStudio Development Tools allow the developer to visualize or debug an application while it runs in real time. RTDX provides significant benefits over alternative methods of system debugging.

RTDX gives developers the industry's first DSP system that provides real-time, continuous visibility into the way target applications operate in the real world. RTDX allows developers to transfer data between the host computer and DSP devices without stopping their target application. This shortens development time by giving developers a much more realistic representation of the way their

systems operate. RTDX allows designers to continually monitor their systems and gain real-time insight into their running applications.

### Interactive Profiling

CCStudio 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.

### Real-Time Analysis

Using the real-time analysis capabilities of CCStudio Development Tools, a developer can probe, trace and monitor a DSP application while it runs. These utilities are based on a real-time link and awareness between the CCStudio Development Tools host environment and the target. Even after the program has been halted, information already captured through the real-time analysis tools can provide invaluable insight into the sequence of events that led up to the current point of execution. Real-time analysis tools are used later in the development cycle when transitioning from the debug phase to the runtime phase. They show subtle problems arising from time-dependent interaction of program components. Real-time analysis tools are the software counterpart of the hardware logic analyzer.

## DSP/BIOS™ Kernel for eXpressDSP™ Software



### DSP/BIOS Kernel Scalable Real-Time Kernel

Get more information about DSP/BIOS Real-Time Kernel at: [www.ti.com/dspbios](http://www.ti.com/dspbios)

### DSP/BIOS Kernel Shortens Development Time

DSP/BIOS kernel is a scalable real-time kernel, designed for the TMS320C28x™ DSP generation, TMS320C5000™ and TMS320C6000™ DSP platforms with preemptive multithreading, hardware abstraction, real-time analysis and system configuration tools.

### Features and Benefits

- Quickly design multifunction applications
- Understand your application's real-time behavior
- No need to develop scheduling software
- Port applications quickly to new devices
- Preemptive multitasking scheduler
- Multiple scheduling and communication mechanisms
- Fast, deterministic performance
- Very small memory footprint
- Configurable functionality
- Static and dynamic task creation
- Integrated real-time analysis tools
  - CPU load
  - Max/Average execution times
  - Task execution trace
  - Kernel object browser

### DSP/BIOS Kernel Overview

DSP/BIOS kernel simplifies the development of today's multifunction DSP applications. Complex applications that are easily organized into separate threads are scheduled in real-time according to their priority. New functionality can be easily added without affecting the response time of critical real-time functions. DSP/BIOS kernel also provides a set of interthread communication mechanisms that enable synchronization between threads if desired.

To aid debugging of complex applications, DSP/BIOS kernel includes host-to-target communication and real-time instrumentation services that are integrated with graphical real-time analysis displays on the development host. DSP programmers can instrument their applications to be probed, traced and

monitored as they execute in real-time. Alternatively, programs that take advantage of the multithreading capabilities of the DSP/BIOS kernel are implicitly instrumented; i.e., programs without any explicit calls to the DSP/BIOS kernel APIs can be traced in real-time.

DSP/BIOS kernel is integrated within the Code Composer Studio™ Development Tools, requires no run-time license fees and is fully supported by Texas Instruments.

DSP/BIOS kernel gives you a solid foundation to support substantial, sophisticated programs with a robust, industry-proven software kernel that has been used in thousands of designs.

For more information, visit [www.ti.com/dspbios](http://www.ti.com/dspbios)

The screenshot displays the Code Composer Studio interface with several key components highlighted by callouts:

- DSP/BIOS Kernel Functions and Objects:** Points to the Kernel Object View window, which shows a table of kernel objects with columns for Name, Handle, State, Priority, Halts, and Fun target.
- User-Defined Event Log:** Points to the Log Name field and the list of log entries, such as "Audio example started!" and "load new load = 100000 instructions every 16 ms".
- CPU Load:** Points to the CPU load graph at the bottom left, showing a peak of 23.65%.
- Real-Time Analysis Control:** Points to the RTA Control Panel on the right, which contains various checkboxes for enabling logging and analysis features.
- Graphical Execution Log:** Points to the Execution Graph window, which shows a timeline of task execution with colored bars representing different threads.
- Statistics Accumulation Display:** Points to the Statistics window at the bottom right, which displays a table of performance metrics for various kernel objects.

Object Name	Count	Total	Max	Average
STS	3070	3075	2	0.98205
loadPhd	4	4	2	0.75
stepPhd	4	4	2	0.75
PRD_obj	3070	61820000	407844	20392.24
audioFile	6140	14681256	3152	2367.82
DSP_objPhd	6140	0	0	0
DSP_objPhd	6142	0	0	0
CL_objPhd	45219	-4.05761e+007	-74	-68.7267
DSP_objPhase	6140	2.66456e+007	4879	4837.99

Find and fix real-time problems without any runtime license fees.



## TMS320™ DSP Algorithm Standard for eXpressDSP™ Software

### eXpressDSP Algorithm Interoperability Standard (xDAIS) – Digital Media (xDM)

Standards for Application Interoperability

Get more information on xDAIS-DM at: [www.ti.com/ccstudio](http://www.ti.com/ccstudio)

#### Features and Benefits

- Reduces system integration by enabling multiple algorithms to interoperate out-of-the-box
- Lowers support and development costs by eliminating custom coding
- Choose from hundreds of compliant algorithms available today
- Uniform lightweight APIs across various classes of multimedia algorithms, such as audio, video, speech and image
- Flexibility of extension for various requirements such as metadata parsing, file format, custom processing and so forth
- Enables developer to experiment between algorithms from different vendors without modifying application

#### Mandatory Rules

- The standard consists of:
  - 46 basic “common sense” rules for all algorithms
  - IALG APIs – Abstracts DSP memory management away from algorithms
  - IDMA2 and IDMA3 APIs – Abstracts DSPDMA management away from algorithms
  - Instruction Set Architecture (ISA) rules for DSPs
  - Naming conventions to reduce name space pollution

#### Optional Guidelines

- Several guidelines to help system integrators
- Methods for extending baseline APIs for added functionality – allowing for differentiation

#### eXpressDSP™ Compliance

- Hundreds of algorithms tested to comply to the TMS320 DSP Algorithm Standard

#### Overview of eXpressDSP Algorithm Interoperability Standard – Digital Media

The Digital Media extension to the eXpressDSP Algorithm Interoperability Standard – (xDAIS-DM or xDM) is a key ingredient of eXpressDSP™ Technology. xDM defines a uniform set of APIs across various multimedia algorithms to ease integration and allow developers to change between algorithms. The standard is a set of coding conventions for algorithm writers that ultimately eliminate much of the time-consuming reengineering work required to integrate algorithms into a variety of applications. It achieves this by defining common programming rules, guidelines and interfaces.

The xDM enforces known behaviors, requires documentation of features relevant to integration and defines interfaces for algorithms to use to request resources. As a result, the standard facilitates the integration and deployment of algorithms in a variety of systems.

