Digital Signal Processing Selection Guide

TEXAS INSTRUMENTS

Digital Signal Processors
Digital Media Processors
Digital Signal Controllers
Applications Processors
Microcontrollers
Software and Development Tools
Support

DSP
TMS320C6000

DSP
TMS320C2000

DaVinci
TMS320DM64x

DSP
TMS320C5000

OMAP
OMAP35x

MSP430
MSP430F169

2Q 2008

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TI Worldwide Technical Support

Internet

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

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

Product Information Centers

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

Europe, Middle East, and Africa
Phone
    European Free Call   00800-ASK-TEXAS
                            (00800 275 83927)
    International   +49 (0) 8161 80 2121
    Russian Support   +7 (4) 95 98 10 701
    Note: The European Free Call (Toll Free) number is not active in all countries. If you have technical difficulty calling the free call number, please use the international number above.
    Fax   +(49) (0) 8161 80 2045
Internet   support.ti.com/sc/pic/euro.htm

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

Asia
Phone
    International   +91-80-41381665
    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   1-800-425-7888   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   tiasia@ti.com
Internet   support.ti.com/sc/pic/asia.htm   ti-china@ti.com

C010208

Digital Signal Processing Overview

Texas Instruments has a processor for almost every application imaginable. Our large portfolio of processors has a wide range of price, performance and power options, which fits the needs of nearly any digital electronic design. With TI's systems expertise, support for your peripheral design and a full spectrum of software and complementary analog components at your fingertips, your design options are boundless.

TEXAS INSTRUMENTS
DSP

DaVinci™ Digital Media Processors: Optimized for Digital Video

DaVinci technology consists of scalable, programmable signal processing system on chips (SoCs), accelerators and peripherals, optimized to match the price, performance and feature requirements for a broad spectrum of video end equipments.

New OMAP™ Applications Processors: Best General-Purpose, Multimedia and Graphics

TI's scalable OMAP platform offers the industry's best combination of general-purpose, multimedia and graphics processing in any single-chip combination. The four new OMAP35x devices target applications such as portable navigation devices, Internet appliances, portable media players and personal 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.

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.

MCU-Like Control, DSP Performance: TMS320C2000™ Digital Signal Controllers

The C2000™ digital signal controller (DSC) 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 DSCs are ideal for embedded industrial applications such as digital motor control, digital power supplies and intelligent sensor applications.

MSP430 Ultra-Low-Power Microcontroller Platform

The MSP430 family of ultra-low-power 16-bit RISC mixed-signal processors from TI provides the ultimate solution for battery-powered measurement applications. Using leadership in both mixed-signal and digital technologies, TI has created the MSP430 which enables system designers to simultaneously interface to analog signals, sensors and digital components while maintaining unmatched low power.

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 Developer 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** for technical documentation, systems block diagrams and more.

Applications Matrix Guideline

	Digital Media Processors	OMAP Applications Processors	C6000 Digital Signal Processors	C5000 Digital Signal Processors	C2000 Digital Signal Controllers	MSP430 Microcontrollers
Audio	●	●	●	●		
Automotive	●	●			●	
Communications	●		●	●	●	
Industrial	●	●			●	●
Medical	●	●	●	●	●	●
Security	●	●				●
Video	●	●	●			
Wireless		●	●	●		●
Key Feature	Complete tailored video solution	Low power and high performance	High performance	Power-efficient performance	Performance, integration for greener industrial applications	Ultra-low power

Silicon

TMS320C28x™ Controller Generation, Fixed Point and Floating Point
MCU Control. DSP Performance

Get samples, data sheets, tools and app reports at: **www.ti.com/c2000**

Specifications
- 32-bit C28x™ DSC core with floating-point option
- Industry's first floating-point DSCs
- Highest performance DSCs at 150 MHz and 300 MFLOPS
- Only processors with full software compatibility between fixed-point and floating-point
- Full software compatibility across all C2000™ platform controllers
- All C28x controllers are AEC Q-100 qualified for automotive applications

Applications
Green energy (solar, wind, fuel cells), digital motor control (home appliances, industrial drives, medical), digital power supplies (telecom and server rectifiers, wireless basestations, UPS), automotive (electric power steering, driver's assistance radar, wipers, HVAC)

Features
- Industry's most efficient C compiler for 32-bit controllers
- Up to 150-MHz operation
- Single-precision 32-bit floating-point unit on F283xx generation
- Ultra-fast interrupt response time
- Integrated real-time debug simplifies control system development
- Single-cycle 32×32-bit multiply-accumulate
- 32-bit and 16-bit instructions optimize performance and code efficiency

Peripherals
- Up to 512-KB Flash and 68-KB RAM
- Code security module with 128-bit password protection
- Ultra-fast 12-bit A/D converter with 80-ns conversion time
- High-resolution PWM allows duty cycle modulation with 150 pico second accuracy
- Flexible PWM generation allows easy generation of any switching waveform
- Quadrature encoder interfaces for easy motor feedback
- Multiple communications interfaces
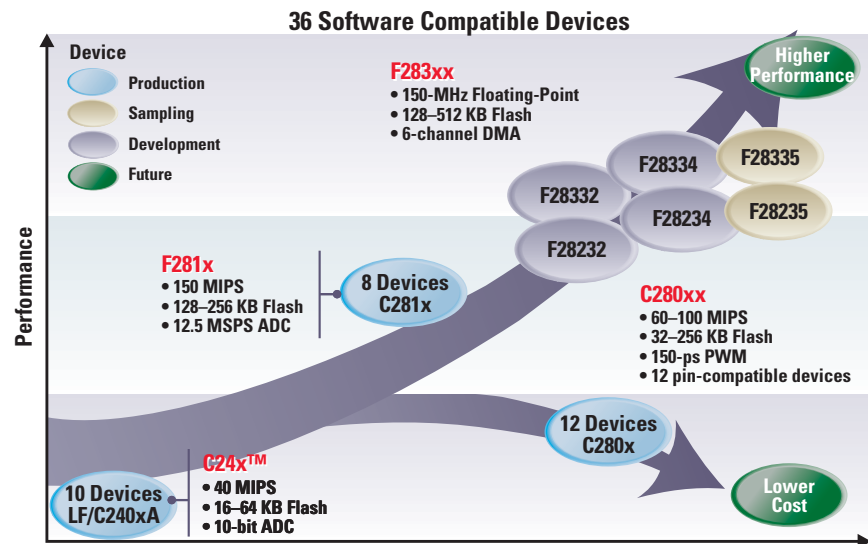
TMS320C2000 Digital Signal Controller Platform Roadmap
The C2000™ controller platform provides an optimized combination of DSP performance and MCU integration for digital control systems.
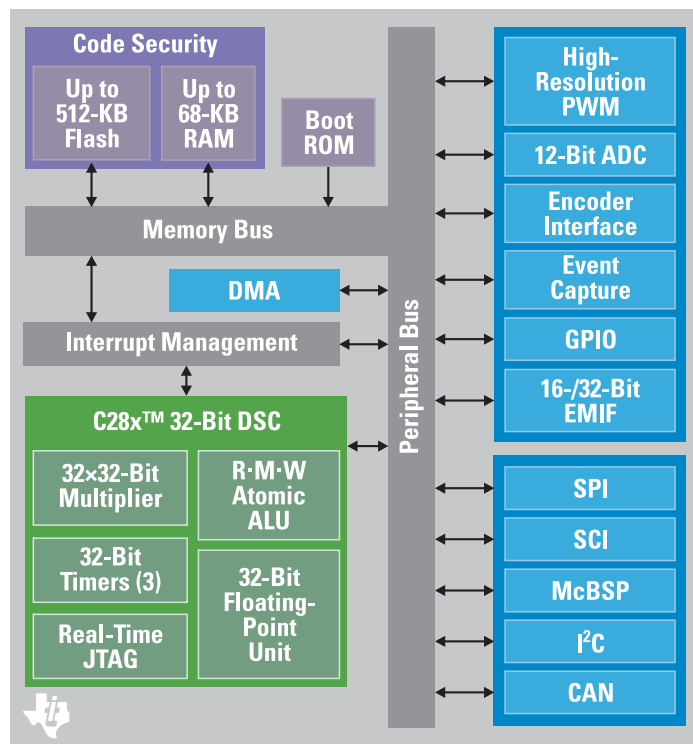
TMS320C28x Digital Signal Controller Block Diagram

TMS320C28x™ Controller Generation

www.ti.com/c28x

Device	Processor Speed (MHz)	FPU	DMA	Memory RAM (KB)	Flash (KB)	ROM (KB)	Control Interfaces PWM Channels	HiRes PWM	Timers	Event Captures	Quadrature Encoder	12-Bit A/D Chan/ Conversion Time (ns)	Communications Ports SPI	SCI	CAN	I²C	McBSP	External Memory Bus	I/O Pins	Core Voltage	Packaging	100-U Price*
TMS320F28335	150	Yes	Yes	68	512	Boot	18	6	9	6	2	16 ch/80	1	3	2	1	2	16 or 32-bit	88	1.9	176 LQFP or 179 BGA	23.00
TMS320F28334	150	Yes	Yes	68	256	Boot	18	6	9	4	2	16 ch/80	1	3	2	1	2	16 or 32-bit	88	1.9	176 LQFP or 179 BGA	20.30
TMS320F28332	100	Yes	Yes	52	128	Boot	16	6	9	4	2	16 ch/80	1	2	2	1	1	16 or 32-bit	88	1.8	100 LQFP or BGA	15.30
TMS320F28235	150	No	Yes	68	512	Boot	18	6	9	6	2	16 ch/80	1	3	2	1	2	16 or 32-bit	88	1.9	176 LQFP or 179 BGA	20.30
TMS320F28234	150	No	Yes	68	256	Boot	16	6	9	4	2	16 ch/80	1	3	2	1	2	16 or 32-bit	88	1.9	176 LQFP or 179 BGA	18.00
TMS320F28232	100	No	Yes	52	128	Boot	16	6	9	4	2	16 ch/80	1	2	2	1	1	16 or 32-bit	88	1.8	176 LQFP or 179 BGA	14.10
TMS320F2812	150	No	No	36	256	Boot	16	–	7	6	2	16 ch/80	1	2	1	–	1	16-bit	56	1.9	176 LQFP or 179 BGA	18.00
TMS320F2811	150	No	No	36	256	Boot	16	–	7	6	2	16 ch/80	1	2	1	–	1	No	56	1.9	128 LQFP	17.00
TMS320F2810	150	No	No	36	128	Boot	16	–	7	6	2	16 ch/80	1	2	1	–	1	No	56	1.9	128 LQFP	16.00
TMS320F28015	60	No	No	12	32	Boot	8	4	7	2	2	16 ch/267	1	1	–	1	–	No	35	1.8	100 LQFP or BGA	3.80
TMS320F28016	60	No	No	12	64	Boot	8	4	7	2	2	16 ch/267	1	1	1	1	–	No	35	1.8	100 LQFP or BGA	4.10
TMS320F2801-60	60	No	No	12	32	Boot	8	3	9	2	1	16 ch/267	2	1	1	1	–	No	35	1.8	100 LQFP or BGA	4.60
TMS320F2802-60	60	No	No	12	64	Boot	8	3	9	2	2	16 ch/267	2	1	1	1	–	No	35	1.8	100 LQFP or BGA	5.50
TMS320F2801	100	No	No	12	32	Boot	8	3	9	2	1	16 ch/160	2	1	1	1	–	No	35	1.8	100 LQFP or BGA	6.70
TMS320F2802	100	No	No	12	64	Boot	8	3	9	2	2	16 ch/160	2	1	1	1	–	No	35	1.8	100 LQFP or BGA	8.20
TMS320F2806	100	No	No	20	64	Boot	16	4	15	4	2	16 ch/160	4	2	1	1	–	No	35	1.8	100 LQFP or BGA	10.10
TMS320F2808	100	No	No	36	128	Boot	16	4	15	4	2	16 ch/160	4	2	2	1	–	No	35	1.8	100 LQFP or BGA	13.40
TMS320F2809	100	No	No	36	256	Boot	16	6	15	4	2	16 ch/80	4	2	2	1	–	No	35	1.8	100 LQFP or BGA	14.90
TMS320F28044	100	No	No	20	128	Boot	16	16	19	–	–	16 ch/80	1	1	–	1	–	No	35	1.8	100 LQFP or BGA	11.50
TMS320C2810	150	No	No	36	0	128	16	–	7	6	2	16 ch/80	1	2	1	–	1	No	56	1.9	128 LQFP	–
TMS320C2811	150	No	No	36	0	256	16	–	7	6	2	16 ch/80	1	2	1	–	1	No	56	1.9	128 LQFP	–
TMS320C2812	150	No	No	36	0	256	16	–	7	6	2	16 ch/80	1	2	1	–	1	16-bit	56	1.9	176 LQFP or 179 BGA	–
TMS320C2801	100	No	No	12	0	32	8	3	9	2	1	16 ch/160	2	1	1	1	–	No	35	1.8	100 LQFP or BGA	–
TMS320C2802	100	No	No	12	0	64	8	3	9	2	2	16 ch/160	2	1	1	1	–	No	35	1.8	100 LQFP or BGA	–

*All prices listed are in U.S. dollars and for the –40°/+85°C temperature range only.
*Prices are quoted in U.S. dollars and represent 2008 suggested resale pricing. All prices are subject to change.
*Minimum quantity order for all ROM devices is 10K units, NRE charge is $11,000 for C28x™ and $9,000 for LC240x controllers.
All TMS320C28x devices are available in –40°/+85°C or –40°/+125°C temperature ranges.
All TMS320C28x devices in LQFP package are available as AEC Q100 qualified.
All devices available in Pb-Free/Green packaging.

New products are listed in bold red.

TMS320C2000™ Controller Platform

Silicon

TMS320C24x™ Controller Generation, Fixed Point
MCU Control. DSP Performance

Get samples, data sheets, tools and app reports at: **www.ti.com/c2000**

Specifications
- Up to 40-MIPS operation
- Three power-down modes
- Code-compatible digital signal controllers
- JTAG scan-based emulation
- 3.3-V and 5-V designs

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

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) inter-face 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)
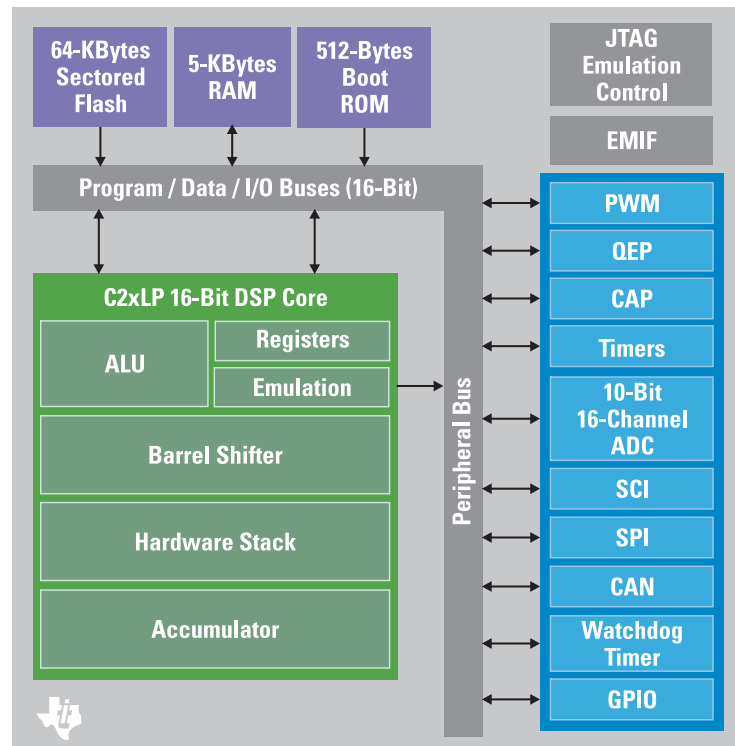
TMS320LF2407A Digital Signal Controller Block Diagram
For high-performance industrial applications, the Flash-based LF2407A digital signal controller includes peripherals such as a controller area network (CAN) module to enable control of multiple motors by a single DSP-based controller.
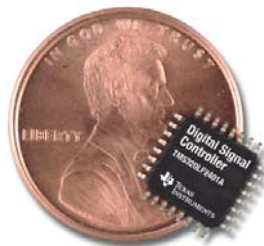
TMS320LF/C2401A Digital Signal Controllers: For Space-Constrained Designs
The TMS320LF/C2401A controllers pack a tremendous amount of power in an unbelievably small package. In only 49 mm^2, the TMS320LF/C2401A controllers provide 40 MIPS of processing performance with 500-ns conversion time, 8 Kw of sectored memory with code security and much more.