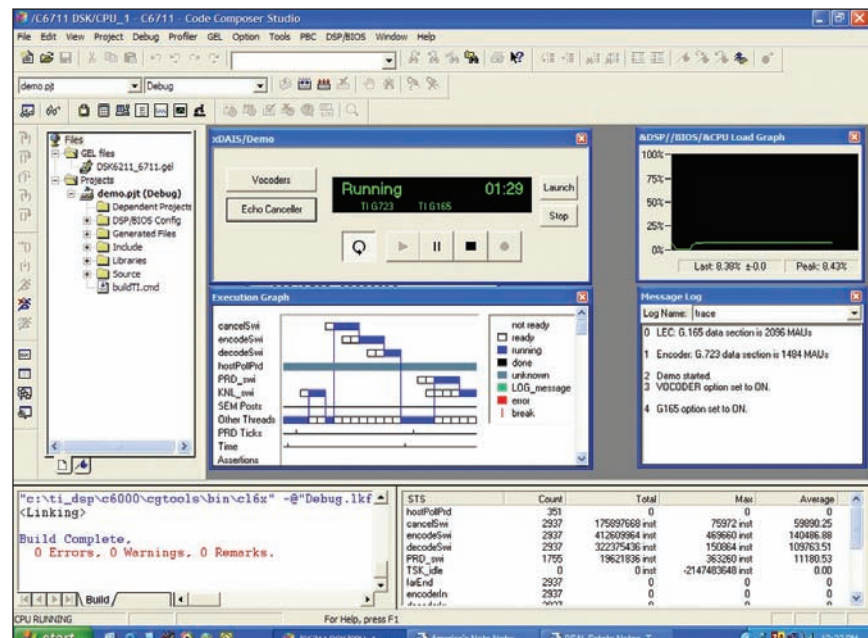
The xDM documentation, header files and examples are included in Code Composer Studio™ Integrated Development Environment (IDE).

#### Using eXpressDSP-Compliant Algorithms

To browse and purchase off-the-shelf production-ready algorithms, visit TI's website to view a list of companies that have produced eXpressDSP-compliant algorithms. Go to the DSP Developer's Village and follow the links in the eXpressDSP compliance program box and look for the compliance logo.



For more information about the TMS320 DSP Algorithm Standard Developer's Kit visit [www.ti.com/ccstudio](http://www.ti.com/ccstudio)



The TMS320 DSP Algorithm Standard Developer's Kit demo shows how easily eXpressDSP-compliant algorithms interoperate.



## TMS320™ DSP Algorithm Standard for eXpressDSP™ Software



### eXpressDSP™ Digital Media Software

Simplify Development and Reduce Cost in Digital Media Applications

Get more information about eXpressDSP Digital Media Software at: [www.ti.com/digitalmediasoftware](http://www.ti.com/digitalmediasoftware)

eXpressDSP digital media software is production tested and optimized for a portfolio of DSP and SoC platforms. Instead of investing time and effort in standardized media software, manufacturers are able to save years of development time to differentiate their digital media products. eXpressDSP digital media software is available for free evaluation and numerous flexible pricing options exist to fit any development need. An experienced network of authorized software providers are available to support TI software and provide integration services to help customers reach production more quickly. For more information or to get started today, visit [www.ti.com/digitalmediasoftware](http://www.ti.com/digitalmediasoftware)

Unlike example software or freeware, all digital media software components have been developed by following stringent coding guidelines. Accompanying each module is a re-targetable production library featuring reentrant code. Each module is fully documented with a datasheet, release notes, user guide and usage examples.

All digital media software is both unit tested and system tested by applying thousands of test vectors in world-class

testing labs. In addition, a wide range of use-case scenarios from end-equipments/applications, including cell phones, wireless networking, video/IP phones,

streaming media, set-top boxes and others contribute to the library of test vectors used to validate each algorithm.

### Digital Media Software Overview

Codect	MIPS at D1	Memory	Memory I/O
H.264 BP Decoder	<ul style="list-style-type: none"> <li>• 30 fps at D1 resolution</li> <li>• 255 MHz typical</li> <li>• 310 MHz peak</li> </ul>	<ul style="list-style-type: none"> <li>• 7247 kB external</li> <li>• 63 kB internal data</li> <li>• 152 kB Program</li> </ul>	<ul style="list-style-type: none"> <li>• BP D1 377–415 megabits/second</li> </ul>
H.264 BP Encoder	<ul style="list-style-type: none"> <li>• 450 MHz typical</li> <li>• 465 MHz peak</li> </ul>	<ul style="list-style-type: none"> <li>• 2360 kB external</li> <li>• 62 kB internal data</li> <li>• 130 kB program</li> </ul>	<ul style="list-style-type: none"> <li>• BP D1 377–415 megabits/second</li> </ul>
H.264 MP Decoder	<ul style="list-style-type: none"> <li>• 480 MHz typical</li> <li>• 510 MHz peak</li> </ul>	<ul style="list-style-type: none"> <li>• 7700 kB external</li> <li>• 62 kB internal data</li> <li>• 380 kB program</li> </ul>	<ul style="list-style-type: none"> <li>• MP D1 resolution 30 fps</li> </ul>
MPEG-4 SP Encoder	<ul style="list-style-type: none"> <li>• 225 MHz typical</li> <li>• 230 MHz peak</li> </ul>	<ul style="list-style-type: none"> <li>• 2360 kB external</li> <li>• 62 kB internal data</li> <li>• 130 kB program</li> </ul>	<ul style="list-style-type: none"> <li>• 350–400 MB/s</li> </ul>
MPEG-4 SP Decoder	<ul style="list-style-type: none"> <li>• 160 MHz typical</li> <li>• 165 MHz peak</li> </ul>	<ul style="list-style-type: none"> <li>• 2360 kB external</li> <li>• 62 kB internal data</li> <li>• 130 kB program</li> </ul>	<ul style="list-style-type: none"> <li>• 210 MB/s</li> </ul>
MPEG-2 MP Decoder	<ul style="list-style-type: none"> <li>• 170 MHz typical</li> <li>• 220 MHz peak</li> </ul>	<ul style="list-style-type: none"> <li>• 2360 kB external</li> <li>• 62 kB internal data</li> <li>• 130 kB program</li> </ul>	<ul style="list-style-type: none"> <li>• MP D1 218 MB/s</li> </ul>
JPEG Encoder	<ul style="list-style-type: none"> <li>• 29 Mpixels/second</li> <li>• 55 MHz @ D1</li> </ul>	<ul style="list-style-type: none"> <li>• 112 kB external</li> <li>• 8 kB internal data</li> <li>• 99 kB program</li> </ul>	<ul style="list-style-type: none"> <li>• 30 MB/s @ D1</li> </ul>
JPEG Decoder	<ul style="list-style-type: none"> <li>• 31 Mpixels/second</li> <li>• 55 MHz @ D1</li> </ul>	<ul style="list-style-type: none"> <li>• 2360 kB external</li> <li>• 62 kB internal data</li> <li>• 130 kB program</li> </ul>	<ul style="list-style-type: none"> <li>• 30 MB/s @ D1</li> </ul>
MP3 Decoder	<ul style="list-style-type: none"> <li>• 16 MHz typical</li> <li>• 22 MHz peak</li> </ul>	<ul style="list-style-type: none"> <li>• 43 kB external</li> <li>• 2 kB internal data</li> <li>• 52 kB program</li> </ul>	

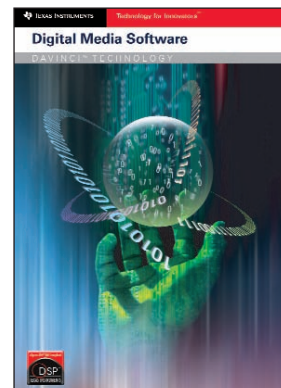
### Current Listing of eXpressDSP Digital Media Software

e = encode d = decode

Available Now
H.264 MP d D1
H.264 BP e/d D1
MPEG-4 SP e/d D1
MPEG-2 MP d D1
JPEG e/d D1
AAC LC e/d
MP3 d
G.711 e/d
HE-AAC e/d
AC-3* d
WMA9 d
WMV9 MP / VC1 d D1

Available 1H07
WMV9 MP / VC1 e D1
WMA8 e
HE-AAC e
AAC LC e
G.729AB e/d
G.726 e/d
G.723.1 e/d

\*Dolby requires development license with OEM prior to TI fulfilling the evaluation request. Please provide proof of license with request.





## TMS320™ DSP Algorithm Standard for eXpressDSP™ Software

### Codec Combinations\*

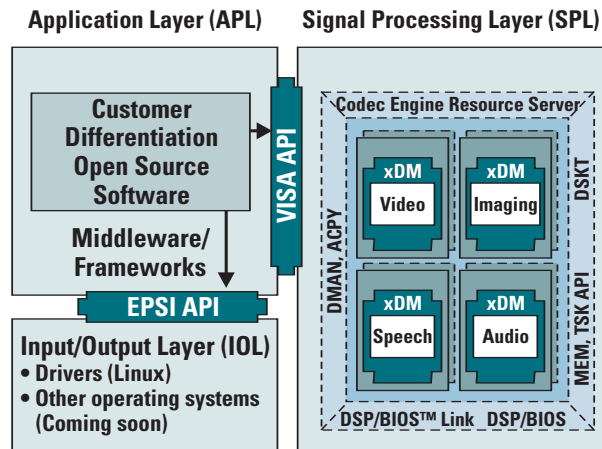
e = encode d = decode c = codec

Networked AV/Set-Top Box	Video Phone/Video Conferencing	Security Surveillance
WMV9 MP d + WMA9 d	H.264 BP c + G.729AB c + G.726 c	JPEG c (simultaneous, full motion) + G.711 c
MPEG-2 MP d + HE-AAC d	H.264 BP c + AAC LC c	MPEG-4 SP e D1 & MPEG-4 SP e CIF simultaneous, plus G.711
H.264 MP d + AAC LC d	H.264 BP c + HE-AAC c	DVEVM VS-B2 (H.264 BP e + G.711 e)
H.264 MP d + HE-AAC d	MPEG-4 SP (and H.263) c + G.711 / G.726 / G.729AB c	DVEVM VS-B3 (MPEG-4 SP e + G.711 e)
MPEG-2 MP d + AC3 d		
DVEVM NAV1 (MPEG-2 d + MP3 d)		

\*Several are available now, including the DVEVM combinations, and two of the new combinations (JPEG e/d and H.264 MP d + AAC LC d)

### Digital Media Software Architecture

The overall software architecture for the DaVinci TMS320DM6443 and TMS320DM6446 processors is shown in the figure. TI digital media encoders and decoders seamlessly plug into the signal processing layer architecture; the right side of the diagram to the right. The codec engine framework includes code for different classes of TI digital media software. It connects to the application layer and exposes user control through the VISA API; a high-level interface that allows developers to control and operate the software from a high-level Operating System (OS) environment. TI digital media codecs allow developers to focus design efforts on differentiating features at the application layer, while DaVinci's™ open software environment allows developers to include differentiating IP on any of the DSP, application or IO layers shown.



The overall software architecture for the DaVinci Technology-based TMS320DM644x processor is shown above. TI digital media encoders and decoders seamlessly plug into the signal-processing layer architecture; the right side of the above diagram. The codec engine framework includes code for different classes of TI digital media software. It connects to the application layer and exposes user control through the VISA API; a high-level interface that allows developers to control and operate the software from a high-level operating system (OS) environment. TI digital media codecs allow developers to focus their design efforts on differentiating features at the application layer, while DaVinci's open software environment allows developers to include differentiating IP on any of the DSP, application, or I/O layers shown above.



## TI eXpressDSP™ Digital Media Software

Availability Schedule	Status	DaVinci™ TMS320DM644x Current Revision	Customer Availability
<b>Video</b>			
<b>H.263</b>			Included with MPEG-4
<b>H.264</b>			
H.264 BP Encode/Decode	Available		Now
H.264 BP Decode	Available	1.00	Now
H.264 BP Encode	Available	1.01	Now
H.264 Main Profile Decode	Available	1.00	Now
<b>MPEG-2</b>			
MPEG-2 MP @ ML Decode	Available	1.00	Now
<b>MPEG-4</b>			
MPEG-4 SP Encode/Decode (incl. H263 p0 )	Available		Now
MPEG-4 SP Decode (includes H263 p0)	Available	1.00	Now
MPEG-4 SP Encode (includes H263 p0)	Available	1.00	Now
<b>WMV Technology</b>			
VC1 / WMV9 MP Decode	In Development	1.00	2Q07
<b>Imaging</b>			
OSD	Future		Future
Deinterlacing	Future		Future
JPEG Encode/Decode			Now
JPEG Decode	Available	1.00	Now
JPEG Encode	Available	1.00	Now
<b>Voice / Speech</b>			
G.711 Encode/Decode	Available	1.00	Now
<b>Wireline Voice Codecs</b>			
G.726 Encode/Decode	In Development		1Q07
G.723.1 Encode/Decode	In Development		1Q07
G.729AB Encode/Decode	In Development		1Q07
<b>Audio</b>			
MP3 Decode	Available	1.00	Now
MPEG-1 Layer 2 Decode	Available	1.00	Now
WMA9 Decode	In Development	1.00	Now
WMA8 Encode	In Development	1.00	2Q07
<b>AAC</b>			
AAC LC Decode	Available	1.00	Now
AAC LC Encode	Future	1.00	1Q07
HE-AAC Decode	In Development	1.00	Now
HE-AAC Encode	In Development	1.00	1Q07
<b>Other</b>			
Network Development Kit (with TCP/IP stack) (v1.7, v1.8, v1.9, v1.91, v1.92)			Included with Linux driver package



## Digital Media Software

### TI Digital Media Software, an eXpressDSP™ Technology

Availability Schedule	DaVinci™ TMS320DM644x		
	Status	Current Revision	Customer Availability
<b>System-Tested Codec Combinations</b>			
<b>DVEVM Codec Servers/DVSDK Codec Server Packages</b>			
DVEVM VP-B1 (H.264 BP Encode + H.264 BP Decode)	Available	1.00	Now
DVEVM VS-B2 (H.264 BP Encode + G.711 Encode)	Available	1.00	Now
DVEVM VS-B3 (MPEG-4 SP Encode + G.711 Encode)	Available	1.00	Now
DVEVM NAV1 (MPEG-2 Decode + MP3 Decode)	Available	1.00	Now
DVEVM NAV2 (MPEG-4 SP Decode + G.711 Decode)	Available	1.00	Now
<b>Video Phone/Video Conferencing Codec Server Packages</b>			
H.264 BP Encode/Decode + G.729AB Codec + G.726 Codec	In Development		2Q07
H.264 BP Encode/Decode + AAC LC Encode/Decode	In Development		2Q07
H.264 BP Encode/Decode + HE-AAC Encode/Decode	In Development		2Q07
MPEG-4 SP (and H.263) Encode/Decode + G.711 Codec + G.726 Codec + G.729AB Codec	In Development		2Q07
<b>Security/Surveillance Codec Server Packages</b>			
JPEG Encode/Decode (simultaneous, full motion) + G.711 Codec	Available		Now
MPEG-4 SP Encode D1 & MPEG-4 SP Encode CIF simultaneous + G.711 Codec	Available		Now
DVEVM VS-B2 (H.264 BP Encode + G.711 Encode)	Available	1.10	Now
DVEVM VS-B3 (MPEG-4 SP Encode + G.711 Encode)	Available	1.10	Now
<b>Networked AV/Set-Top Box Codec Server Packages</b>			
WMV9 MP Decode + WMA9 Decode	In Development		2Q07
MPEG-2 MP Decode + HE-AAC Decode	Available		Now
H.264 MP Decode + AAC LC Decode	Available		Now
H.264 MP Decode + HE-AAC Decode	Available		Now
MPEG-2 MP Decode + AC3 Decode	In Development		1Q07