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	100-U Price[*]
TMS320LC2401AVFA	40	–	2 KB	–	16 KB	2	7	5 ch / 0.5	–	Y	–	Y	–	13	3.3	32 LQFP	1.95[2]
TMS320LC2402APGA[1]	40	–	1 KB	–	12 KB	2	8	8 ch / 0.425	–	Y	–	Y	–	21	3.3	64 PQFP	2.60[2]
TMS320LC2402APAGA[1]	40	–	1 KB	–	12 KB	2	8	8 ch / 0.425	–	Y	–	Y	–	21	3.3	64 LQFP	2.60[2]
TMS320LC2403APAGA[1]	40	–	2 KB	–	32 KB	2	8	8 ch / 0.425	–	Y	Y	Y	Y	21	3.3	64 LQFP	3.95[2]
TMS320LC2404APZA[1]	40	–	3 KB	–	32 KB	4	16	16 ch / 0.375	–	Y	Y	Y	–	41	3.3	100 LQFP	4.55[2]
TMS320LC2406APZA[1]	40	–	5 KB	–	64 KB	4	16	16 ch / 0.375	–	Y	Y	Y	Y	41	3.3	100 LQFP	5.20[2]
TMS320LF2401AVFA	40	512 B	2 KB	16 KB	–	2	7	5 ch / 0.5	–	Y	–	Y	–	13	3.3	32 LQFP	3.75
TMS320LF2402APGA[1]	40	512 B	2 KB	16 KB	–	2	8	8 ch / 0.5	–	Y	–	Y	–	21	3.3	64 PQFP	7.55
TMS320LF2403APAGA[1]	40	512 B	2 KB	32 KB	–	2	8	8 ch / 0.5	–	Y	Y	Y	Y	21	3.3	64 LQFP	8.80
TMS320LF2406APZA[1]	40	512 B	5 KB	64 KB	–	4	16	16 ch / 0.5	–	Y	Y	Y	Y	41	3.3	100 LQFP	8.90
TMS320LF2407APGEA[1]	40	512 B	5 KB	64 KB	–	4	16	16 ch / 0.5	Y	Y	Y	Y	Y	41	3.3	144 LQFP	10.10

[1] Non-Pb-Free/Green version of MicroStar BGA™; All other devices are Pb-Free/Green.

[2] Minimum volume for LC240xA devices is 10 KU with NRE of $9,000.

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

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	TMS320C24x Controller Generation	www.ti.com/c24x

IQMath Provides a Bridge Between Floating Point and Fixed Point

Control algorithms typically start life in a floating-point format, often created with PC-based simulation tools, such as MATLAB®. With the availability of the TMS320F283xx floating-point digital signal controllers (DSCs), it is easy to port that floating-point code to the embedded controller. TI's IQMath library provides seamless portability from the F283xx DSCs to fixed-point members of the C28x™ generation. The TMS320F282xx fixed-point DSCs are pin-to-pin compatible with the F283xx DSCs. These controllers offer the first set of processors that provide both hardware and software compatibility between floating point and fixed point.

For more information, visit
www.ti.com/iqmath
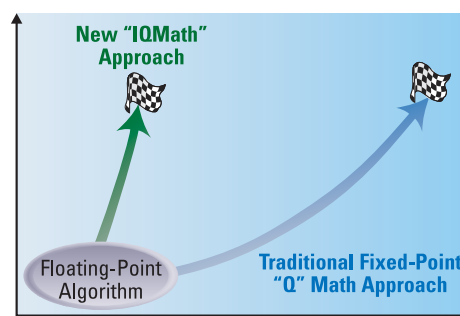
Slash development time and reduce overall costs with TI's IQMath: floating-point development on a fixed-point machine.
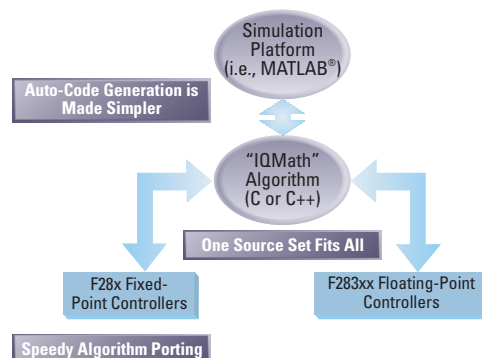
TI's C28x IQMath Library makes code development easier, faster and enables seamless portability of code between fixed- and floating-point devices.

TMS320C2000™ Controller Platform

Tools, Software and Support

C2000™ Controller Platform Hardware and Software Development Tools

Description	Part #	$U.S.[1]
Starter Kits		
TMS320F28044 eZdsp™ Starter Kit	TMDXEZ28044 (WW part number)	495
Includes target board with socket, USB cable, Code Composer Studio™ (CCStudio) IDE for eZdsp, power supply		
TMS320F28335 eZdsp Starter Kit	TMDXEZ28335 (WW part number)	495
Includes target board with socket, USB cable, CCStudio IDE for eZdsp, power supply		
TMS320F2808 eZdsp Starter Kit	TMDSEZS2808 (U.S./Asia part number)	495
Includes target board with socket, USB cable, CCStudio IDE for eZdsp, power supply	TMDSEZS2808-0E (European part number)	495
TMS320F2812 eZdsp Starter Kit	TMDSEZS2812 (U.S./Asia part number)	495
Includes target board with socket, parallel port cable, CCStudio IDE for eZdsp, power supply	TMDSEZS2812-0E (European part number)	495
TMS320F2812 eZdsp Starter Kit	TMDSEZD2812 (U.S./Asia part number)	395
Includes target board, parallel port cable, CCStudio IDE for eZdsp, power supply	TMDSEZD2812-0E (European part number)	395
TMS320LF2407 eZdsp Starter Kit	TMDSEZD2407 (U.S./Asia part number)	345
Includes target board, parallel port cable, CCStudio IDE for eZdsp, power supply	TMDSEZD2407-0E (European part number)	345
Evaluation Modules		
F2812 Development Bundle[2]	TMDSEVP2812 (U.S. part number)	1,995
Includes eZdsp (socketed), CCStudio IDE, XDS510PP-Plus	TMDSEVP2812-0E (European part number)	
F2812 Development Bundle[2]	TMDSEVU2812 (U.S. part number)	2,295
Includes eZdsp (socketed), CCStudio IDE, XDS510™ USB Emulator	TMDSEVU2812-0E (European part number)	
JTAG Emulators		
JTAGjet-TMS-C2000 USB Emulator for Windows	www.signum.com	595
Blackhawk USB2000 Controller	www.blackhawk-dsp.com	299
XDS510 USB-Based Emulator	TMDSEMUUSB	1,995
Software Development Tools		
C2000 DSP Code Composer Studio Development Tools Bundled with Annual Software Subscription	TMDSCCS2000-1	495
Supports TMS320C24x™ and TMS320C28x™ DSC products		
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
Code Composer Studio IDE Free Evaluation Tools	SPRC119	Free
Includes C6000, C5000, C2000, DaVinci and OMAP processor CCStudio 120-Day Free Evaluation Tools[3]	www.ti.com/freetools	
TMS320C2000 Flash Programming Utilities	www.ti.com/c2000flashtools	Free
TMS320C2000 Digital Motor Control Software	www.ti.com/c2000appsw	Free
TMS320C2000 Digital Power Software	www.ti.com/dpslib	Free
TMS320C2000 Signal Processing Libraries	www.ti.com/c2000sigproclib	Free

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

[2]Includes Code Composer Studio IDE, code-generation tools with C compiler/assembler/linker, target board and device drivers.

[3]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), Spectrum Digital (www.spectrumdigital.com), Technosoft (www.technosoft.ch) and Softronics (www.softronx.com).

Power Management Products for the C2000™ Controller Platform

Get samples, data sheets, Evaluation Modules (EVMs) and app reports at: **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	Multiple-Output Converter
3.3 V	TPS73701	TPS40041	TPS64200	TPS54110	MC33063	PTH04070		TPS62420	
5 V	TPS73701	TPS40042	TPS40200	TPS54110	TPS40222	PTH04070		TPS75003	TPS54386
12 V	TLV1117	TPS40190	TPS40200	TPS62110	TPS5410	PTH08080		TPS5120	TPS54386
24 V	LM317	TPS40057	TPS40200*		TPS5410*	PTN78000*	PTB78560*		TPS54386
48 V		TPS40061					PTMA403033*		

Due to Vout/Vin 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
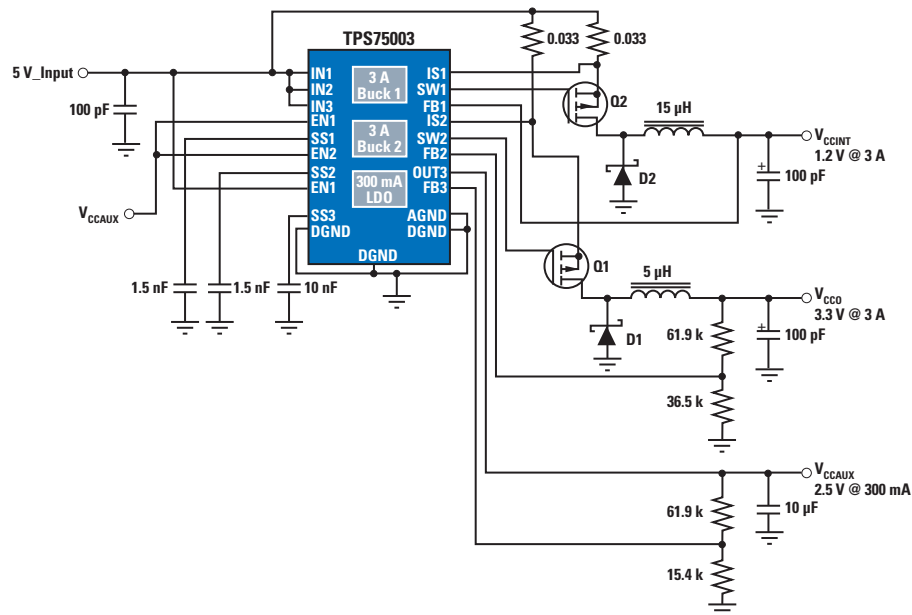
For additional power supply designs for TI digital signal controllers, please visit **www.ti.com/processorpower**.

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, data sheets, tools and app reports at: **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 DSPs –
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), I2C, general-purpose timers, watchdog timer, UART
- 16-/32-bit EMIF

TMS320C5510 DSP – *Ideal for Memory-Intensive Applications*
- Ultra low power – 69 µA in deep-sleep mode (with state retention)
- Large on-chip memory – up to 320-KB on-chip memory
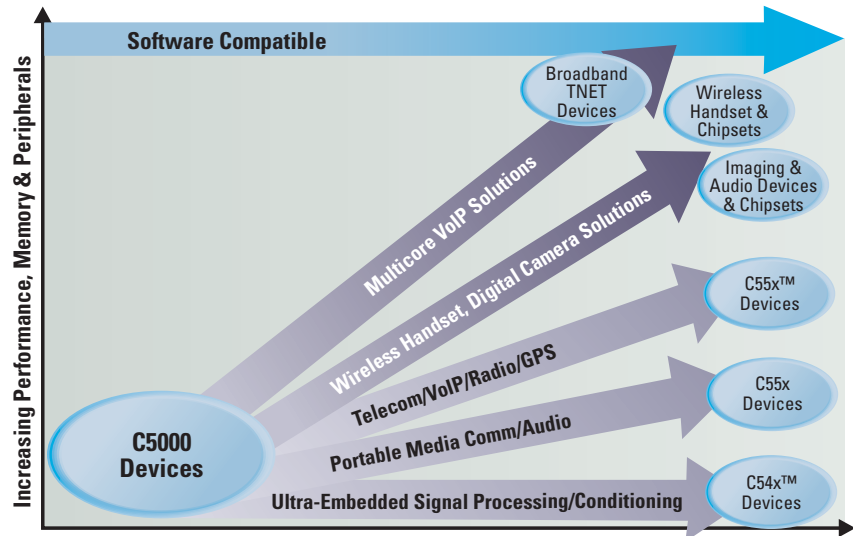
C5000 DSP Platform Roadmap
The C5000 DSPs span the applications spectrum with core performance extended to 300 MHz.
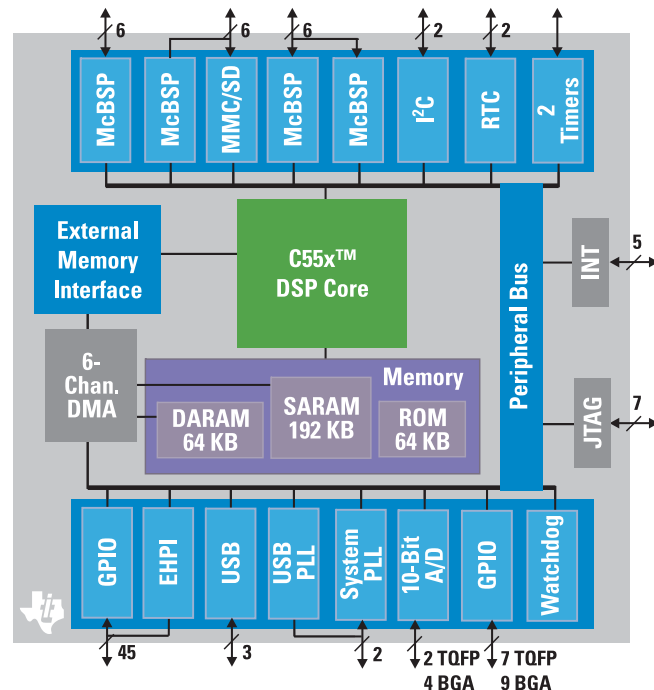
TMS320C5509A DSP Block Diagram
The C5509A DSP is the portable and connected DSP optimized for portable/industrial medical markets.