### TI Digital Media Software, an eXpressDSP Technology

Availability Schedule	TMS320DM640/DM641/DM642/DM643		
	Status	Current Revision	Customer Availability
<b>Legacy – Sold “As Is” – No Updates, Bug Fixes or Maintenance</b>			
TMS320DM642 H.263 Encode/Decode	As is – No revisions	0.80	Now
DM642 H.263 Decode	As is – No revisions	0.80	Now
DM642 H.263 Encode	As is – No revisions	0.80	Now
DM642 JPEG Encode/Decode	As is – No revisions	0.50	Now
DM642 JPEG Decode	As is – No revisions	0.50	Now
DM642 JPEG Encode	As is – No revisions	0.50	Now
DM642 MPEG-2 Encode/Decode	As is – No revisions	0.50	Now
DM642 MPEG-2 Decode	As is – No revisions	0.50	Now
DM642 MPEG-2 Encode	As is – No revisions	0.50	Now
<b>TMS320C55x™ DSP</b>			
MP3 Encode/Decode	As is – No revisions		C55x Eval Now
MP3 Decode	As is – No revisions		C55x Eval Now
MP3 Encode	As is – No revisions		C55x Eval Now
WMA Encode/Decode	As is – No revisions		C55x Eval Now
WMA9 Decode	As is – No revisions		C55x Eval Now
WMA8 Encode	As is – No revisions		C55x Eval Now
MPEG-4 AAC/LC Encode/Decode	As is – No revisions		C55x Eval Now
MPEG-4 AAC/LC Decode	As is – No revisions		C55x Eval Now
MPEG-4 AAC/LC Encode	As is – No revisions		C55x Eval Now

## JTAG Emulator with High-Speed Real-Time Data Link



### XDS560™ JTAG Emulator

JTAG Emulator Supporting RTDX™ Data Link

Get more information about the XDS560 Emulator at: [www.ti.com/emulator](http://www.ti.com/emulator)

#### Features and Benefits

- **Increase productivity through faster start up for larger applications** – Code download speeds of up to more than half a Mbps
- **Quickly find and fix intermittent real-time problems** – Real-time, non-intrusive breakpoint and action point capabilities via Advanced Event Triggering
- **Preserve existing emulation investment** – Upward compatible with XDS510™ Emulators
- **Speed time-to-market with real-time visibility** – High-speed RTDX with real-time data transfer rates of more than 2 Mbps

TI offers a variety of emulator adapters to support the various emulator header standards and to accommodate processor voltage range operation.

Target Board Header	Emulator Connection	Voltage Translation	Part #
14 TI	14 TI	Yes	TMDSADP1414
	20 ARM	No	TMDSADPEMU-20A
20 ARM	20 ARM	No	TMDSADPEMU-20A
60 TI	14 TI	No	TMDSADP1460
20 TI (CTI)	14 TI	No	TMDSADPEMU-20T
		Yes	TMDSADP1420
	20 ARM	No	TMDSADPEMU-20T

#### JTAG Emulator with High-Speed Real-Time Data Exchange (RTDX): XDS560 Emulator

The XDS560 JTAG Emulator provides an unparalleled level of real-time visibility into executing applications to assist developers in debugging and monitoring real-time systems. The XDS560 Emulator can achieve code download speeds of up to more than half a megabyte per second (500 Kbps), as much as eight times faster than XDS510-class technology, for better loading times of larger applications, speeding development. High-speed RTDX bandwidth enables visibility into a new range of high-bandwidth applications, as well as multi-channel or multiprocessing versions of lower-bandwidth applications. The XDS560 Emulator also enables Advanced Event Triggering to define and evaluate complex sequences of events before halting the CPU, or taking another action, including:

- Setting hardware breakpoints and watchpoints
  - For example, halt the CPU upon access to specific program or data address or address ranges
- Counting many kinds of events such as CPU processor stalls and cache events
- Detecting very precise debugging sequences such as a 16-bit write to a data address with a specific value

The XDS560 Emulator is fully upward compatible with TI's existing XDS510 Emulator. XDS510-class Emulator customers can move from the XDS510 Emulator to using the XDS560 Emulator with very little apparent change, using the same target boards with the existing 14-pin JTAG connectors. The XDS560 Emulator features are a superset of the XDS510 Emulator, but include all of the same XDS510-class functions that TI developers expect, with significantly improved performance.

The XDS560 Emulator is available in Ethernet, PCI and USB interfaces offering high performance and ample bandwidth to support high-speed RTDX data rates. It includes a longer and highly flexible

5-1/2 foot (1.5+ m) host-target cable suitable for use from 5 V down to 0.5 V to



*XDS560 Emulator with highly flexible cable and credit card-sized pod is available in the eStore.*

support TI's low-voltage device roadmap. The XDS560 Emulator is based on TI's TMS320C6202 DSP, for additional processing power to help drive the improved performance. It is well suited for space-constrained environments, as the cable can reach into tight places between rack-mounted target boards, and the cable/pod assembly is so light it can even hang from the 14-pin JTAG connector without straining it.

For more information on the XDS560 Emulator, visit [www.ti.com/emulator](http://www.ti.com/emulator)

XDS560-class JTAG Emulator products are also available from many TI third parties featuring different communication interfaces such as Ethernet and USB, as well as other features. See the TI Third Party on-line catalog and search for "XDS560."



## Code Composer Studio™ IDE Features Supported by Processor Platform

### Code Composer Studio™ Version 3.3 Development Tools – Features Supported by Platform

Feature	Code Composer Studio IDE Platinum															
	C6000™ DSP			DaVinci™ Processor			C5000™ DSP			OMAP™ Processors			C2000™ Controllers			
	C62x™	C64x™	C64x+™	C67x™	DM644x	DM64x™	C54x™	C55x™	C54x	C55x	ARM7	ARM9	C24x™	C28x™		
<b>Application Design</b>																
DSP/BIOS™ Kernel	X	X	X	X	X	X	X	X	X	X				X		
TMS320™ DSP Algorithm Std.	X	X	X	X	X	X	X	X	X	X			X	X		
Reference Frameworks <sup>1</sup>	X	X	X	X	X	X	X	X	X	X						
Chip Support Library	X	X	X	X	X	X	X	X	X	X						
Data Converter Selector Plug-In <sup>1</sup>	X	X	X	X	X	X	X	X	X	X			X	X		
Driver Development Kit <sup>1</sup>	X	X	X	X	X	X	X	X	X	X			X	X		
Update Advisor	X	X	X	X	X	X	X	X	X	X		X	X	X		
<b>Code &amp; Build</b>																
CCStudio Point and Click IDE	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
C/C++ and Assembly Language Tools	X	X	X	X	X	X	X	X	X	X	X	X	X <sup>2</sup>	X	X	
CodeWright Integrated Editor	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
On-Line Help	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
Project Manager	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
<b>Debug</b>																
RTDXTM	X	X <sup>3</sup>	X	X	X <sup>3</sup>	X	X	X	X	X					X	
Fast Simulation	X	X	X	X	X	X	X	X	X	X						
Simulators	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
Watch Windows	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
GEL Scripting (internal)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
Per/VBA Scripting <sup>1</sup> (external)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
Parallel Debug Manager	X	X	X	X	X	X	X	X	X	X	X	X	X <sup>4</sup>	X <sup>4</sup>	X	
Connect/Disconnect	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
Flashburn Utility <sup>1</sup>	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
Unified Breakpoint Manager	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
Advance Event Triggering	X	X	X	X	X	X	X	X	X	X						
Code Coverage/Multi-Event Profiler	X	X	X	X	X	X	X	X	X	X						
Interrupt Latency Checker	X	X	X	X	X	X	X	X	X	X						
Simulation Watch Points	X	X	X	X	X	X	X	X	X	X						
<b>Analyze &amp; Tune</b>																
Pipeline Analysis																X
Rewind	X	X	X	X	X	X	X	X	X	X						
Tuning Dashboard and Profiler	X	X	X	X	X	X	X	X <sup>5</sup>	X	X <sup>5</sup>	X	X	X	X	X	
Compiler Consultant	X	X	X	X	X	X	X	X	X	X						
Cache Tune	X	X	X	X	X	X	X	X	X	X						

<sup>1</sup> Available through Update Advisor for users with a active CCStudio IDE subscription

<sup>2</sup> C and ASM support only

<sup>3</sup> HSRTDX available

<sup>4</sup> Supports only homogeneous multi-processing

<sup>5</sup> Includes power management advice

## DSP Development Tools Feature Matrix



T1 Part Number	Tool Description	Annual Subscription	Code Composer Studio IDE	DSPBIOS™ Real-Time Operating System/Kernel Services	TMS320™ DSP Algorithm Standard Developer's Kit	Code Generation Tools C/C++ Compiler/Assembler/Linker	XDS100™ Device Drivers (Emulation software)	XDS560™ Device Drivers (Emulation software)	Simulator	Target Board (Hardware)	Target-Specific Device Drivers	Emulator	Price \$ U.S.¹
TMDSOCSALL-1	Code Composer Studio™ Development Tools Platinum Edition	X	X	X	X	X	X	X	X	X	X	X	3,595
TMDSOSK6713	66713 DSP Starter Kit (DSK)	X²	X²	X	X	X	X	X	X²	X	X	X	395
TMDSOSK6416-T	66416 DSP Starter Kit (DSK)	X²	X²	X	X	X	X	X	X²	X	X	X	495
TMDSOSK6455	66455 DSP Starter Kit (DSK)	X²	X²	X	X	X	X	X	X²	X	X	X	495
TMDSXEM6455	66455 Evaluation Module with SRIO	X²	X²	X	X	X	X	X	X²	X	X	X	1,795
TMDSXEM6424	TMX3206424 Evaluation Module	X²	X²	X	X	X	X	X	X²	X	X	X	495
TMDSXEM642	TMS320DM642 Evaluation Module	X	X	X	X	X	X	X	X	X	X	X	1,995
TMDSOADM642	TMS320DM642 Digital Media Development Kit	X	X	X	X	X	X	X	X	X	X	X	6,495
TMDSXNK6415-T	664x™ DSP Network Video Developer's Kit	X	X	X	X	X	X	X	X	X	X	X	4,495
TMDSXISK642	Video Security over Internet Protocol (VSIP) Development Platform	X	X	X	X	X	X	X	X	X	X	X	15,000
TMDSXISK642-3	Video Security over IP (VSIP) with ATME Emulator (NTSC)	X	X	X	X	X	X	X	X	X	X	X	16,000
TMDSXPK6727	Pro Audio Development Kit (PADK)	X	X	X	X	X	X	X	X	X	X	X	1,995
TMDSXPD6727	Pro Audio Development Kit (PADK) Bundle	X	X	X	X	X	X	X	X	X	X	X	5,995
TMDSXEM6446	DM6446 Digital Video Evaluation Module	X²	X²	X	X	X	X	X	X²	X	X	X	2,495
TMDSXDP6437	TMS320DM6437 Digital Video Development Platform	X²	X²	X	X	X	X	X	X²	X	X	X	495
TMDSXSDK6446-L	DM6446 Digital Video Software Development Kit	X	X	X	X	X	X	X	X	X	X	X	6,995
TMDSXSDK6446-3L	DM6446 Digital Video Software Development Kit Bundle	X	X	X	X	X	X	X	X	X	X	X	10,995
SPFC119	Essential Guide to Getting Started with DSP CD-ROM²	L	L	X	X	L	X	X	L	X	X	X	Free
TMDSOSK5416	654x™ DSP Starter Kit (DSK)	X²	X²	X	X	X²	X	X	X	X	X	X	395
TMDSOSK5510	655x™ DSP Starter Kit (DSK)	X²	X²	X	X	X²	X	X	X	X	X	X	395
TMDSOSK5509	65509 DSP Starter Kit (DSK)	X²	X²	X	X	X²	X	X	X	X	X	X	495
TMDSOSK5912	OMAP5912 Starter Kit (OSK)	X	X	X	X	X⁴	X	X	X	X	X	X	295
TMDSKSP5912-L	OMAP™ Starter Kit with Logic PD Kickstart Program	X	X	X	X	X	X	X	X	X	X	X	7,200
TMDSKSP5912-M	OMAP Starter Kit with Mirral Kickstart Program	X	X	X	X	X	X	X	X	X	X	X	7,200
TMDS3P71016A	LF2407A Evaluation Module (EVM)⁵	X	X	X	X	X	X	X	X	X	X	X	1,995
TMDSXEZ28044	F28044 eZdsp™ Starter Kit⁵	X²	X²	X	X	X	X	X	X	X	X	X	495
TMDSXED2407	LF2407A eZdsp Starter Kit⁵	X²	X²	X	X	X	X	X	X	X	X	X	345
TMDSXED2401	LF2401A eZdsp Starter Kit⁵	X²	X²	X	X	X	X	X	X	X	X	X	595
TMDSXED2812	F2812 eZdsp Starter Kit⁵	X²	X²	X	X	X	X	X	X	X	X	X	395
TMDSXES2812	F2812 eZdsp Starter Kit (Socketed)	X²	X²	X	X	X	X	X	X	X	X	X	495
TMDSXES2808	F2808 eZdsp Starter Kit (Socketed)	X	X	X	X	X	X	X	X	X	X	X	495
TMDSXEZR2812	R2812 eZdsp Starter Kit	X²	X²	X	X	X	X	X	X	X	X	X	495
TMDSXEV2812	F2812 Development Bundle (Parallel Port)	X	X	X	X	X	X	X	X	X	X	X	1,995
TMDSXEV2812	F2812 Development Bundle (USB)	X	X	X	X	X	X	X	X	X	X	X	2,295
TMDSXEMU560	XDS560™ PCI Bus High-Performance JTAG Emulator	X	X	X	X	X	X	X	X	X	X	X	3,995
TMDSXEMU560U	XDS560 Blackhawk USB High-Performance Emulator	X	X	X	X	X	X	X	X	X	X	X	2,995
TMDSXEMUPP	XDS510PP-Plus (Parallel Port) Emulator	X	X	X	X	X	X	X	X	X	X	X	1,500
TMDSXEMUUSB	XDS510™ USB-Based Emulator for Windows	X	X	X	X	X	X	X	X	X	X	X	1,995

1 Prices are quoted in U.S. dollars and represent year 2007 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 DSK must be connected for Code Composer Studio to run.

3 Includes 120-day free evaluation tools.

4 ARM® code generation tools only.

5 Codeveloped with Spectrum Digital.

X = included

L = Full featured - Limited to 120 days



## TI DSP Third Party Network

### A Wide Variety of DSP Solutions

Utilize the TI Third Party Network for:

- **Complete solutions** – Third parties 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 third parties.
- **Lower costs** – Don't spend time and money recreating something that has already been produced. Third parties allow you to dedicate your resources to producing value-added, application-specific products.
- **Additional expertise** – Third parties consulting services, training, integration, contract engineering, research and development and much more. They are an extra resource for project assistance.

### eXpressDSP™-Compliant Third-Party Products

Texas Instruments, in conjunction with its industry-leading DSP Third Party 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.

### DSP Third Party Network Overview

More than 700 independent third parties 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

#### Video/Imaging and Audio

- Compression software
- Research and development support
- Hardware and reference designs
- Enhancement libraries

#### Comprehensive Development Support

- DSP boards, starter kits and add-ons
- Customized debuggers
- Targeted development platforms
- Real-time emulation
- Consulting services
- Simulation models

### Third Party Product Catalog on TI's Website

For information regarding the vast array of products available from TI's Third Party Network, check out: [www.ti.com/3p](http://www.ti.com/3p).