TMS320C55x™ DSP Generation

Part Number	RAM (Bytes)	ROM (Bytes)	DMA	DAT/PRO (ADDR) (Words)	USB	ADC	UART	I²C	RTC	McBSP[2]	MMC/ SD	Voltage (V) Core	I/O	COM	Timers[3]	MHz	MIPS	Packaging	100-U Price[1]
TMS320VC5501GZZ300[4]	32K	32K	6 ch	8M	–	–	Y	Y	–	2	–	1.26	3.3	HPI8	3[6]	300	600	201 BGA[7]	5.23
TMS320VC5501PGF300[4]	32K	32K	6 ch	8M	–	–	Y	Y	–	2	–	1.26	3.3	HPI8	3[6]	300	600	176 LQFP	5.23
TMS320VC5502GZZ200[4]	64K	32K	6 ch	8M	–	–	Y	Y	–	3	–	1.26	3.3	HPI16/8	3[6]	200	400	201 BGA[7]	7.48
TMS320VC5502PGF200[4]	64K	32K	6 ch	8M	–	–	Y	Y	–	3	–	1.26	3.3	HPI16/8	3[6]	200	400	176 LQFP	7.48
TMS320VC5502PGF300[4]	64K	32K	6 ch	8M	–	–	Y	Y	–	3	–	1.26	3.3	HPI16/8	3[6]	300	600	176 LQFP	9.62
TMS320VC5502GZZ300[4]	64K	32K	6 ch	8M	–	–	Y	Y	–	3	–	1.26	3.3	HPI16/8	3[6]	300	600	201 BGA[7]	9.62
TMS320VC5503GHH	64K	64K	6 ch	8M	–	–	–	Y	Y	3	–	1.6	3.3	HPI16	2[6]	200	400	179 BGA[7]	7.85
TMS320VC5503PGE	64K	64K	6 ch	8M	–	–	–	Y	Y	3	–	1.6	3.3	HPI16	2[6]	200	400	144 LQFP	7.85
TMS320VC5506GHH	128K	64K	6 ch	8M	Y	–	–	Y	Y	3	–	1.2	3.3	–	2[6]	200	400	179 BGA[7]	7.53
TMS320VC5506PGE	128K	64K	6 ch	8M	Y	–	–	Y	Y	3	–	1.2	3.3	–	2[6]	200	400	144 LQFP	7.53
TMS320VC5507GHH	128K	64K	6 ch	8M	Y	Y	–	Y	Y	3	–	1.6	3.3	HPI16	2[6]	200	400	179 BGA[7]	11.23
TMS320VC5507PGE	128K	64K	6 ch	8M	Y	Y	–	Y	Y	3	–	1.6	3.3	HPI16	2[6]	200	400	144 LQFP	11.23
TMS320VC5509AGHH[5]	256K	64K	6 ch	8M	Y	Y	–	Y	Y	3	Y	1.6	3.3	HPI16	2[6]	200	400	179 BGA[7]	17.19
TMS320VC5509APGE[5]	256K	64K	6 ch	8M	Y	Y	–	Y	Y	3	Y	1.6	3.3	HPI16	2[6]	200	400	144 LQFP	17.19
TMS320VC5510AGGW1	320K	32K	6 ch	8M	–	–	–	–	–	3	–	1.6	3.3	HPI16	2	160	320	240 BGA[7]	17.24
TMS320VC5510AGGW2	320K	32K	6 ch	8M	–	–	–	–	–	3	–	1.6	3.3	HPI16	2	200	400	240 BGA[7]	20.28

[1] Prices are quoted in U.S. dollars and represent year 2008 suggested resale pricing. All prices are subject to change. Customers are advised to obtain the most current and complete pricing information from TI prior to placing orders. TI may verify final pricing prior to accepting any order.
[2] Multi-channel buffered serial port (McBSP).
[3] 3 = Two general-purpose timers and one 32-bit DSP/BIOS™ kernel counter, 2 = Two general-purpose timers.
[4] Extended temperature device, –40 to 85°C case temperature operation.
[5] JTAG disconnect option.
[6] Plus 1 additional programmable watchdog timer.
[7] MicroStar BGA™ package.
Note: All devices include software PLL.
Note: Enhanced plastic and HiRel 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.

TMS320C5000™ DSP Platform

Silicon

TMS320C54x™ DSP Generation, Fixed Point

Power-Efficient Performance DSPs

Get samples, data sheets, tools and app reports at: **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, wire-less 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 con-figuration 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
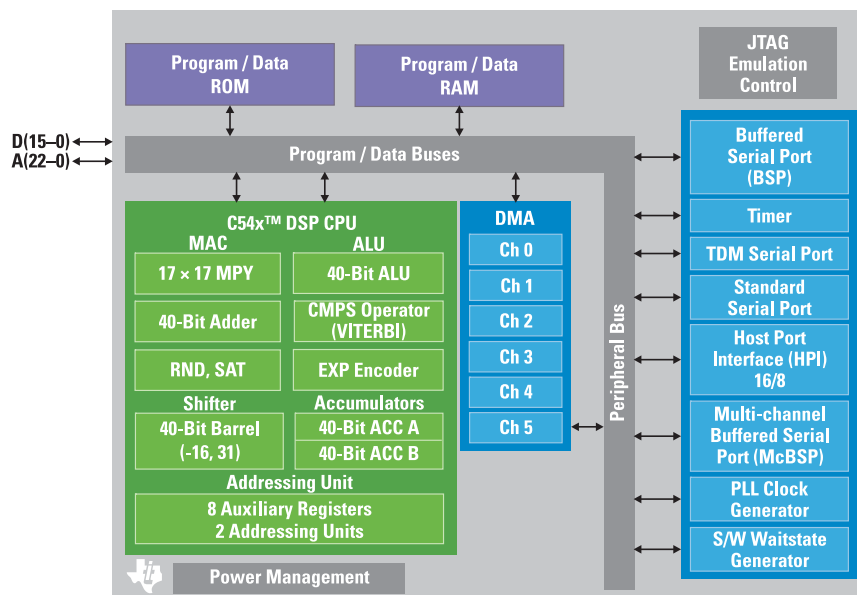
C54x™ DSP Generation Block Diagram
This block diagram of the C54x DSP is a comprehensive diagram showing all peripheral options. C54x DSPs are optimized to meet the performance, cost and low-power needs of wireless and wire-line communications systems as well as emerging applications like IP phones, VoP and portable applications.

TMS320C54x™ DSP Generation

Part Number	RAM (Bytes)	ROM (Bytes)	DAT/PRO (ADDR) (Bytes)	McBSP	Voltage (V) Core	I/O	COM	Timers	DMA	MHz	MIPS	Packaging	100-U Price[1]
TMS320VC5401PGE50	16K	8K	128K/2M	2	1.8	3.3	HPI 8	2	6	50	50	144 LQFP	3.92
TMS320VC5401GGU50	16K	8K	128K/2M	2	1.8	3.3	HPI 8	2	6	50	50	144 BGA[2]	3.92
TMS320VC5402PGE100	32K	8K	128K/2M	2	1.8	3.3	HPI 8	2	6	100	100	144 LQFP	6.22
TMS320VC5402GGU100	32K	8K	128K/2M	2	1.8	3.3	HPI 8	2	6	100	100	144 BGA[2]	6.22
TMS320VC5402APGE16	32K	32K	128K/16M	3	1.6	3.3	HPI 8	1	6	160	160	144 LQFP	12.33
TMS320VC5402AGGU16	32K	32K	128K/16M	3	1.6	3.3	HPI 8	1	6	160	160	144 BGA[2]	12.33
TMS320VC5404PGE	32K	128K	128K/16M	3	1.5	3.3	HPI 8/16	2	6	120	120	144 LQFP	9.03
TMS320VC5404GGU	32K	128K	128K/16M	3	1.5	3.3	HPI 8/16	2	6	120	120	144 BGA[2]	9.03
TMS320UC5405GQW	16K	4K	64K/1M	2	1.8	3.6	HPI 8	2	6	80	80	143 BGA[2]	6.04
TMS320VC5407PGE	80K	256K	128K/16M	3	1.6	3.3	HPI 8/16	2	6	120	120	144 LQFP	10.13
TMS320VC5407GGU	80K	256K	128K/16M	3	1.6	3.3	HPI 8/16	2	6	120	120	144 BGA[2]	10.13
TMS320VC5409PGE-80	64K	32K	128K/16M	3	1.8	3.3	HPI 8/16	1	6	80	80	144 LQFP	9.64
TMS320VC5409GGU-80	64K	32K	128K/16M	3	1.8	3.3	HPI 8/16	1	6	80	80	144 BGA[2]	9.64
TMS320VC5409PGE100	64K	32K	128K/16M	3	1.8	3.3	HPI 8/16	1	6	100	100	144 LQFP	11.84
TMS320VC5409GGU100	64K	32K	128K/16M	3	1.8	3.3	HPI 8/16	1	6	100	100	144 BGA[2]	11.84
TMS320VC5409APGE12	64K	32K	128K/16M	3	1.5	3.3	HPI 8/16	1	6	120	120	144 LQFP	13.99
TMS320VC5409AGGU12	64K	32K	128K/16M	3	1.5	3.3	HPI 8/16	1	6	120	120	144 BGA[2]	13.99
TMS320VC5409APGE16	64K	32K	128K/16M	3	1.6	3.3	HPI 8/16	1	6	160	160	144 LQFP	15.50
TMS320VC5409AGGU16	64K	32K	128K/16M	3	1.6	3.3	HPI 8/16	1	6	160	160	144 BGA[2]	15.50
TMS320VC5410PGE100	128K	32K	128K/16M	3	2.5	3.3	HPI 8	1	6	100	100	144 LQFP	33.43
TMS320VC5410GGW100	128K	32K	128K/16M	3	2.5	3.3	HPI 8	1	6	100	100	176 BGA[2]	33.43
TMS320VC5410APGE12	128K	32K	128K/16M	3	1.5	3.3	HPI 8/16	1	6	120	120	144 LQFP	16.81
TMS320VC5410AGGU12	128K	32K	128K/16M	3	1.5	3.3	HPI 8/16	1	6	120	120	144 BGA[2]	16.81
TMS320VC5410APGE16	128K	32K	128K/16M	3	1.6	3.3	HPI 8/16	1	6	160	160	144 LQFP	18.60
TMS320VC5410AGGU16	128K	32K	128K/16M	3	1.6	3.3	HPI 8/16	1	6	160	160	144 BGA[2]	18.60
TMS320VC5416PGE120	256K	32K	128K/16M	3	1.5	3.3	HPI 8/16	1	6	120	120	144 LQFP	27.98
TMS320VC5416GGU120	256K	32K	128K/16M	3	1.5	3.3	HPI 8/16	1	6	120	120	144 BGA[2]	27.98
TMS320VC5416PGE160	256K	32K	128K/16M	3	1.6	3.3	HPI 8/16	1	6	160	160	144 LQFP	31.11
TMS320VC5416GGU160	256K	32K	128K/16M	3	1.6	3.3	HPI 8/16	1	6	160	160	144 BGA[2]	31.11

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

[2] MicroStar BGA™ package.

Note: All devices include software PLL.

Note: Enhanced plastic and HiRel 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.[1]
C5000™ DSP Starter Kits (DSKs)		
TMS320C55x Low-Power Optimization DSP Starter Kit (DSK)	TMDSDSK5509 (U.S. part number)	495
	TMDSDSK5509-0E (European part number)	
TMS320VC5407 DSP Hands-Free Kit Development Platform	TMDSHFK5407	495
TMS320C54x DSP Starter Kit (DSK), TMS320C5416 DSP based[2]	TMDSDSK5416 (U.S. part number)	395
	TMDSDSK5416-0E (European part number)	
TMS320C55x DSP Starter Kit (DSK), TMS320C5510 DSP based[2]	TMDSDSK5510 (U.S. part number)	395
	TMDSDSK5510-0E (European part number)	
JTAG Emulators		
Spectrum Digital XDS510PP-Plus Emulator	TMDSEMUPP (U.S. part number)	1,095
Spectrum Digital XDS510PP-Plus Emulator with European Cords	TMDSEMUPP-0E (European part number)	1,095
Spectrum Digital XDS510™ USB Emulator	TMDSEMUUSB	1,495
Blackhawk XDS560™ JTAG PCI Emulator	TMDSEMU560PCI	2,995
Blackhawk XDS560 USB High-Performance JTAG Emulator	TMDSEMU560U	2,999
Software Development Tools		
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[3]	SPRC119 (www.ti.com/freetools)	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

[1] Prices are quoted in U.S. dollars and represent year 2008 suggested resale pricing. All prices are subject to change. Customers are advised to obtain the most current and complete pricing information from TI prior to placing orders. TI may verify final pricing prior to accepting any order.
[2] 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.
[3] 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. Please see the tools features matrix on page 60 for more details.

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	TMS320C55x DSP Generation	www.ti.com/c55x

Power Management Products for the C5000™ DSP Platform

Get samples, data sheets, Evaluation Modules (EVMs) and app reports at: **power**.ti.com

Suggested Texas Instruments Power Management Solutions for the C5000 DSP Platform				
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
				TPS54386
12 V	TLV1117	TPS40190	TPS62110	TPS54386
		TPS5124		
24 V		TPS5124		TPS54386

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
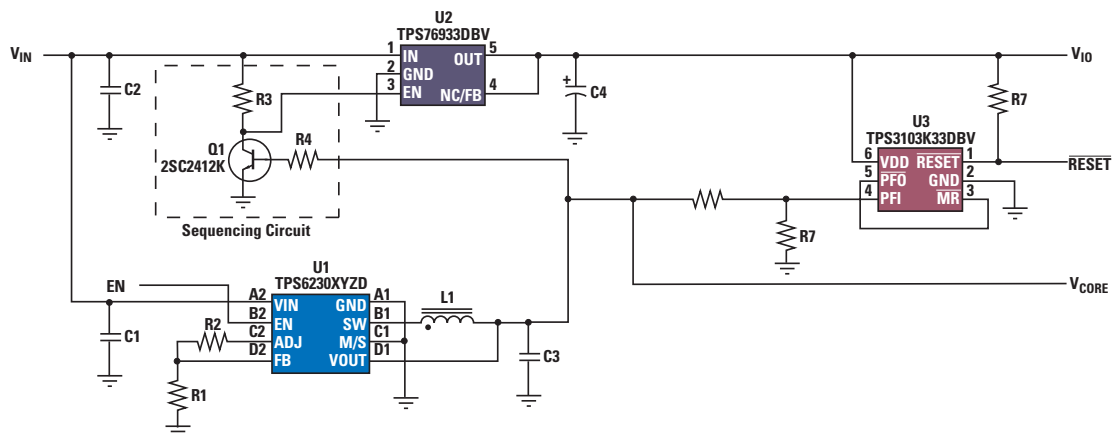
For additional power supply designs for TI DSPs, please visit **www.ti.com/processorpower**.

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

TMS320C64x™ DSP Generation, Fixed Point
Highest-Performance and Performance Value DSPs

Get samples, data sheets, tools and app reports at: **www.ti.com/c6000**

Specifications
- Broadest portfolio of high-performance DSPs ranging from $8.95 to 1.2 GHz
- Shipping the industry's first 1.2-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
- VelociTI.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 two-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
- Serial RapidIO®
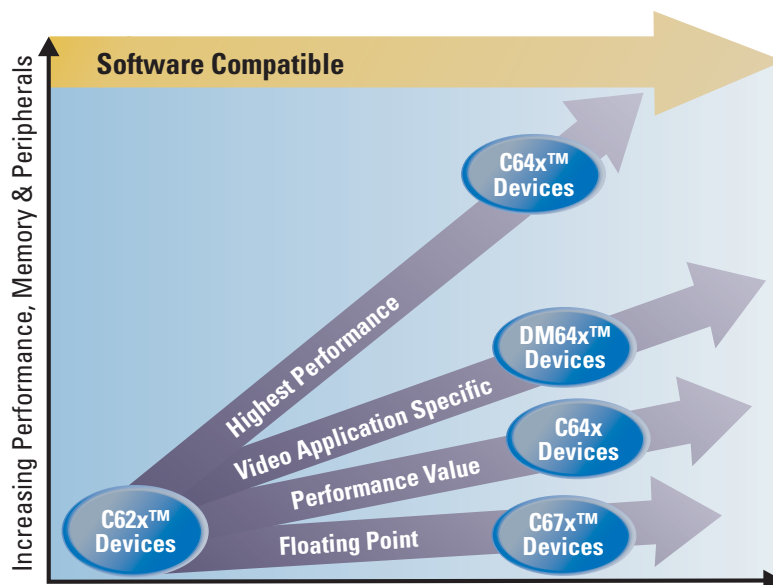
C6000™ DSP Platform Roadmap
The C6000 DSP platform includes a wide range of devices that raise the bar in performance, set new levels of cost efficiency and offer on-chip peripheral integration to enable developers of high-performance systems to choose the device that best suits their specific application.
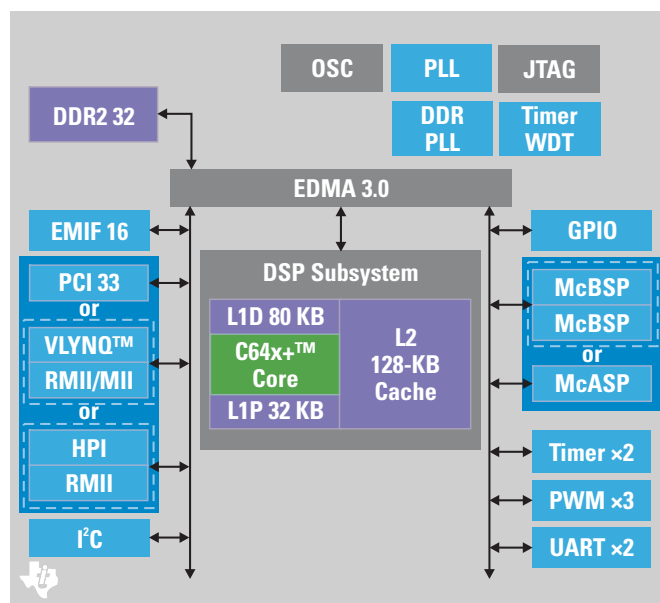
* Please check user guide for MUXing options.