Extensive information can be found through searchable listings of third parties located worldwide. Search hundreds of listings by company, device supported, keyword, product name or product category.

### Third Party Network Logo Indicates TMS320™ DSP-Based Solution

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



### eXpressDSP-Compliant Logo Indicates TMS320 DSP Algorithm Standard Compliance

Third Party Network members use the eXpressDSP compliance logo in various communications. The logo identifies companies ready to provide products that have passed the standards for application interoperability and reuse.



### Getting Started with DSP

- On-site customized training
- Contract engineering design resources
- Subsystem development
- Software experts in applications: embedded control, set-top box, optical networking, digital radio, telematics, biometrics

### Communications

- Modem software
- Encryption software
- Voice and fax software
- Wireless software
- Real-time operating systems (RTOS)
- Hardware and reference designs
- Consultants

### DSP Solutions to Reduce Development Time



## TI DSP Third Party Network Consultants



## Texas Instruments DSP Third Party Network Consultant Service Providers

More than 300 member consultants provide TMS320™ DSP-related services to help accelerate development efforts and reduce time-to-market. These consultants simplify the navigation of “best fit” solutions for customers and Texas Instruments. Our members are located worldwide in order to provide customers with the best service.

For more TI DSP Third Party Network consultant providers, please visit [www.ti.com/3pconsultants](http://www.ti.com/3pconsultants)

**TI DSP Third Party Network Consultants Accelerate Your Design Time.**



*Third Party Consultants located worldwide*

## North, Central and South America Consultants

Region	Company	Country/Location	Phone	Website	Description
Central US	INDesign	Indianapolis, IN	(317) 377 5465	<a href="http://www.indesign-llc.com">www.indesign-llc.com</a>	Extensive background in DSP and embedded microcontrollers design and development for telecommunication, networking, gaming, entertainment, computer, medical applications.
Central US	Logic Product Development	Minneapolis, MN	(612) 672 9495	<a href="http://www.logicpd.com">www.logicpd.com</a>	Provides consulting services for OMAP™ processor and TMS320C6000™ DSP technology, along with combining user research, design, technology and manufacturing to create innovative new products and product categories.
Central US	Tier Electronics	Oconomowoc, WI	(262) 790 9500	<a href="http://www.tierelectronics.com">www.tierelectronics.com</a>	Specializes in the design of custom and semi-custom power electronics products for motor control, appliance, power tool, power line quality incorporating DSP controllers, embedded intelligence, wireless and other technologies.
East US	D3 Engineering	Rochester, NY	(585) 429 1550	<a href="http://www.d3engineering.com">www.d3engineering.com</a>	A DSP engineering service company that provides hardware, software and algorithm design services, with DSP expertise in wireless, imaging and motion control applications.
West US	A2e Technologies	San Diego, CA	(858) 560 6600	<a href="http://www.A2eTechnologies.com">www.A2eTechnologies.com</a>	A2e Technologies is an Electronic Design Services (EDS) firm providing custom application software, embedded design and product development services to industry and government.
West US	CEO Consultancy, Inc.	Irvine, CA	(888) 387 1470	<a href="http://www.ceoconsultancy.com">www.ceoconsultancy.com</a>	Services include DSP and TMS320™ DSP Algorithm Standard algorithm development, video processing, image processing, audio algorithms, device controllers and communication interfaces.
West US	Clarity Design, Inc.	Poway, CA	(858) 668 2981	<a href="http://www.claritydsn.com">www.claritydsn.com</a>	A full-service engineering company that can assist with DSP selection, electrical engineering, software development or application code, along with single- or multi-processor based systems and TI DSP audio and video design.
West US	Nuvation Engineering	San Jose, CA	(408) 228 5580 x122	<a href="http://www.nuvation.com">www.nuvation.com</a>	Consulting and DSP services that include: system architecture, FPGA/DSP co-processing designs, MATLAB® algorithm development, DSP code development, DSP hardware, development, integration and turnkey product realization.
Central America	CIDESI	Mexico	+52 (44) 2211 9800	<a href="http://www.cidesi.com">www.cidesi.com</a>	The Industrial Development and Engineering Center offers engineering services to the industrial and educative sectors, including specific applications requiring analog, digital and communications devices.
Central America	DSP Design Masters	Mexico	+52 (33) 3624 9320	<a href="http://www.dspdesignmasters.com">www.dspdesignmasters.com</a>	DSP Design Masters offers design services for algorithms and hardware based on TI TMS320C2000™ and TMS320C6000™ DSP platforms. They also offer DSP training courses to companies, universities and government offices.
South America	FITec	Brazil	+55 (19) 3756 6806	<a href="http://www.fitec.org.br">www.fitec.org.br</a>	FITec provides hardware and software R&D services to telecom and internet-networking equipment vendors in the areas of VoIP, IPTV, WiMax and PSTN. FITec has expertise in embedded real-time and multitasking solutions for DSPs.
South America	Syspac	Brazil	+55 (11) 3868 4004	<a href="http://www.syspac.com.br">www.syspac.com.br</a>	Syspac is a design house with expertise in embedded real-time and multitasking hardware and software solutions for DSPs. They design software modules to enable the utilization of TMS320C54x™ and C55x™ generations of DSPs for embedded applications.



## TI DSP Third Party Network Consultants

### European Consultants

Region	Company	Country/Location	Phone	Website	Description
North Europe	Generics Group	UK	+44 (0)1223 875200	www.generics.co.uk	A leading integrated technology consulting and development organization with an international reputation for successfully commercializing emerging science and technology.
North Europe	ML Electronics	UK	+ 44(0)870 835 8416	www.ml-electronics.co.uk	A British based electronic development & consulting company in: DSP, embedded, instrumentation, power supply, motor drives, communications and interfaces, instrumentation, software and other leading-edge technologies.
North Europe	Plextek	UK	+44 (0)1799 533200	www.plextek.co.uk	Europe's largest independent design consultancy specializing in DSP design for telecommunications, defense and the medical field.
North Europe	Roke Manor Research Limited	UK	+44 (0)1794 833000	www.roke.co.uk	Based in the UK, Roke Manor Research (RMR) is a contract R&D business offering a wide range of technologies across the communications and electronic sensors fields. Our client base includes our owner, Siemens, many other commercial companies, defense and Government agencies.
Central Europe	D.SignT	Germany	+49 (28) 3357 0977	www.dsignt.de	Experts in DSP technology that provide off-the-shelf solutions for embedded DSP systems in the industrial control and automotive field.
Central Europe	Drivetek	Switzerland	+41 (32) 332 7937	www.drivetek.ch	A technical consulting company specializing in the analysis, design and development of customized AC/DC motor drives, motion control, and power electronics application systems.
Central Europe	Ingenieurburo Bayer DSP Solutions	Germany	+49 (211) 2108120	www.dsp-bayer.de	Provides consulting, tools, hardware, software, algorithms and integration services around DSP applications. A major focus is on telecommunication applications, security devices, VoIP, MP3 radio, etc.
Central Europe	Supercomputing Systems AG	Switzerland	+41 (43) 456 1600	www.scs.ch	Supercomputing Systems defines the level of innovation required to a new product line. They aim to achieve the ideal mix of market requirement, state-of-the-art technology, a head-start over rivals and return on investment based on DSP and FPGA designs.
Central Europe	X-SPEX	Germany	+49 (30) 7076 1363	www.x-spex.de	A team of long-time experienced DSP engineers providing consulting, hardware, software, system integration services in Germany, Austria and Asia.
South Europe	CRESITT Industrie	France	+ 33 (23) 849 4559	www.cresitt.com	Consulting company supporting DSP development, regional DSP technology deployment and DSP marketing and communication seminars.
South Europe	D & P Electronics	Italy	+ 39 (06) 932 2025	www.depelsys.it	Offers hardware, software and system development support for ground and airborne radars, video transmission and presentation for airport surveillance, real-time control systems for industrial, military and telecom applications.
South Europe	Multimedia Technologies Institute – MTI S.r.l.	Italy	+ 39 (95) 722 4945	www.mtionline.it	A hi-tech laboratory operating in the field of interactive multimedia technology and especially the study, design and implementation of advanced DSP algorithms and systems.
Israel	DSP-IP	Israel	+ 97 (25) 4531 3092	www.dsp-ip.com	A consulting, development and solution company for multimedia and biomedical applications.
Israel	GS-Technologies	Israel	+ 97 (25) 4655 1204	www.gs-tech.co.il	Specializes in professional embedded solutions for a wide range of applications and offers consulting services of the best tools for the design and development of complex embedded systems.
Israel	Sightsys	Israel	+ 97 (23) 922 2771	www.sightsys.com	Provides a complete solution of development tools, testing solutions and engineering services for infrastructure embedded hardware and software.