The C642x DSPs come in two flavors – the C6421 and C6424 DSPs. These DSPs are pin-for-pin compatible, start from U.S. $8.95 (10 KU volumes), and are completely scalable in speed and/or feature set. Both new DSPs are available in 400, 500 and 600 MHz speeds, and have the same raw processing power, but differ in on-chip memory and peripherals.

Silicon →

TMS320C64x™ DSP Generation – Performance Value Fixed-Point DSPs

Part Number	Internal RAM (Bytes) L1 Program Cache/ L1 Data Cache/ L2 Unified RAM/Cache	McBSP	Enhanced DMA (Channels)	COM	Timers	MHz	MIPS	Power (W)[2] CPU and L1	Total	Voltage (V) Core	I/O	Packaging	100-U Price[1]
Performance Value													
TMS320**C6410**GTS400	16K/16K/128K	2	64	HPI 32/16[3]	3	400	3200	0.58	1.0	1.2	3.3	288 BGA, 23 mm	19.65
TMS320**C6413**GTS500	16K/16K/256K	2	64	HPI 32/16[3]	3	500	4000	0.58	1.1	1.2	3.3	288 BGA, 23 mm	28.40
TMS320**C6412A**GDK5	16K/16K/256K	2	64	PCI/HPI/EMAC[4]	3	500	4000	0.66	1.3	1.2	3.3	548 BGA, 23 mm	41.85
TMS320**C6412A**GDK6	16K/16K/256K	2	64	PCI/HPI/EMAC[4]	3	600	4800	0.93	1.9	1.4	3.3	548 BGA, 23 mm	46.05
TMS320**C6412A**GDK7	16K/16K/256K	2	64	PCI/HPI/EMAC[4]	3	720	5760	0.93	2.15	1.4	3.3	548 BGA, 23 mm	72.00
TMS320**C6418**GTS600	16K/16K/512K	2	64	HPI 32/16[3]	3	600	4800[5]	0.82	1.7	1.4	3.3	288 BGA, 23 mm	52.85
TMS320**C6418**ZTSA500	16K/16K/512K	2	64	HPI 32/16[3]	3	500	4000[5]	0.58	1.1	1.4	3.3	288 BGA, 23 mm	52.85
TMS320**C6424**ZWT4	32K/80K/128K	2	64	PCI/HPI/EMAC[6]	3	400	3200	TBD	TBD	1.05/1.2	1.8/3.3	361 PBGA, 16 mm	20.95
TMS320**C6424**ZWT5	32K/80K/128K	2	64	PCI/HPI/EMAC[6]	3	500	4000	TBD	TBD	1.2	1.8/3.3	361 PBGA, 16 mm	26.15
TMS320**C6424**ZWTQ5[7]	32K/80K/128K	2	64	PCI/HPI/EMAC[6]	3	500	4000	TBD	TBD	1.2	1.8/3.3	361 PBGA, 16 mm	31.40
TMS320**C6424**ZDUQ5[7]	32K/80K/128K	2	64	PCI/HPI/EMAC[6]	3	500	4000	TBD	TBD	1.2	1.8/3.3	376 PBGA, 23 mm	31.40
TMS320**C6424**ZWT6	32K/80K/128K	2	64	PCI/HPI/EMAC[6]	3	600	4800	TBD	TBD	1.2	1.8/3.3	361 PBGA, 16 mm	32.85
TMS320**C6421**ZWT4	48K/16K/64K	1	64	HPI/EMAC[6]	3	400	3200	TBD	TBD	1.05/1.2	1.8/3.3	361 PBGA, 16 mm	11.75
TMS320**C6421**ZWT5	48K/16K/64K	1	64	HPI/EMAC[6]	3	500	4000	TBD	TBD	1.2	1.8/3.3	361 PBGA, 16 mm	15.75
TMS320**C6421**ZWTQ5[7]	48K/16K/64K	1	64	HPI/EMAC6	3	500	4000	TBD	TBD	1.2	1.8/3.3	361 PBGA, 16 mm	18.80
TMS320**C6421**ZDUQ5	48K/16K/64K	1	64	HPI/EMAC6	3	500	4000	TBD	TBD	1.2	1.8/3.3	376 PBGA, 23 mm	18.80
TMS320**C6421**ZWT6	48K/16K/64K	1	64	HPI/EMAC[6]	3	600	4800	TBD	TBD	1.2	1.8/3.3	361 PBGA, 16 mm	22.30

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

New devices are listed in red.

[2] 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.

[3] HPI is selectable, 32 bit or 16 bit. [4] The C6412 can be configured to have either a 32-bit PCI or 32-bit HPI, or a 16-bit HPI with Ethernet MAC.

[5] Plus on-chip VITERBI (VCP) coprocessor. [6] HPI interface is 16 bit.

[7] Q designates Q100 automotive reliability.

Note: Check www.ti.com for extended temperature and packaging options. Additional information on enhanced plastic and HiRel DSP versions is available on page 64.

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

Part Number	Internal RAM (Bytes) L1 Program Cache/ L1 Data Cache/ L2 Unified RAM/Cache	McBSP	Enhanced DMA (Channels)	COM[3]	Timers	MHz	MIPS	Power (W)[2] CPU and L1	Total	Voltage (V) Core	I/O	Packaging	100-U Price[1]
Highest Performance													
TMS320**C6416TB**GLZ1	16K/16K/1M	2+Utopia[4]	64	PCI/HPI 32/16	3	1000	8000[5]	0.44	1.65	1.2	3.3	532 BGA, 23 mm	246.55
TMS320**C6416T**GLZ8	16K/16K/1M	2+Utopia[4]	64	PCI/HPI 32/16	3	850	6800[5]	TBD	TBD	1.2	3.3	532 BGA, 23 mm	191.90
TMS320**C6416TB**GLZ7	16K/16K/1M	2+Utopia[4]	64	PCI/HPI 32/16	3	720	5760[5]	0.44	1.36	1.2	3.3	532 BGA, 23 mm	123.80
TMS320**C6416T**GLZ6	16K/16K/1M	2+Utopia[4]	64	PCI/HPI 32/16	3	600	4800[5]	0.39	1.1	1.1	3.3	532 BGA, 23 mm	104.30
TMS320**C6415TB**GLZ1	16K/16K/1M	2+Utopia[4]	64	PCI/HPI 32/16	3	1000	8000	0.44	1.65	1.2	3.3	532 BGA, 23 mm	219.60
TMS320**C6415TB**GLZ8	16K/16K/1M	2+Utopia[4]	64	PCI/HPI 32/16	3	850	6800	TBD	TBD	1.2	3.3	532 BGA, 23 mm	165.60
TMS320**C6415TB**GLZ7	16K/16K/1M	2+Utopia[4]	64	PCI/HPI 32/16	3	720	5760	0.44	1.36	1.2	3.3	532 BGA, 23 mm	112.50
TMS320**C6415TB**GLZ6	16K/16K/1M	2+Utopia[4]	64	PCI/HPI 32/16	3	600	4800	0.39	1.1	1.1	3.3	532 BGA, 23 mm	90.00
TMS320**C6414TB**GLZ1	16K/16K/1M	3	64	HPI 32/16	3	1000	8000	0.44	1.65	1.2	3.3	532 BGA, 23 mm	207.85
TMS320**C6414TB**GLZ8	16K/16K/1M	3	64	HPI 32/16	3	850	6800	TBD	TBD	1.2	3.3	532 BGA, 23 mm	157.40
TMS320**C6414TB**GLZ7	16K/16K/1M	3	64	HPI 32/16	3	720	5760	0.44	1.36	1.2	3.3	532 BGA, 23 mm	106.95
TMS320**C6414TB**GLZ6	16K/16K/1M	3	64	HPI 32/16	3	600	4800	0.39	1.1	1.1	3.3	532 BGA, 23 mm	85.55

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

[2] 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.

[3] HPI is selectable, 32 bit or 16 bit. [4] UTOPIA pins muxed with a second McBSP.

[5] Plus on-chip Turbo (TCP) and VITERBI (VCP) coprocessors.

Note: Check www.ti.com for extended temperature and packaging options. Additional information on enhanced plastic and HiRel DSP versions is available on page 64.

→ *Silicon*

DaVinci™ Digital Media Processors

Device	CPU	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) Core	I/O	Packaging	100-U Price[1]
TMS320DM6446ZWT	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^{2}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	361 BGA, 16 × 16 mm	43.50
TMS320DM6443ZWT	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^{2}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	361 BGA, 16 × 16 mm	37.40
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^{2}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	37.75
TMS320DM6431ZWT3 TMS320DM6431ZWTQ3[3] TMS320DM6431ZDU3 TMS320DM6431ZDUQ3[3]	C64x+, DaVinci Video	300	64 K	64 K	64 K	1 8-Bit EMIFA, 1 16-Bit DDR2	64 Ch	1 Input	McASP, I^{2}C, 1 UART, 1 McBSP, 1 HECC	10/100 EMAC	Async SRAM, DDR2 SDRAM, NAND Flash	1.2	1.8/ 3.3	361 PBGA 16 × 16 mm 376 BGA 23 × 23 mm	13.10 14.40 13.10 14.40
TMS320DM6433ZWT4 TMS320DM6433ZWT5 TMS320DM6433ZWTQ5[3] TMS320DM6433ZWT6 TMS320DM6433ZDU4 TMS320DM6433ZDU5 TMS320DM6433ZDUQ5[3] TMS320DM6433ZDU6	C64x+, DaVinci Video	400 500 500 600 400 500 500 600	112 K	128 K	64 K	1 8-Bit EMIFA, 1 16-/32-Bit DDR2	64 Ch	1 Output	McASP, 1 McBSP, I^{2}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 PBGA 16 × 16 mm 376 BGA 23 × 23 mm	18.35 19.40 21.60 21.60 18.35 19.40 21.60 21.60
TMS320DM6435ZWT4 TMS320DM6435ZWTQ4[3] TMS320DM6435ZWT5 TMS320DM6435ZWTQ5[3] TMS320DM6435ZWT6 TMS320DM6435ZDU4 TMS320DM6435ZDUQ4[3] TMS320DM6435ZDU5 TMS320DM6435ZDUQ5[3] TMS320DM6435ZDU6	C64x+, DaVinci Video	400 400 500 500 600 400 400 500 500 600	112 K	128 K	64 K	1 8-Bit EMIFA, 1 16-/32-Bit DDR2	64 Ch	1 Input	McASP, I^{2}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 PBGA 16 × 16 mm 376 BGA 23 × 23 mm	18.95 20.10 20.10 22.35 22.35 18.95 20.10 20.10 22.35 22.35
TMS320DM6437ZWT4 TMS320DM6437ZWTQ4[3] TMS320DM6437ZWT5 TMS320DM6437ZWTQ5[3] TMS320DM6437ZWT6 TMS320DM6437ZDU4 TMS320DM6437ZDUQ4[3] TMS320DM6437ZDU5 TMS320DM6437ZDUQ5[3] TMS320DM6437ZDU6	C64x+, DaVinci Video	400 400 500 500 600 400 400 500 500 600	112K	128 K	64 K	1 8-Bit EMIFA, 1 16-/32-Bit DDR2	64 Ch	1 Input, 1 Output	McASP, I^{2}C, 1 HECC, 2 McBSPs[2], 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 PBGA 16 × 16 mm 376 BGA 23 × 23 mm	24.35 25.85 25.85 28.75 28.75 24.35 25.85 25.85 28.75 28.75

[1] Prices are quoted in U.S. dollars and represent year 2008 suggested resale pricing. All prices are subject to change. Customers are advised to obtain the most current and complete pricing information from TI prior to placing orders. TI may verify final pricing prior to accepting any order.
[2] McBSP can be configured as an SPI peripheral
[3] Q designates Q100 automotive reliability.

New devices are listed in red.

DaVinci™ Digital Media Processors (Continued)

Device	CPU	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) Core	I/O	Packaging	100-U Price[1]
TMX320DM6467ZUT	C64x+, ARM9 DaVinci HD Video	594 (DSP) 297 (ARM)	64K (DSP) 56K (ARM)	128K (DSP)	8K (ARM)	1 16-/8-Bit EMIFA, 1 32-/16-Bit DDR2	64 Ch	1 Video Port [config. for dual 8-bit SD (BT.565), single 16-bit HD (BT.1120), or single 8-/10-/12-bit raw capture chs]. 1 Video Port [config. for dual 8-bit SD (BT.565) or single 16-bit HD (BT.1120) display chs]. 2 Transport Stream I/F for MPEG Transport Stream. 1 VDCE for Horz./Vert. Downscaling, Chroma Conversion, Edge Padding & Anti-Alias Filtering	2 McASPs, I^2C, SPI, 3 UARTs (with IrDA and CIR support)	32-Bit PCI (33 MHz), USB 2.0, PHY, VLYNQ, 10/100/1000 EMAC, (w/ MII, GMII, & MDIO support) 32-/16-Bit HPI	Async SRAM, DDR2 SDRAM, Smart Media/ SSFDC/xD, NAND Flash, NOR Flash	1.2	1.8/ 3.3	529 BGA 19 × 19 mm	87.58
TMX320DM355ZCE216 TMX320DM355ZCE270	ARM9, DaVinci Video	216 270	–	–	8K	1 16-/8-Bit EMIFA, 1 16-Bit MDDR/DDR2	64 Ch	1 Input, 1 Output	3 SPI, 2 ASP, 3 UARTs, I^2C	USB 2.0 HS	Async SRAM, MDDR/DDR2 SDRAM, NAND Flash, SmartMedia/xD	1.3	1.8/ 3.3	329 BGA 13 × 13 mm	16.51 19.58
TMS320DM647ZUT7 TMS320DM647ZUT9	C64x+, DaVinci Video	720 900	32K/32K	256K	64K	1 16-/8-Bit EMIFA[2] 1 32-/16-Bit DDR2	64 Ch	5 Video Ports (Each configurable as dual capture, single capture, display, TSI capture)	1 I^2C, 1 SPI, 1 UART, 1 McASP	PCI/HPI, VLYNQ, 10/100/1000 3-pt Ethernet Switch Subsys w/ 1 SGMII Pt	Async SRAM, DDR2 SDRAM, NAND Flash, NOR Flash	1.2/ 1.2	1.8/ 3.3	529 nFBGA 19 × 19 mm	52.33 73.28
TMS320DM648ZUT7 TMS320DM648ZUT9	C64x+, DaVinci Video	720 900	32K/32K	512K	64K	1 16-/8-Bit EMIFA[2] 1 32-/16-Bit DDR2	64 Ch	5 Video Ports (Each configurable as dual capture, single capture, display, TSI capture)	2 I^2C, 1 SPI, 1 UART, 1 McASP 2 TSIP	PCI/HPI, VLYNQ, 10/100/1000 3-pt Ethernet Switch Subsys w/ 2 SGMII Pts	Async SRAM, DDR2 SDRAM, NAND Flash, NOR Flash	1.2/ 1.2	1.8/ 3.3	529 nFBGA 19 × 19 mm	65.43 86.39

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

[2] EMIFA does not support SDRAM.

*New devices are listed in red.*

TMS320C6000™ DSP Platform

→ ## Silicon

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.
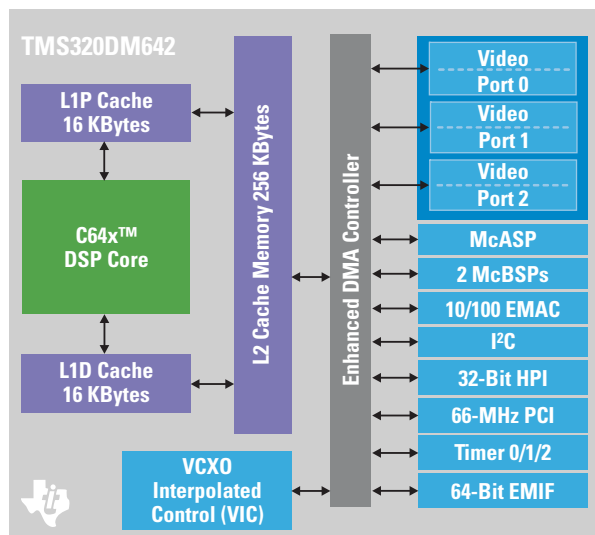
TMS320DM642 DSP Block Diagram
The TMS320DM64x digital media processors give designers the industry's most powerful, flexible and easy-to-use solutions for high-performance digital media applications.

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[2]	Timers	MHz	MIPS	Power (W) CPU and L1[3]	Total[4]	Voltage (V) Core	I/O	Packaging	100-U Price[1]
Video Application Specific														
TMS320**DM640**AGDK4	16K/16K/128K	1 8-bit	2	64	EMAC	3	400	3200	0.66	1.15	1.2	3.3	548 BGA, 23 mm	24.82
TMS320**DM640**AGNZ4	16K/16K/128K	1 8-bit	2	64	EMAC	3	400	3200	0.66	1.15	1.2	3.3	548 BGA, 27 mm	24.82
TMS320**DM641**AGDK5	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	30.59
TMS320**DM641**AGNZ5	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	30.59
TMS320**DM641**AGDK6	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	33.64
TMS320**DM641**AGNZ6	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	33.64
TMS320**DM643**AGDK5	16K/16K/256K	2 20-bit	1	64	HPI 32/EMAC[6]	3	500	4000	0.66	1.30	1.2	3.3	548 BGA, 23 mm	33.99
TMS320**DM643**AGNZ5	16K/16K/256K	2 20-bit	1	64	HPI 32/EMAC[6]	3	500	4000	0.66	1.30	1.2	3.3	548 BGA, 27 mm	33.99
TMS320**DM643**AGDK6	16K/16K/256K	2 20-bit	1	64	HPI 32/EMAC[6]	3	600	4800	0.93	1.90	1.4	3.3	548 BGA, 23 mm	37.20
TMS320**DM643**AGNZ6	16K/16K/256K	2 20-bit	1	64	HPI 32/EMAC[6]	3	600	4800	0.93	1.90	1.4	3.3	548 BGA, 27 mm	37.20
TMS320**DM642**AGDK5	16K/16K/256K	3 20-bit	2[5]	64	PCI/HPI 32/EMAC[6]	3	500	4000	0.66	1.30	1.2	3.3	548 BGA, 23 mm	40.39
TMS320**DM642**AGNZ5	16K/16K/256K	3 20-bit	2[5]	64	PCI/HPI 32/EMAC[6]	3	500	4000	0.66	1.30	1.2	3.3	548 BGA, 27 mm	40.39
TMS320**DM642**AGDK6	16K/16K/256K	3 20-bit	2[5]	64	PCI/HPI 32/EMAC[6]	3	600	4800	0.93	1.90	1.4	3.3	548 BGA, 23 mm	44.44
TMS320**DM642**AGNZ6	16K/16K/256K	3 20-bit	2[5]	64	PCI/HPI 32/EMAC[6]	3	600	4800	0.93	1.90	1.4	3.3	548 BGA, 27 mm	44.44
TMS320**DM642**AGDK7	16K/16K/256K	3 20-bit	2[5]	64	PCI/HPI 32/EMAC[6]	3	720	5760	0.93	2.15	1.4	3.3	548 BGA, 23 mm	62.41
TMS320**DM642**AGNZ7	16K/16K/256K	3 20-bit	2[5]	64	PCI/HPI 32/EMAC[6]	3	720	5760	0.93	2.15	1.4	3.3	548 BGA, 27 mm	62.41

[1] Prices are quoted in U.S. dollars and represent year 2008 suggested resale pricing. All prices are subject to change. Customers are advised to obtain the most current and complete pricing information from TI prior to placing orders. TI may verify final pricing prior to accepting any order.
[2] HPI is selectable, 32-bit or 16-bit.
[3] Assumes 60% CPU utilization.
[4] 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.
[5] The DM642 can be configured to have up to three serial ports in various video/McASP/McBSP combinations.
[6] 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 for extended temperature and packaging options. Additional information on enhanced plastic and HiRel DSP versions is available on page 64.

Digital Signal Processing Selection Guide

TMS320C64x™/TMS320DM64x™/DaVinci™ Hardware and Software Development Tools

Description	Part Number	$U.S.[1]
Hardware Development Tools		
TMS320C6416 DSP Starter Kit (DSK)	TMDSDSK6416-T (U.S. part number)	495
	TMDSDSK6416-TE (European part number)	
Video Security over Internet Protocol Development Platform (VSIP) (NTSC)	TMDXVSK642 (U.S. part number)	15,000
VSIP Development Platform (PAL)	TMDXVSK642-0E (European part number)	
Video Security over IP (VSIP) with ATEME Emulator (NTSC)	TMDXVSK642-3 (U.S. part number)	16,000
Video Security over IP (VSIP) with ATEME Emulator (PAL)	TMDXVSK642-3E (European part number)	
TMS320DM642 Digital Media Development Kit (DM642 DMDK)	TMDSDMK642 (U.S. part number)	6,495
	TMDSDMK642-0E (European part number)	
Evaluation Modules (EVMs)		
TMS320DM6446 Digital Video Evaluation Module (DVEVM)	TMDSEVM6446	2,495
TMS320DM642 Evaluation Module (EVM)	TMDSEVM642 (U.S. part number)	1,995
	TMDSEVM642-0E (European part number)	
TMS320C6424 Evaluation Module (EVM)	TMDXEVM6424	495
TMS320DM6437 Digital Video Development Platform (DVDP)	TMDXVDP6437	495
TMS320DM648 Digital Video Development Platform (DVDP)	TMDXDVP648	1,295
TMS320DM355 Digital Video Evaluation Module (DVEVM)	TMDXEVM355	495
TMS320DM6467 Digital Video Evaluation Module (DVEVM)	TMDXEVM6467	1,995
JTAG Emulators		
Spectrum Digital XDS510PP-Plus Emulator	TMDSEMUPP (U.S. part number)	1,095
Spectrum Digital XDS510PP-Plus Emulator with European Cords	TMDSEMUPP-0E (European part number)	1,095
Spectrum Digital XDS510™ USB Emulator	TMDSEMUUSB	1,495
Blackhawk XDS560™ JTAG PCI Emulator	TMDSEMU560PCI	2,995
Blackhawk XDS560 USB High-Performance JTAG Emulator	TMDSEMU560U	2,999
XDS560 USB Trace Emulator[2]	TMDSEMU560T	9,995
Software Development Tools		
Digital Video Software Production Bundle (DVSPB)	TMDSDVSPBA9-L	6,995
Digital Video Software Production Bundle (DVSPB) + CCStudio IDE and XDS560R Emulator	TMDSDVSPBA9-3L	10,995
Code Composer Studio Platinum v 3.3 Development Tools Bundled with Annual S/W Subscription	TMDSCCSALL-1	3,595
Supports C6000™, C5000™, C2000™, DaVinci™ and OMAP™ processor platforms		
C6000, C5000, C2000, DaVinci and OMAP processor CCStudio Development Tools Annual Software	TMDSSUBALL	600
Subscription for Version 3.10 and higher		
Code Composer Studio IDE Free Evaluation Tools	SPRC119 (www.ti.com/freetools)	Free
Includes C6000, C5000, C2000, DaVinci and OMAP processor CCStudio 120-Day Free Evaluation Tools[3]		
TMS320C6000 DSP Chip Support Library	SPRC090	Free
TMS320C64x™ DSP Library	SPRC092	Free
TMS320C64x DSP Image Library	SPRC094	Free

New tools are listed in bold red.

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

[2] The XDS560 Trace is designed for use with trace-enabled digital signal processors. Currently the following processors are fully supported by trace: TMS320C6418, TMS320C6416T, TMS320C6415T, TMS320C6414T, TMS320C6413, TMS320C6412, TMS320C6411, TMS320C6410, TMS320DM648, TMS320DM647, TMS320DM643, TMS320DM642, TMS320DM641 and TMS320DM640 processors.

[3] Includes full-featured Code Composer Studio Development Tools, code generation tools (C/C++ compiler/assembler/linker) and simulator all limited to 120 days. Please see the tools features matrix on page 60 for more details.

C64x™/DM64x™/DaVinci 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.

TMS320C64x DSP Generation	www.ti.com/c64x	TMS320DM643x DSP Generation	www.ti.com/dm643x
TMS320DM64x DSP Generation	www.ti.com/dm64x	TMS320DM644x DSP Generation	www.ti.com/dm644x

Silicon

TMS320C645x™ DSP Generation, Fixed Point
Highest-Performance DSPs

Get samples, data sheets, tools and app reports at: **www.ti.com/c6000**

Specifications
- TMS320C6455 DSP offers Serial RapidIO® for DSP-to-DSP, DSP-to-switch and DSP-to-FPGA interconnectivity
- TMS320C6452 DSP offers Gigabit Ethernet switch with two EMAC ports for ease of scalability
- Enhanced 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, printing and VoIP infrastructure

Features
- Based on the TMS320C64x+™ core
  - 720 MHz, 850 MHz, 900 MHz, 1 GHz and 1.2 GHz
- Memory
  - 32-KB L1D, 32-KB L1P cache/SRAM
  - Up to 2 MB L2
- Acceleration
  - Viterbi decoder co-processor (VCP)
  - Turbo decoder co-processor (TCP)

Peripherals
- Serial RapidIO: 10-Gb/s full duplex
- Telecom serial interface port (TSIP)
- Other high-bandwidth peripherals: Gigabit Ethernet MAC, UTOPIA, PCI-66, HPI
- Up to two EMIFs: 32-bit DDR2, 64-bit EMIF
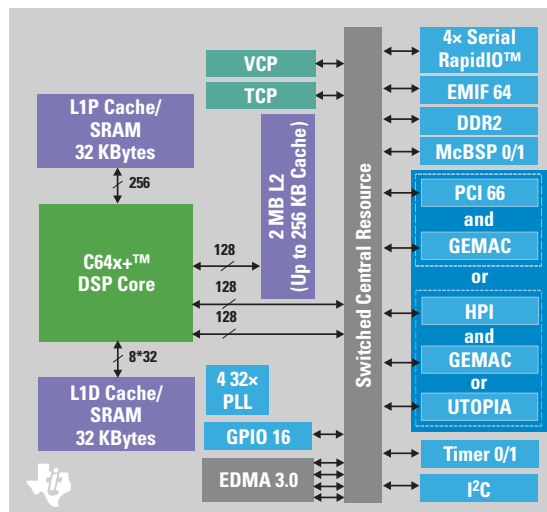
TMS320C6455/TMS320C6454 DSP Block Diagram
Enables high-performance multiprocessing via Serial RapidIO plus other high-bandwidth peripherals, and at 1.2 GHz, it is the world's fastest single-core DSP.

TMS320C64x+ DSP Core Benefits and Features

Benefits	Supporting Architecture Features
20% higher cycle performance improves overall system performance	• Doubled multiplication bandwidth • Instruction set enhancements for FFT, FIR and DCT • EDMA 3.0 engine
20–30% smaller code size reduces system cost	• 16-bit compact instructions • SPLOOP buffer
Enhanced development	• Real-time bandwidth management • Memory protection
Better debug	• Exception handling • Cache coherency visibility
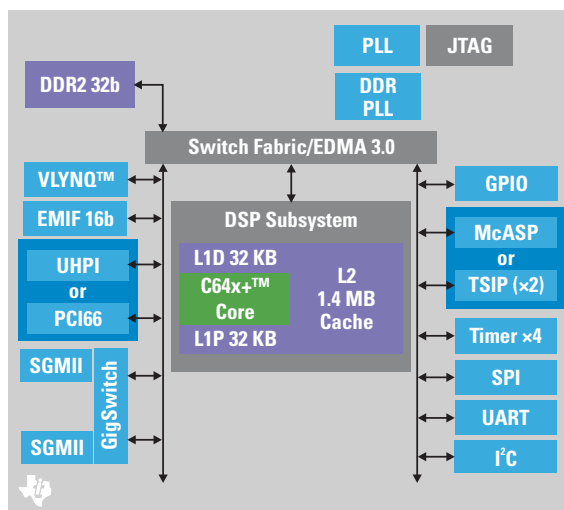
The C6452 DSP provides customers lower system cost by offering a greater channel density and more peripheral integration. The C6452 DSP will be offered at both 900 MHz and 720 MHz.

TMS320C645x DSP Generation – Highest-Performance Fixed-Point DSPs

Part Number	Internal RAM (Bytes) L1 Program Cache/ L1 Data Cache/ L2 Unified RAM/Cache	McASP	McBSP	TSIP	Enhanced DMA (Channels)	COM[3]	Timers	MHz	MIPS	Power (W)[2] Internal Logic	Total	Voltage (V) Core	I/O	Packaging	100-U Price[1]
Highest Performance															
TMS320C6455BZTZ2	32K/32K/2M	–	2+Utopia[4]	–	64	Serial RapidIO®/HPI/ PCI/Gigabit EMAC	2[5]	1200	9600[6]	1.76	2.30	1.25	3.3, 1.8, 1.5, 1.25	697 BGA, 24 mm	320.95
TMS320C6455BZTZ	32K/32K/2M	–	2+Utopia[4]	–	64	Serial RapidIO/HPI/ PCI/Gigabit EMAC	2[5]	1000	8000[6]	1.66	2.19	1.25	3.3, 1.8, 1.5, 1.25	697 BGA, 24 mm	247.66
TMS320C6455BZTZ8	32K/32K/2M	–	2+Utopia[4]	–	64	Serial RapidIO/HPI/ PCI/Gigabit EMAC	2[5]	850	6800[6]	1.41	1.94	1.2	3.3, 1.8, 1.5, 1.2	697 BGA, 24 mm	210.50
TMS320C6455BZTZ7	32K/32K/2M	–	2+Utopia[4]	–	64	Serial RapidIO/HPI/ PCI/Gigabit EMAC	2[5]	720	5760[6]	1.29	1.81	1.2	3.3, 1.8, 1.5, 1.2	697 BGA, 24 mm	178.32
TMS320C6454BZTZ2	32K/32K/1M	–	2	–	64	HPI/PCI/ Gigabit EMAC	2[5]	1200	9600	1.76	2.30	1.25	3.3, 1.8, 1.5, 1.25	687 BGA, 24 mm	247.59
TMS320C6454BZTZ	32K/32K/1M	–	2	–	64	HPI/PCI/ Gigabit EMAC	2[5]	1000	8000	1.66	2.19	1.25	3.3, 1.8, 1.5, 1.25	687 BGA, 24 mm	192.90
TMS320C6454BZTZ8	32K/32K/1M	–	2	–	64	HPI/PCI/ Gigabit EMAC	2[5]	850	6800	1.41	1.94	1.2	3.3, 1.8, 1.5, 1.2	687 BGA, 24 mm	150.58
TMS320C6454BZTZ7	32K/32K/1M	–	2	–	64	HPI/PCI/ Gigabit EMAC	2[5]	720	5760	1.29	1.81	1.2	3.3, 1.8, 1.5, 1.2	687 BGA, 24 mm	123.14
TMS320C6452ZUT9	32K/32K/1.4M	1	–	2	64	2×SGMII/Gigabit EMAC Switch/UHPI/PCI/VLYNQ	4[5]	900	7200	TBD	TBD	1.2	3.3, 1.8	529 BGA, 19 mm	155.89
TMS320C6452ZUT7	32K/32K/1.4M	1	–	2	64	2×SGMII/Gigabit EMAC Switch/UHPI/PCI/VLYNQ	4[5]	720	5760	TBD	TBD	1.2	3.3, 1.8	529 BGA, 19 mm	123.14

New devices are listed in red.