### DSP Support

Design Answers at Your Fingertips

Get additional information on training, technical documentation and more at: [www.ti.com/dspsupport](http://www.ti.com/dspsupport)

### TI DSP Support

Get to market easily and quickly by leveraging TI DSP support. Customers large and small can access fast and accurate support for their DSP applications. From your personal, on-line "24/7" DSP KnowledgeBase to technical documentation, TI offers the technical support you need when YOU need it. On-line training, webcasts, workshops and the TI Developer Conference provide an array of convenient support choices.

### TI DSP Training Options



#### TI Developer Conference Worldwide

*Minds in Motion*

The TI Developer Conference is the industry's premier real-time signal processing event, showcasing the latest innovations in high-performance analog, DSP and microcontrollers to help customers maximize their system design and accelerate time-to-market. Attendees will have access to high-level technical content that will help them with projects they are working on today. Attendees can expect a multitude of networking and interaction opportunities with industry leaders and peers.

Track sessions include:

- Audio
- Communications
- Education
- Industrial
- QoE (Quality of Experience)
- Systems
- Tools
- Video



Register on-line at [www.ti.com/tidc07dspseigd](http://www.ti.com/tidc07dspseigd)

#### Free On-Line Training

Learn more about how to design your digital signal processing application with self-paced on-line training covering DSP applications, TMS320™ DSPs and easy-to-use software development tools.



Dozens of courses such as "1-GHz DSP Overview" to "Reference Frameworks for eXpressDSP™ Software" are available today and run from 30 minutes to two hours each.

[www.ti.com/onlinetraining](http://www.ti.com/onlinetraining)

#### DSP Webcasts

TI conducts free DSP webcasts to address topics most critical to designers. A typical webcast includes a presentation followed by a question & answer



session with the technical engineering presenter specializing in the topic. After the live event, DSP webcasts are available via the archive library.

[www.ti.com/webcastarchive](http://www.ti.com/webcastarchive)

#### TI DSP On-Line KnowledgeBase

Available 24 hours a day, seven days a week, the TI DSP KnowledgeBase is the industry's most complete on-line resource for DSP questions and project development support. Featuring an easy-to-use, natural-language-based search capability, the DSP KnowledgeBase pulls information from hundreds of thousands of TI DSP content web pages, including technical documentation, giving customers immediate, relevant and focused answers to their search.

[www.ti.com/kbase](http://www.ti.com/kbase)



## Support

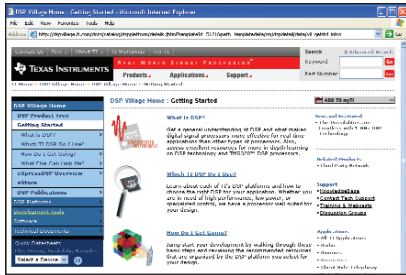
### Technical Documentation

Find complete and easy-to-use data sheets, user's guides and application reports for every TI DSP platform and corresponding DSP software development tools. Easy navigation and search capabilities for more than 3,000 dedicated on-line DSP web pages and more than 100,000 pages of DSP technical documentation.

[www.ti.com/techdocs](http://www.ti.com/techdocs)

### Getting Started with TI DSP

TI's web-based "Getting Started" DSP support tool helps engineers get their designs from inspiration to implementation quickly and easily. Designers choosing to use TI DSPs in their real-time applications get easy-to-access introduc-



tory DSP content, thus decreasing the learning curve and speeding products to market. See page 1 for additional information.

[www.ti.com/gettingstarted](http://www.ti.com/gettingstarted)

### The Essential Guide to Getting Started with DSP CD-ROM

This free CD contains links to a variety of getting started resources including documentation and the latest new product information. It also provides you with a guided tour of eXpressDSP™



Software and Development Tools and a 120-day free evaluation of the Code Composer Studio™ Platinum Edition for the TMS320C2000™, TMS320C5000™, TMS320C6000™ DSP, DaVinci™ and OMAP™ processor platforms. Download today at [www.ti.com/ccsfets](http://www.ti.com/ccsfets)

### TI DSP Discussion Groups

Join the community of DSP users and share information about signal processing application design. Peer-to-peer discussion groups include *High Performance Digital Signal Processing*, *Power-Efficient Digital Signal Processing*, *Control-Optimized Digital Signal Processing* and for users new to DSP, *Getting Started with Digital Signal Processing* discussion groups.

[www.ti.com/discussgroup](http://www.ti.com/discussgroup)

### Publications

#### eTech Innovations eNewsletter

Receive the latest digital signal processing news from TI including: DSP silicon, software, systems applications and sup-



port information. Subscribe today for this free monthly eNewsletter to be delivered right to your inbox in html or text format.

[www.ti.com/etech](http://www.ti.com/etech)

### TI Product Information Center (PIC)

Worldwide technical support staff are available to answer questions and troubleshoot problems. Contact the PIC by e-mail or directly by phone. See the worldwide contact information inside the front cover for the e-mail and phone number appropriate to your area.

[www.ti.com/dspsupport](http://www.ti.com/dspsupport)



## Training Resources

On-Line Training • Webcast Library • One-Day Workshops • Multi-Day Workshops

Get updated information on TI training resources at: [www.ti.com/training](http://www.ti.com/training)

### On-Line Training

A variety of free on-line training courses are available to you at your fingertips 24/7. Learn more about how to design your signal processing application with

self-paced on-line training courses covering DSP and analog applications, easy-to-use software development tools and more.

Visit [www.ti.com/onlinetraining](http://www.ti.com/onlinetraining) for more FREE courses!

### TI DSP Webcast Library

The library contains a variety of webcasts ranging from technical "How-Tos" to systems solution presentations and product overviews, which address current topics

most critical to designers. Designed for 24/7 access worldwide via the Web, these webcasts typically last one hour. Each includes a presentation followed by

a live Question & Answer session with the technical engineering presenter specializing in the topic. To access the library, visit [www.ti.com/webcasts](http://www.ti.com/webcasts)

### Workshops

TI workshops are a fast and efficient way to learn how to use and implement designs on TI DSPs. The workshops are designed to develop a strong working knowledge of TI DSPs through lectures and practical hands-on exercises. All workshops are facilitated by qualified TI representatives and are based on DSP Starter Kits (DSKs), Evaluation Modules (EVMs) or simulators. We have a range of One-Day, Application, and Multi-Day Workshops.

#### One-Day Workshops

One-day workshops are introductory courses designed to offer product or technology knowledge. These workshops include a significant hands-on section and are ideal introductions to get started with TI DSPs. Visit [www.ti.com/training](http://www.ti.com/training) for a complete list of courses.