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

[2] Assumes the following conditions: 60% CPU utilization; DDR2 at 50% utilization (250 MHz); 50% writes, 32 bits, 50% bit switching; two 2-MHz McBSPs at 100% utilization, 50% switching; two 75-MHz timers at 100% utilization; device configured for HPI32 mode with pull-up resistors on HPI pins; room temperature (25°C). See SPRAAE8 for TMS320C6455 and TMS320C6454 DSPs. See SPRAAR5 for TMS320C6452 DSPs.

[3] HPI is selectable, 32 bit or 16 bit. [4] UTOPIA pins muxed with a second McBSP.

[5] 64-bit configurable timers. [6] Plus on-chip Turbo (TCP) and VITERBI (VCP) coprocessors.

Note: Check www.ti.com for extended temperature and packaging options. Additional information on enhanced plastic and HiRel DSP versions is available on page 64.

C645x DSP Generation Hardware and Software Development Tools

Description	Part Number	$U.S.[1]
Hardware Development Tool		
TMS320C6455 DSP Starter Kit (DSK)	TMDSDSK6455	595
Evaluation Module (EVM)		
TMS320C6455 DSP Evaluation Module with SRIO	TMDXEVM6455 (U.S. part number)	1,795
TMS320C6452 DSP Evaluation Module	TMDXEVM6452	1,295
JTAG Emulators		
Spectrum Digital XDS510PP-Plus Emulator	TMDSEMUPP (U.S. part number)	1,095
Spectrum Digital XDS510PP-Plus Emulator with European Cords	TMDSEMUPP-0E (European part number)	1,095
Spectrum Digital XDS510™ USB Emulator	TMDSEMUUSB	1,495
Blackhawk XDS560™ JTAG PCI Emulator	TMDSEMU560PCI	2,995
Blackhawk XDS560 USB High-Performance JTAG Emulator	TMDSEMU560U	2,999
XDS560 USB Trace Emulator[2]	TMDSEMU560T	9,995
Software Development Tools		
Code Composer Studio™ (CCStudio) 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
Code Composer Studio IDE Free Evaluation Tools Includes C6000, C5000, C2000, DaVinci and OMAP processor CCStudio 120-Day Free Evaluation Tools[3]	SPRC119 (www.ti.com/freetools)	Free
TMS320C6000 DSP Chip Support Library	SPRC090	Free

New tools are listed in red.

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

[2] The XDS560 Trace is designed for use with trace-enabled digital signal processors. The following processors are fully supported by trace: TMS320C6452, TMS320C6454 and TMS320C6455 DSPs.

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

TMS320C6000™ DSP Platform

Silicon

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

High-Performance DSPs

Get samples, data sheets, tools and app reports at: **www.ti.com/c6000**

Features

- 100% code-compatible DSPs priced as low as U.S. $5.75 in 10 KU quantities
- 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

- 16-bit multiply, 32-bit instruction
- Up to 7-Mbit on-chip memory
- 32-bit PCI interface (TMS320C6205 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
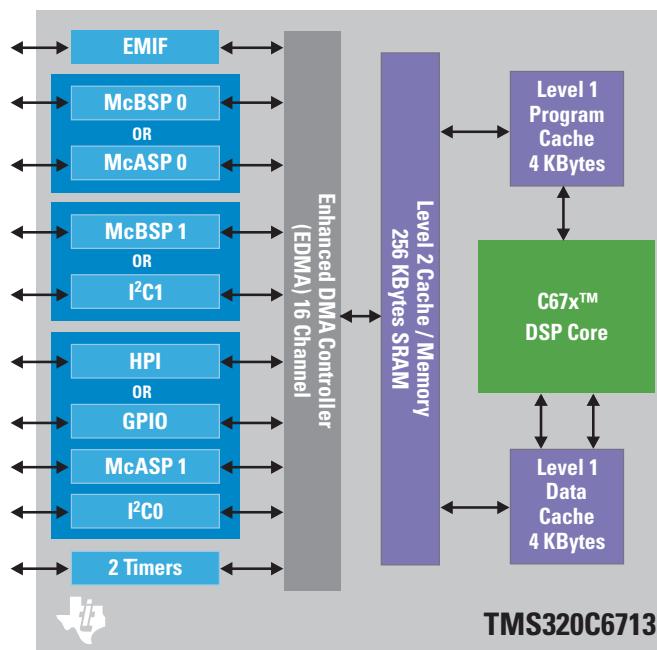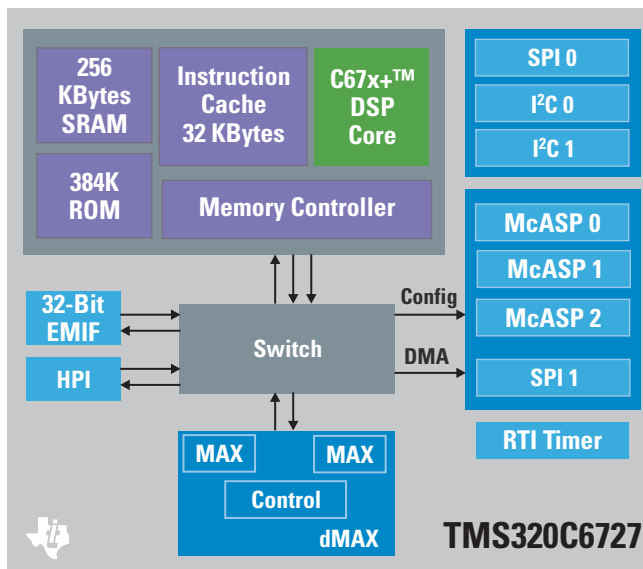
TMS320C6713

TMS320C6727 and TMS320C6713 DSP Block Diagrams
TI's floating-point DSPs are ideal for applications that require high precision and/or dynamic range such as 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.

TMS320C67x™ DSP Generation – Floating-Point DSPs

Device	RAM (Bytes) Data/Prog	McBSP	McASP	DMA	COM	SPI/ I²C	MHz	Cycle (ns)	MFLOPS	Typical Activity Total Internal Power (W) (Full Device Speed)	Voltage (V) Core	I/O	Packaging	100-U Price[1]
TMS320**C6720**RFP200[5]	32K/64K/384K[2]	—	2	dMAX	—	2/2	200	5	1200	0.8	1.2	3.3	144 PQFP, 22 mm	7.53
TMS320**C6722B**RFP200[4,5]	32K/128K/384K[7]	—	2	dMAX	—	2/2	200	5	1200	0.8	1.2	3.3	144 PQFP, 22 mm	11.14
TMSD**C6722B**RFPA225[4,5,6]	32K/128K/384K[7]	—	2	dMAX	—	2/2	225	4.4	1350	0.9	1.2	3.3	144 PQFP, 22 mm	12.95
TMS320**C6722B**RFP250[4,5]	32K/128K/384K[7]	—	2	dMAX	—	2/2	250	4	1500	0.9	1.2	3.3	144 PQFP, 22 mm	12.95
TMS320**C6726B**RFP225[4,5]	32K/256K/384K[7]	—	3[8]	dMAX	—	2/2	225	4.4	1350	0.9	1.2	3.3	144 PQFP, 22 mm	13.89
TMS320**C6712D**GDP150	4K/4K/64K[2]	2	—	16[3]	—	—	150	6.7	900	0.7	1.2	3.3	272 BGA, 27 mm	15.16
TMS320**C6726B**RFP266	32K/256K/384K[7]	—	3[8]	dMAX	—	2/2	266	3.75	1600	0.8	1.2	3.3	144 PQFP, 22 mm	16.68
TMS320**C6711D**GDP200	4K/4K/64K[2]	2	—	16[3]	HPI/16	—	200	5	1200	0.9	1.2	3.3	272 BGA, 27 mm	18.00
TMS320**C6711D**ZDP200	4K/4K/64K[2]	2	—	16[3]	HPI/16	—	200	5	1200	0.9	1.26	3.3	272 BGA, 27 mm	18.00
TMS320**C6711D**GDP250	4K/4K/64K[2]	2	—	16[3]	HPI/16	—	250	4	1500	0.9	1.4	3.3	272 BGA, 27 mm	19.40
TMS320**C6711D**ZDP250	4K/4K/64K[2]	2	—	16[3]	HPI/16	—	250	4	1500	0.9	1.4	3.3	272 BGA, 27 mm	19.40
TMS320**C6727B**ZDH275[4,5]	32K/256K/384K[7]	—	3	dMAX	UHPI	2/2	275	3.63	1650	1.0	1.2	3.3	256 BGA, 17 mm	21.05
TMS320**C6713B**PYP200	4K/4K/256K[2]	2[9]	2[9]	16[3]	HPI/16	—	200	5	1200	1.0	1.2	3.3	208 TQFP, 28 mm	21.10
TMS320**C6713B**PYPA167[6]	4K/4K/256K[2]	2[9]	2[9]	16[3]	HPI/16	—	167	5.99	1002	0.9	1.2	3.3	208 TQFP, 28 mm	21.10
TMS32**C6711D**GDPA167[6]	4K/4K/64K[2]	2	—	16[3]	HPI/16	—	200	5	1200	0.9	1.26	3.3	272 BGA, 27 mm	22.45
TMS32**C6711D**ZDPA167[6]	4K/4K/64K[2]	2	—	16[3]	HPI/16	—	150	6.7	900	0.7	1.26	3.3	272 BGA, 27 mm	22.45
TMSD**C6727B**ZDHA250[5,6,10]	32K/256K/384K[7]	—	3	dMAX	UHPI	2/2	250	4	1500	1	1.2	3.3	256 BGA, 17 mm	23.80
TMS320**C6727B**ZDH300[4,5,10]	32K/256K/384K[7]	—	3	dMAX	UHPI	2/2	300	3.3	1800	1.1	1.2	3.3	256 BGA, 17 mm	23.80
TMS32**C6713B**PYPA200[6]	4K/4K/256K[2]	2[9]	2[9]	16[3]	HPI/16	—	200	5	1200	1	1.2	3.3	208 TQFP, 28 mm	25.20
TMS320**C6713B**ZDPA200[6]	4K/4K/256K[2]	2[9]	2[9]	16[3]	HPI/16	—	200	5	1200	0.9	1.2/1.26	3.3	208 TQFP, 28 mm	25.20
TMS32**C6713B**GDP225	4K/4K/256K[2]	2[9]	2[9]	16[3]	HPI/16	—	225	4.4	1350	1.1	1.2	3.3	272 BGA, 27 mm	27.65
TMS32C6713BGDPA200[6]	4K/4K/256K[2]	2[9]	2[9]	16[3]	HPI/16	—	200	5	1200	0.9	1.2	3.3	272 BGA, 27 mm	28.15
TMS320C6727BZDH350[5]	32K/256K/384K[2]	—	3	dMAX	UHPI	2/2	350	2.86	2100	1.5	1.4	3.3	256 BGA, 17 mm	32.50
TMS320C6713BGDP300	4K/4K/256K[2]	2[9]	2[9]	16[3]	HPI/16	—	300	3.3	1800	1.6	1.4	3.3	272 BGA, 27 mm	36.60

[1] Prices are quoted in U.S. dollars and represent year 2008 suggested resale pricing. All prices are subject to change. Customers are advised to obtain the most current and complete pricing information from TI prior to placing orders. TI may verify final pricing prior to accepting any order.
[2] Format represents cache memory architecture: [data cache] / [program cache] / [unified cache].
[3] Enhanced DMA.
[4] Extended temperature versions available for C6722, C6726, C6727, C6713, C6711D DSPs.
[5] RFP and ZDH packages are Pb-Free.
[6] The "A" designation is for industrial temperature range.
[7] Format represents program cache/program or data memory/ROM.
[8] McASP2 DIT only.

[9] 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 I²C and additional GPIO.
[10] Also available in 256-pin BGA, 17-mm (GDH) package.
Note: All devices include two timers.
Note: Check www.ti.com for extended temperature and packaging options. Additional information on enhanced plastic and HiRel DSP versions is available on page 64.

TMS320C62x™/C67x™ 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	www.ti.com/c62x	TMS320C67x DSP Generation	www.ti.com/c67x

Silicon, Tools and Software

TMS320C62x™ DSP Generation – Fixed-Point DSPs

Part Number	RAM (Bytes)		McBSP	DMA	COM	MHz	Cycle (ns)	MIPS	Typical Activity Total Internal Power (W) (Full Device Speed)	Voltage (V)		Packaging	100-U Price[1]
	Data	Prog								Core	I/O		
TMS320**C6204**GHK200[2]	64K	64K	2	4	Exp. Bus/32	200	5	1600	0.8	1.5	3.3	288 BGA, 16 mm	11.20
TMS320**C6204**GLW200	64K	64K	2	4	Exp. Bus/32	200	5	1600	0.8	1.5	3.3	340 BGA, 18 mm	25.39
TMS320**C6205**GHK200[2]	64K	64K	2	4	PCI/32	200	5	1600	0.8	1.5	3.3	288 BGA, 16 mm	12.09
TMS320**C6211B**GFN150[2]	4K/4K/64K[3]		2	16[4]	HPI/16	150	6.7	1200	0.9	1.8	3.3	256 BGA, 27 mm	26.13
TMS320**C6211B**GFN167	4K/4K/64K[3]		2	16[4]	HPI/16	167	6	1336	1.0	1.8	3.3	256 BGA, 27 mm	32.67
TMS320**C6202B**GNZ250[2]	128K	256K	3	4	Exp. Bus/32	250	4	2000	0.9	1.5	3.3	352 BGA, 27 mm	67.90
TMS320**C6202B**GNY250	128K	256K	3	4	Exp. Bus/32	250	4	2000	0.9	1.5	3.3	384 BGA, 18 mm	67.90
TMS320**C6202B**GNZ300	128K	256K	3	4	Exp. Bus/32	300	3.3	2400	1.0	1.5	3.3	352 BGA, 27 mm	81.75
TMS320**C6202B**GNY300	128K	256K	3	4	Exp. Bus/32	300	3.3	2400	1.0	1.5	3.3	384 BGA, 18 mm	81.75
TMS320**C6203B**GNZ300	512K	384K	3	4	Exp. Bus/32	300	3.3	2400	1.3	1.5	3.3	352 BGA, 27 mm	81.75
TMS320**C6203B**GNY300	512K	384K	3	4	Exp. Bus/32	300	3.3	2400	1.3	1.5	3.3	384 BGA, 18 mm	86.91
TMS320**C6203B**GNZ250	512K	384K	3	4	Exp. Bus/32	250	4	2000	1.3	1.5	3.3	352 BGA, 27 mm	86.91
TMS320**C6203B**GNZ173[2]	512K	384K	3	4	Exp. Bus/32	173	5.78	1384	1.1	1.5[5]	3.3	352 BGA, 27 mm	73.33
TMS320**C6203B**GNY173	512K	384K	3	4	Exp. Bus/32	173	5.78	1384	1.1	1.5[5]	3.3	384 BGA, 18 mm	73.33
TMS320**C6201**GJC200[2]	64K	64K	2	4	HPI/16	200	5	1600	1.3	1.8	3.3	352 BGA, 35 mm	100.36
TMS320**C6201**GJL200[2]	64K	64K	2	4	HPI/16	200	5	1600	1.3	1.8	3.3	352 BGA, 27 mm	100.36

[1] Prices are quoted in U.S. dollars and represent year 2008 suggested resale pricing. All prices are subject to change. Customers are advised to obtain the most current and complete pricing information from TI prior to placing orders. TI may verify final pricing prior to accepting any order. [2] Extended temperature versions available for C6201, C6202, C6203, C6204, C6205 and C6211 DSPs for additional charge.
[3] The C6211 DSPs 72 KBytes of cache memory is comprised of 4 KBytes data cache, 4 KBytes program cache and 64 KBytes unified cache memory. [4] Enhanced DMA.
[5] Device may operate at 300 MHz with 1.7-V core. Note: All devices include two timers.
Note: Check www.ti.com for extended temperature and packaging options. Additional information on enhanced plastic and HiRel DSP versions is available on page 64.

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

Description	Part Number	$U.S.[1]
Hardware Development Tools		
TMS320C6713 DSP Starter Kit (DSK)	TMDSDSK6713 (U.S. part number)	395
	TMDSDSK6713-0E (European part number)	
Professional Audio Development Kit (PADK) Evaluation Module	TMDSPDK6727	1,495
Professional Audio Development Bundle – includes PADK + CCStudio IDE and XDS560™ USB Emulator	TMDXPDB6727	5,995
JTAG Emulators		
Spectrum Digital XDS510PP-Plus Emulator	TMDSEMUPP (U.S. part number)	1,095
Spectrum Digital XDS510PP-Plus Emulator with European Cords	TMDSEMUPP-0E (European part number)	1,095
Spectrum Digital XDS510™ USB Emulator	TMDSEMUUSB	1,495
Blackhawk XDS560™ JTAG PCI Emulator	TMDSEMU560PCI	2,995
Blackhawk XDS560 USB High-Performance JTAG Emulator	TMDSEMU560U	2,999
Software Development Tools		
Code Composer Studio™ (CCStudio) 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
Code Composer Studio IDE Free Evaluation Tools Includes C6000, C5000, C2000, DaVinci and OMAP processor CCStudio 120-Day Free Evaluation Tools[2]	SPRC119 (www.ti.com/freetools)	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

[1] Prices are quoted in U.S. dollars and represent year 2008 suggested resale pricing. All prices are subject to change. Customers are advised to obtain the most current and complete pricing information from TI prior to placing orders. TI may verify final pricing prior to accepting any order.
[2] Includes full-featured Code Composer Studio Development Tools, code generation tools (C/C++ compiler/assembler/linker) and simulator all limited to 120 days.
Please see the features supported by platform matrix on page 60 for more details.

## Power Management Products for the C6000™ DSP Platform

Get samples, data sheets, Evaluation Modules (EVMs) and app reports at: **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	Multiple-Output Converter
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
									TPS54386
	6 A	TPS75901	TPS40009		TPS54610	TPS54550	PTH04T230		
12 V	3 A		TPS40190	TPS40200	TPS54350	TPS54350	PTH08T260		TPS5124
									TPS54386
	6 A		TPS40190		TPS54550	TPS54550	PTH08T230		TPS5124
24 V	3 A		TPS40057	TPS40200		TPS5430*	PTN78020*	PTB78560*	TPS54386
	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
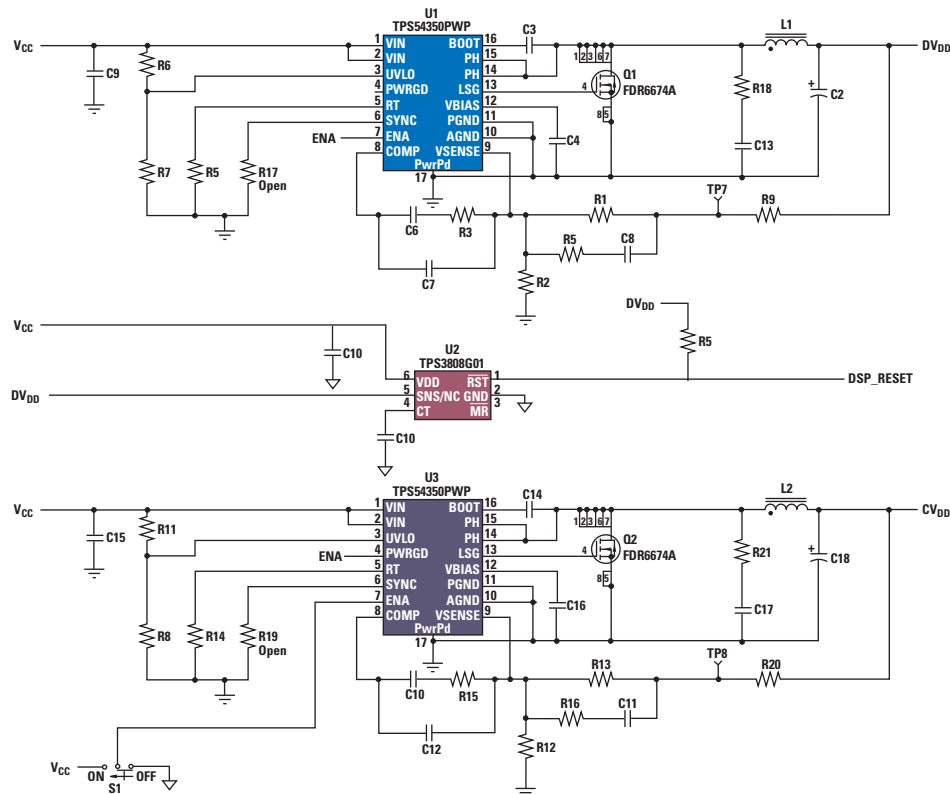
For additional power supply designs for TI DSPs, please visit **www.ti.com/processorpower**.

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

DaVinci Digital Media Technology

Digital Media Processors

Get samples, data sheets, tools and app reports at: **www.ti.com/davinci**

Targeted Applications
- Automotive infotainment
- Automotive video sensing
- Automotive vision
- Broadcast systems
- Cable head-end video equipments (routers)
- Digital camcorders
- Digital still cameras
- Digital media adapters
- Digital photo frames
- Digital TV and server head-ends
- Digital video recorders
- IP network cameras
- IP-based video-conferencing end-points
- IP-based video phones
- IP set-top boxes
- Hard-copy appliances
- Machine vision
- Media encoder/decoder appliances
- Media gateways
- Medical imaging
- Personal video recorders
- Portable media players
- Professional-grade video broadcast equipment
- Robotics
- Security recording systems
- Streaming video appliances
- Video broadcast transcoding
- Video-conferencing, multi-point conference units (MCUs)/gateways
- Video infrastructure
- Video jukeboxes
- Digital video security recorders (DVRs)
- Video surveillance cameras
- Webpads
- Wireless cameras

DaVinci Processors: Tuned for Digital Video End Equipments

DaVinci Processor	CPU	MHz	Capture/Display
DM355*	ARM926**	216, 270	Capture/Display
DM6467	C64x+™/ARM926†	600/300	Capture/Display
DM648	C64x+	720, 900	Capture/Display
DM647	C64x+	720, 900	Capture/Display
DM6446*	C64x+/ARM926	600/300	Capture/Display
DM6443	C64x+/ARM926	600/300	Display
DM6441*	C64x+/ARM926	512/256	Capture/Display
DM6437	C64x+	400, 500, 600	Capture/Display
DM6435	C64x+	400, 500, 600	Capture
DM6433	C64x+	400, 500, 600	Display
DM6431	C64x+	300	Capture

*Includes video imaging co-processor.
**Includes MPEG-4/JPEG co-processor.
†Includes DaVinci high-definition video/imaging co-processor.

DaVinci Technology Overview

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

DaVinci Processors Reduce System Cost

The portfolio of DaVinci processors consists of scalable, programmable signal-processing system on chips (SoCs), accelerators and peripherals, optimized to match the price, performance and feature requirements for a broad spectrum of video end equipments. The DaVinci technology portfolio includes:

- **TMS320DM644x digital media processors** – Highly integrated SoCs based on an ARM926 processor and the TMS320C64x+™ DSP core. The TMS320DM6446, TMS320DM6443 and TMS320DM6441 processors are ideal for applications and end equipments such as video phones, automotive infotainment and IP set-top boxes (STBs).

- **TMS320DM643x digital media processors** – Based on the C64x+ DSP core and priced as low as U.S. $9.95*. The TMS320DM6437, TMS320DM6435, TMS320DM6433 and TMS320DM6431 processors are ideal for cost-sensitive applications and include special features that make them suitable for automotive market applications such as lane departure and collision avoidance, as well as machine-vision systems, robotics and video security.

- **TMS320DM647/TMS320DM648 digital media processors** – Optimized for multi-channel video security and infrastructure applications, including digital video recorders (DVRs), IP video servers, machine-vision systems and high-performance imaging applications. The DM647 and DM648 digital media processors are fully programmable and offer industry-leading performance for the most demanding streaming multimedia applications.

*Pricing valid at 10 KU

DaVinci

DaVinci Technology Overview (Continued)

- **TMS320DM6467 digital media processor** – DSP-based system-on-chips (SoCs) specifically tuned for real-time, multi-format, HD video transcoding at 10× the performance and 1/10th the price. The DM6467 consists of an integrated ARM926EJ-S core, C64x+™ DSP core, High-Definition Video/Imaging Co-Processors (HD-VICP), video data conversion engine and targeted video port interfaces. The DM6467 processor is specifically designed to address the HD transcoding challenge for

commercial and consumer markets, such as media gateways, multi-point control units, digital media adapters, digital video servers and recorders for the security market and IP set-top boxes.

- **TMS320DM355 digital media processor** – This processor includes an integrated video processing subsystem, an MPEG-4/ JPEG co-processor plus an ARM926 processor and is available in clock speeds of 216 MHz or 270 MHz. The DM355 processor is optimized for

targeted end equipments such as video doorbells, baby monitors, digital cameras and wireless IP network cameras. Driving the market growth for next-generation, portable, high-definition (HD) video products, this digital media processor is priced as low as U.S. $9.75** and provides HD video performance and double the battery life of today's comparable portable products.

**Pricing valid at 50 KU

Complete System Tools Get You to Market Faster

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

- **Digital Video Evaluation Module (DVEVM)** – DVEVMs are comprised of both hardware and software, and enable developers to start instantaneous evaluation of DaVinci processors. DVEVMs come complete with a demo version of MontaVista Linux Pro 4.0, drivers, Codec Engine, evaluation codecs and an evaluation board. While customers developing on an ARM926 processor can go into production with a DVEVM, it is not recommended or supported by TI. Customers developing on a DSP will require a DVSPB (see description below) in order to go into production. Available DVEVMs:
  - TMS320DM6446 DVEVM (part number TMDSEVM6446)
  - TMS320DM355 DVEVM (part number TMDXEVM355)
  - TMS320DM6467 DVEVM (part number TMDXEVM6467)

- **Digital Video Software Production Bundle (DVSPB)** – DVSPBs come complete with drivers, Codec Engine, evaluation codecs and a production license for MontaVista Linux Pro 4.0, plus one year of MontaVista Zone access with updates. DVSPBs do not contain a hardware board. A DVSPB is recommended, coupled with a DVEVM, as a must-have for TI-supported ARM926 processor production design. Available DVSPBs:
  - **Linux System DVSPB** (part number TMDSDVSPBA9-L) – includes everything listed above
  - **DSP + Linux System DVSPB** (part number TMDSDVSPBA9-3L) – includes everything listed above, plus Code Composer Studio™ (CCStudio) integrated development environment (IDE) version 3.3 and Spectrum Digital XDS560™ emulator

- **Digital Video Development Platform (DVDP)** – A DVDP enables immediate evaluation of DSP-based DaVinci technology digital media processors. DVDPs include DSP/BIOS™ production-ready kernel, drivers, Codec Engine, evaluation codecs, Code Composer Studio IDE and an evaluation board. A DVDP provides developers with a comprehensive platform that can be used throughout the entire design process. A DVDP is recommended for TMS320DM6437 and TMS320DM648 customers only. Available DVDPs:
  - TMS320DM6437 DVDP (part number TMDXVDP6437)
  - TMS320DM648 DVDP (part number TMDSDVP648)

For a complete list of DaVinci development tools, see page 77. Or for more information on DaVinci technology DVEVMs, DVSPBs and DVDPs, please visit **www.ti.com/davincitools**.

Software/Resources

Complete System Tools Get You to Market Faster (Continued)

Code Composer Studio™ Integrated Development Environment

The Code Composer Studio (CCStudio) IDE offers robust, mature core functions with easy-to-use configuration and graphical visualization tools for faster system design.

- The CCStudio IDE integrates everything programmers need for application development from start to finish. The CCStudio Platinum Edition (version 3.3) simplifies this process by offering a fully merged IDE that supports the DaVinci processor platform as well as other TI DSP platforms. Free 120-day evaluation tools that include the CCStudio IDE are available.

For more information on the Code Composer Studio IDE, visit **www.ti.com/ccstudio**.

eXpressDSP™ Digital Media Software Simplifies Development and Reduces Design Time

eXpressDSP Digital Media Software

To simplify development and reduce cost in your digital media application, a complete portfolio of eXpressDSP-compliant digital media software is now widely available. TI digital media software is:

- Production tested for easy integration

into audio, video and voice applications
- Optimized to support DaVinci technology-based digital media processors
- Designed to meet the needs of engineers by allowing them to focus on product differentiation instead of codec development
- Available via free 60-day evaluation with multiple licensing options
- Fully supported by Authorized Software Providers that give customized technical support

Available Codecs

H.263	H.264	MPEG-4	MPEG-2	JPEG
AAC+	AC3	G.723.1	G.729ab	G.726
G.711	MP3	WMA9	WMV9/VC1	

Customized Technical Support for eXpressDSP Digital Media Software Provided by Authorized Software Providers

To ensure extensive and qualified support, TI has established a worldwide network of ASPs that offer support for TI-enabled IP and customized software and engineering services. ASPs provide four hours of free support during the free 60-day evaluation stage and up to 40 hours during application development.

For more information on ASPs, please visit **www.ti.com/asp**.

Authorized Software Providers by Region

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

A Comprehensive Developer Network Makes DaVinci Technology Easy to Implement

Valued members of TI's Developer Network provide integral components and tools that

complement DaVinci technology. Developers offer various levels of video system integration, optimization and system expertise on DaVinci products worldwide.

For a complete list of developers supporting DaVinci technology, please visit the TI Developer Network Catalog at **www.ti.com/developernetwork**.

TEXAS INSTRUMENTS
DaVinci
Developer Network

A Variety of Resources Keep You in the Know

DaVinci Technology Webcasts
View the archive of TI on-demand DaVinci webcasts to learn how to accelerate and simplify your video system design. Designed for 24/7 access, these webcasts typically last one hour. Visit **www.ti.com/davinciwebcasts**.

DaVinci Video Casts: Engineering in Front of the Camera
Whether you have two minutes or two hours, a variety of DaVinci technology videos are available for on-demand viewing. These four-minute videos provide engineers the technical meat on the TMS320DM355 and TMS320DM6467 DaVinci processor products, tools and software. Check out the line-up at **www.ti.com/dm355videocasts** or **www.ti.com/dm6467videocasts**.

DaVinci Technology Training
Get hands-on experience on DaVinci technology through on-line training, one-day and multi-day workshops. Check **www.ti.com/davincitraining** for the next workshop near you, as well as 24/7 on-line training and webcasts.

- Introduction to DaVinci Technology On-Line Training – **www.ti.com/davinciolt**
- DM6467 DaVinci Processor for HD Transcoding – **www.ti.com/dm6467olt**
- DaVinci Technical Seminar – **www.ti.com/davinciseminar**
- TMS320DM6437 One-Day Workshop – **www.ti.com/dm6437odw**
- TMS320DM644x Multi-Day Workshop – **www.ti.com/dm644xmdw**

DaVinci White Papers and Articles
Download the 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**.

DaVinci Technology FAQs
Have questions about DaVinci technology? Browse the DaVinci questions and answers to find out everything you need to know about DaVinci processors, development tools, applications frameworks, training and support at **www.ti.com/davincifaq**.

Delve Into Digital Video with Video360 Podcasts
The Video360 podcasts feature industry news, technology updates and practical tips regarding the latest innovations in digital video. Check out the archive at **www.ti.com/davincipodcast**.

CD-ROM Provides Comprehensive View of DaVinci Technology
This highly informative CD includes numerous white papers, FAQs, technical specifications, benchmarks, information about podcasts, important Web links, TI Developer Network support and much more. Get your free copy now at **www.ti.com/davincicd**.