#### TMS320C6416/C6713 DSK One-Day Workshop

- Introduction to TMS320C6000™ DSPs and Code Composer Studio™ IDE
- C6000™ DSP peripherals

- Using the C6000 DSP system tools and software
- Optimizing C6000 DSP code

#### TMS320F2808 eZdsp™ One-Day Workshop

- Basic DSP controller implementation
- TMS320F2808 DSP architecture
- How to use PC-based development tools – F2808 eZdsp and Code Composer Studio IDE
- System design



## Support

### Multi-Day Workshops

Three- or four-day, hands-on, advanced, educational courses are highly technical and designed for engineers who want to sharpen their design and development skills. Managed by TI's technical training staff, these workshops include extensive hands-on labs emphasizing the demonstration and application of techniques and skills. Visit [www.ti.com/training](http://www.ti.com/training) for a complete list of courses.

#### TMS320DM644x DaVinci™ Technology Workshop

Topics covered in this workshop include:

- Introduction to DaVinci technology: device, software and tools
- Application layer programming
- Signal-processing layer programming
- Advanced system programming details

#### TMS320DM64x™ Video System Integration Workshop

Topics covered in this workshop include:

- DM642 hardware
- Code Composer Studio™ IDE introduction
- DSP/BIOS™ kernel introduction
- Reference frameworks
- Video basics
- Video peripherals
- Using and modifying the FVID driver
- Optimizations
- Audio
- Communications

#### TMS320C6000™ DSP Optimization Workshop

- C6000 DSP platform CPU architecture
- C6000 DSP platform CPU pipeline
- Building Code Composer Studio projects
- Exploring C6000 DSP compiler build options

- Writing efficient C code
- Writing optimized standard and linear assembly code
- Mixing C and Assembly language
- Software pipelining techniques
- Numerical issues with fixed-point processors
- Basic C6000 DSP system memory management
- How caches work and optimizing their usage

#### TMS320C645x DSP System Integration Workshop

Topics covered in this workshop include:

- Architectural overview
- Code Composer Studio™ IDE basics
- Intro to DSP/BIOS™ kernel
- Basic memory setup, PLL, CSL 3.0
- Interrupts
- EDMA 3.0
- Using the EMAC/NDK
- Serial RapidIO® and MSGQ
- Optimizing your code/system
- System design considerations
- Other peripherals

#### TMS320C64x™/C67x™ DSP System Integration Workshop

Topics covered in this workshop include:

- Intro to Code Composer Studio Platinum Edition 3.1 IDE
- Basic memory management and using the EDMA
- Hardware interrupts
- DSP/BIOS kernel scheduling
- Integration of eXpressDSP™-compliant algorithms
- Creating a standalone system (Flash, Boot)

#### DSP/BIOS™ OS Design Workshop

Topics covered in this workshop include:

- Real-time system concepts
- Hardware interrupts (HWI)
- Software interrupts (SWI)
- Tasks and semaphores (TSK, SEM)
- Streams (SIO)
- Multi-threaded systems (CLK, PRD)
- BIOS instrumentation (LOG, STS, SYS, TRC)
- Static systems (GCONF, TCONF)
- Dynamic systems (MEM, BUF)
- Inter-thread communication (MSGQ, ...)
- Input output mini-drivers (IOM)
- TMS320™ DSP Algorithm Standard (XDAIS™)
- Reference Frameworks (RF1, 3, 5, 6)

#### TMS320C28x™ DSP Workshop

Topics covered in this workshop include:

- Evaluate C28x™ DSP ability to meet your system requirements
- Compare/contrast C28x DSP to other solutions you have used or evaluated
- Use development tools to compile, optimize, assemble, link, debug and benchmark code
- Demonstrate a working knowledge of the C28x DSP functional modules
- Demonstrate a working knowledge of the basic operations for the C28x DSP
- Understand where to go to get more information
- Have a full working knowledge of your take-home eZdsp™ board

#### Registration

To register for these workshops, please visit

[www.ti.com/multidayworkshops](http://www.ti.com/multidayworkshops)



Texas Instruments DSP device nomenclature includes a Prefix (signifying the device qualification status), the Device Family number (i.e., 320 or 32 for TI DSPs), a Technology symbol, the Device number (typically three to five alpha-numeric characters), a two or three character Package Type code, an optional

Temperature Range character, and the Device Speed Designation. Other variations do exist on a limited basis. See the specific device data sheet for additional information on device nomenclature for that device.

For the most updated information, visit [www.ti.com/dsp](http://www.ti.com/dsp)

## Typical DSP Device Nomenclature

Prefix	Device Family	Technology	Device	Package Type	Temperature Range	Device Speed Designation			
TMX = Experimental device TMP = Prototype device TMS = Qualified device SMJ = MIL-PRF-38535, QML SM = High Rel (non-38535) OMAP = OMAP XOMAP = Experimental device (OMAP) POMAP = Experimental device (OMAP)	32 or 320 = TMS320™ DSP family	C = CMOS DM = Digital media E = CMOS EPROM F = CMOS Flash EEPROM LC = Low-voltage CMOS (3.3 V) LF = Flash EEPROM (3.3 V) R = CMOS ROM UC = Low-voltage CMOS [3 V (1.8-V core)] VC = Low-voltage CMOS [3 V (2.5-V core)]	<b>C6000 DSPs</b> 6201 6454B 6431 6202B 6455B 6433 6203B 6701 6435 6204 6711D 6437 6205 6712D 6441 6211B 6713B 6443 6410 6720 6446 6412 6722 6413 6726 6414T 6727 6415T 640 6416T 641 6418 642 6421 643 6424	<b>C5000 DSPs</b> 5401 5420 5402 5421 5402A 5501 5404 5502 5405 5503 5407 5506 5409 5507 5409A 5509A 5410 5510A 5410A 5910 5416 5912 54CST	<b>C2000 DSPs</b> 240 2801 241 2802 242 2806 243 2808 2401A 2809 2402A 2810 2403A 2811 2404A 2812 2406A 28015 2407A 28016	Blank = 0°C to 90°C, commercial temperature, default for C6000 DSPs Blank = -40°C to 100°C, default for C54x™ DSPs A = -40°C to 105°C, extended temperature (C6000 DSPs) A = -40°C to 85°C, extended temperature (C2000 DSPs) H = 0°C to 50°C L = 0°C to 70°C M = -55°C to 125°C Q = -40°C to 125°C, Q100 qualified (C2000 DSPs) S = -55°C to 125°C (C5000 DSPs) S = -40°C to 125°C (C2000 DSPs)	<b>C6000™ DSPs</b> 150 (150 MHz) 500 (500 MHz) 167 (167 MHz) 600 (600 MHz) 200 (200 MHz) 720 (720 MHz) 233 (233 MHz) 6 (600 MHz) 250 (250 MHz) 7 (720 MHz) 300 (300 MHz) 8 (850 MHz) 400 (400 MHz) 1 (1 GHz)	<b>C5000™ DSPs</b> 50 (50 MHz) 16 (160 MHz) 80 (80 MHz) 200 (200 MHz) 100 (100 MHz) 300 (300 MHz) 12 (120 MHz)	<b>C2000™ DSPs</b> 60 (60 MIPS)

For the *actual* device-specific part numbers, see the Product Specification Guides in this document.



**Technical Documentation**



**eNewsletters**



**Product Information**

Download the latest DSP and Analog resources at [www.ti.com/dsp](http://www.ti.com/dsp) and [www.ti.com/analog4davinci](http://www.ti.com/analog4davinci)

**Texas Instruments Incorporated**

14950 FAA Blvd.

Ft. Worth, TX 76155-9950

Address service requested

PRSR STD  
U.S. POSTAGE  
**PAID**  
DALLAS, TEXAS  
PERMIT NO. 2758