Additional Web Links and Community Resources

- **linux.davincidsp.com** – Here engineers can find open source files related to DaVinci and join the DaVinci Linux Open Source mailing list for discussions.
- **wiki.davincidsp.com** – The DaVinci Technology Developers Wiki was established to assist developers taking advantage of DaVinci processors to get started, help each other innovate and to foster the growth of general knowledge about the hardware and software surrounding these devices.
- **www.ti.com/dspdesignsupport** – DSP Design Support provides quick access to all technical documentation, tools and software details – all from one page.

Silicon

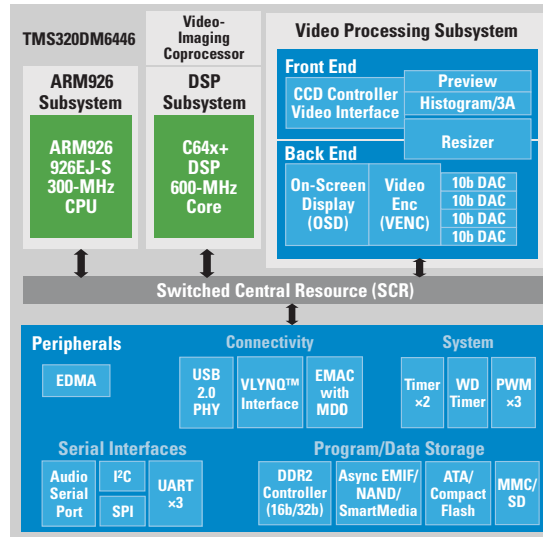### TMS320DM644x Digital Media Processors

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 and IP STBs.

Device	CPU	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) Core	I/O	Packaging	100-U Price[1]
TMS320**DM6446**ZWT	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^{2}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	361 BGA, 16 × 16 mm	43.50
TMS320**DM6443**ZWT	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^{2}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	361 BGA, 16 × 16 mm	37.40
TMS320**DM6441**ZWT	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^{2}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	37.75

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

TMS320DM6446 digital media processor block diagram. For more information, visit www.ti.com/dm644x

Development Tools for TMS320DM644x Processors

Description	Part Number	$U.S.[1]
For Evaluation:		
TMS320DM644x Digital Video Evaluation Module (DVEVM)*	TMDSEVM6446 (U.S. part number)	2,495
Code Composer Studio™ (CCStudio) Integrated Development Environment (IDE)*	TMDSCCSALL-1	3,595[2]
Blackhawk XDS560™ JTAG PCI Emulator (optional)	TMDSEMU560PCI	2,995
Blackhawk XDS560 JTAG USB Emulator (optional)	TMDSEMU560U	2,999
For Production:		
Digital Video Software Production Bundle (DVSPB)[3]* MontaVista Pro Software and TI DVSDK	TMDSDVSPBA9-L	6,995
Digital Video Software Production Bundle (DVSPB) MontaVista Pro Software and TI DVSDK, CCStudio IDE + XDS560R Emulator	TMDSDVSPBA9-3L	10,995
Code Composer Studio IDE*	TMDSCCSALL-1	3,595[2]
Blackhawk XDS560 JTAG PCI Emulator (optional)	TMDSEMU560PCI	2,995
Blackhawk XDS560 JTAG USB Emulator (optional)	TMDSEMU560U	2,999

[1] Prices are quoted in U.S. dollars and represent year 2008 suggested resale pricing. All prices are subject to change. Customers are advised to obtain the most current and complete pricing information from TI prior to placing orders. TI may verify final pricing prior to accepting any order.
[2] Free trial version of Code Composer Studio IDE available as part of the free evaluation tools found at www.ti.com/ccstudiofet
[3] Requires prior purchase of DVEVM

* Required for digital media software evaluation and/or production

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.

Device	CPU	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) Core	Voltage (V) I/O	Packaging	100-U Price[1]
TMS320DM6431ZWT3	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	1.2	1.8/ 3.3	361 PBGA 16 × 16 mm 376 BGA 23 × 23 mm	13.10
TMS320DM6431ZWTQ3[2]															14.40
TMS320DM6431ZDU3															13.10
TMS320DM6431ZDUQ3[2]															14.40
TMS320DM6433ZWT4	C64x+, DaVinci Video	400	112 K	128 K	64 K	1 8-Bit EMIFA, 1 16-/32-Bit DDR2	64 Ch	1 Output	McASP, 1 McBSP, I2C, 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 PBGA 16 × 16 mm	18.35
TMS320DM6433ZWT5		500													19.40
TMS320DM6433ZWTQ5[2]		500													21.60
TMS320DM6433ZWT6		600													21.60
TMS320DM6433ZDU4		400												376 BGA 23 × 23 mm	18.35
TMS320DM6433ZDU5		500													19.40
TMS320DM6433ZDUQ5[2]		500													21.60
TMS320DM6433ZDU6		600													21.60
TMS320DM6435ZWT4	C64x+, DaVinci Video	400	112 K	128 K	64 K	1 8-Bit EMIFA, 1 16-/32-Bit DDR2	64 Ch	1 Input	McASP, I2C, 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 PBGA 16 × 16 mm	18.95
TMS320DM6435ZWTQ4[2]		400													20.10
TMS320DM6435ZWT5		500													20.10
TMS320DM6435ZWTQ5[2]		500													22.35
TMS320DM6435ZWT6		600													22.35
TMS320DM6435ZDU4		400												376 BGA 23 × 23 mm	18.95
TMS320DM6435ZDUQ4[2]		400													20.10
TMS320DM6435ZDU5		500													20.10
TMS320DM6435ZDUQ5[2]		500													22.35
TMS320DM6435ZDU6		600													22.35
TMS320DM6437ZWT4	C64x+, DaVinci Video	400	112K	128 K	64 K	1 8-Bit EMIFA, 1 16-/32-Bit DDR2	64 Ch	1 Input, 1 Output	McASP, I2C, 1 HECC, 2 McBSPs[3], 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 PBGA 16 × 16 mm	24.35
TMS320DM6437ZWTQ4[2]		400													25.85
TMS320DM6437ZWT5		500													25.85
TMS320DM6437ZWTQ5[2]		500													28.75
TMS320DM6437ZWT6		600													28.75
TMS320DM6437ZDU4		400												376 BGA 23 × 23 mm	24.35
TMS320DM6437ZDUQ4[2]		400													25.85
TMS320DM6437ZDU5		500													25.85
TMS320DM6437ZDUQ5[2]		500													28.75
TMS320DM6437ZDU6		600													28.75

[1] Prices are quoted in U.S. dollars and represent year 2008 suggested resale pricing. All prices are subject to change. Customers are advised to obtain the most current and complete pricing information from TI prior to placing orders. TI may verify final pricing prior to accepting any order.
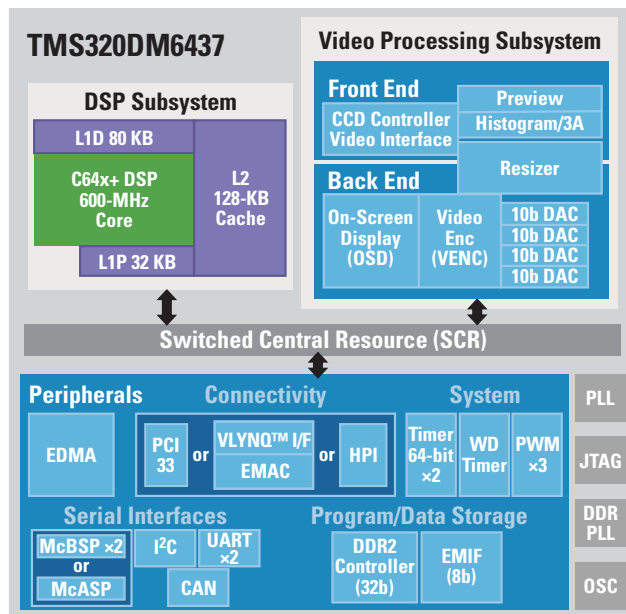[2] Q designates Q100 automotive reliability.
[3] McBSP can be configured as an SPI peripheral

New devices are listed in red.

Silicon

TMS320DM643x Digital Media Processors (Continued)

TMS320DM6437 digital media processor block diagram For more information, visit **www.ti.com/dm643x**

TMS320DM6437

DSP Subsystem
- L1D 80 KB
- C64x+ DSP 600-MHz Core
- L2 128-KB Cache
- L1P 32 KB

Video Processing Subsystem
- **Front End**
  - CCD Controller Video Interface
  - Preview
  - Histogram/3A
- **Back End**
  - Resizer
  - On-Screen Display (OSD)
  - Video Enc (VENC)
  - 10b DAC
  - 10b DAC
  - 10b DAC
  - 10b DAC

Switched Central Resource (SCR)

Peripherals | **Connectivity** | **System**
- EDMA
- PCI 33 or VLYNQ™ I/F EMAC or HPI
- Timer 64-bit ×2 | WD Timer | PWM ×3
- PLL
- JTAG
- DDR PLL
- OSC

Serial Interfaces | **Program/Data Storage**
- McBSP ×2 or McASP
- I²C
- UART ×2
- CAN
- DDR2 Controller (32b)
- EMIF (8b)

Development Tools for TMS320DM643x Processors

Description	Part Number	$U.S.[1]
For Evaluation and Production:		
TMS320DM6437 Digital Video Development Platform (DVDP)*	TMDXVDP6437	495
Code Composer Studio™ Integrated Development Environment (IDE)*	TMDSCCSALL-1	3,595[2]
Blackhawk XDS560™ JTAG PCI Emulator (optional)	TMDSEMU560PCI	2,995
Blackhawk XDS560 JTAG USB Emulator (optional)	TMDSEMU560U	2,999

[1] Prices are quoted in U.S. dollars and represent year 2008 suggested resale pricing. All prices are subject to change. Customers are advised to obtain the most current and complete pricing information from TI prior to placing orders. TI may verify final pricing prior to accepting any order.
[2] Free trial version of Code Composer Studio IDE available as part of the free evaluation tools found at www.ti.com/ccstudiofet
* Required for digital media software evaluation and/or production
Please see the features supported by platform matrix on page 60 for more details.

TMS320DM647/TMS320DM648 Digital Media Processors

TMS320DM647/TMS320DM648 digital media processors are based on the TMS320C64x+™ DSP core and are optimized for multi-channel video security and infrastructure applications, inclu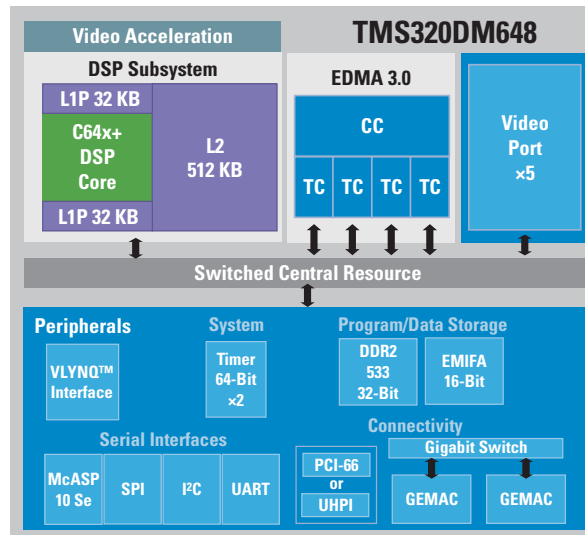ding digital video recorders (DVRs), IP video servers, machine-vision systems and high-performance imaging applications.

Device	CPU	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) Core	I/O	Packaging	100-U Price[1]
TMS320DM647ZUT7 TMS320DM647ZUT9	C64x+, DaVinci Video	720 900	32K/32K	256K	64K	1 16-/8-Bit EMIFA[2] 1 32-/16-Bit DDR2	64 Ch	5 Video Ports (Each configurable as dual capture, single capture, display, TSI capture)	1 I²C, 1 SPI, 1 UART, 1 McASP	PCI/HPI, VLYNQ™, 10/100/1000 3-pt Ethernet Switch Subsys w/ 1 SGMII Pt	Async SRAM, DDR2 SDRAM, NAND Flash, NOR Flash	1.2/ 1.2	1.8/ 3.3	529 nFBGA 19 × 19 mm	52.33 73.28
TMS320DM648ZUT7 TMS320DM648ZUT9	C64x+, DaVinci Video	720 900	32K/32K	512K	64K	1 16-/8-Bit EMIFA[2] 1 32-/16-Bit DDR2	64 Ch	5 Video Ports (Each configurable as dual capture, single capture, display, TSI capture)	2 I²C, 1 SPI, 1 UART, 1 McASP 2 TSIP	PCI/HPI, VLYNQ, 10/100/1000 3-pt Ethernet Switch Subsys w/ 2 SGMII Pts	Async SRAM, DDR2 SDRAM, NAND Flash, NOR Flash	1.2/ 1.2	1.8/ 3.3	529 nFBGA 19 × 19 mm	65.43 86.39

[1] Prices are quoted in U.S. dollars and represent year 2008 suggested resale pricing. All prices are subject to change. Customers are advised to obtain the most current and complete pricing information from TI prior to placing orders. TI may verify final pricing prior to accepting any order.
[2] EMIFA does not support SDRAM.

New devices are listed in red.

TMS320DM648 digital media processor block diagram. For more information, visit **www.ti.com/dm64x**

Development Tools for TMS320DM647/DM648 Processors

Description	Part Number	$U.S.[1]
For Evaluation and Production:		
TMS320DM648 Digital Video Development Platform (DVDP)*	TMDXDVP648	1,295
Code Composer Studio™ Integrated Development Environment (IDE)*	TMDSCCSALL-1	3,595[2]
Blackhawk XDS560™ JTAG PCI Emulator (optional)	TMDSEMU560PCI	2,995
Blackhawk XDS560 JTAG USB Emulator (optional)	TMDSEMU560U	2,999
XDS560 USB Trace Emulator[3]	TMDSEMU560T	9,995

[1] Prices are quoted in U.S. dollars and represent year 2008 suggested resale pricing. All prices are subject to change. Customers are advised to obtain the most current and complete pricing information from TI prior to placing orders. TI may verify final pricing prior to accepting any order.
[2] Free trial version of Code Composer Studio IDE available as part of the free evaluation tools found at www.ti.com/ccstudiofet
[3] The XDS560 Trace is designed for use with trace-enabled digital signal processors. Currently the following processors are fully supported by trace: TMS320DM647 and TMS320DM648 processors.
* Required for digital media software evaluation and/or production
Please see the features supported by platform matrix on page 60 for more details.

DaVinci™ Digital Media Technology

Silicon

TMS320DM6467 Digital Media Processor

The DM6467 DaVinci processor is a DSP-based SoC specifically tuned for real-time, multi-format, high-definition (HD) video transcoding delivering a 10× performance impro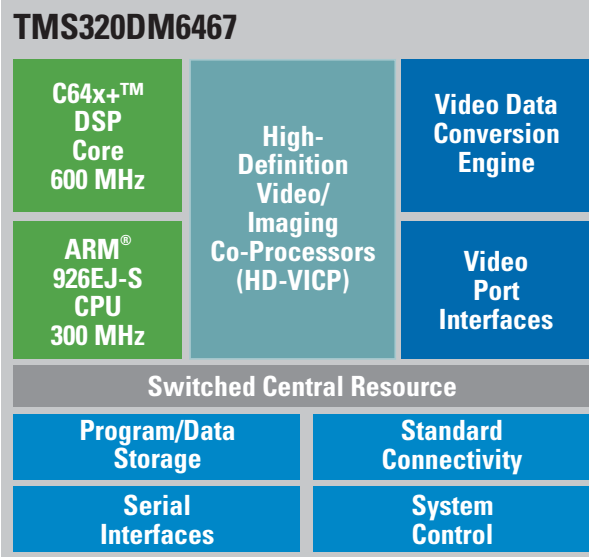vement over previous-generation processors to perform simultaneous, multi-format HD encode, decode and transcoding up to H.264 HP@L4 (1080p 30 fps, 1080i 60 fps, 720p 60 fps). Key application areas include media gateways, multi-point control units, digital media adapters, digital video servers and recorders for the security market and IP set-top boxes (STBs).

Device	CPU	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) Core	I/O	Packaging	100-U Price[1]
TMX320DM6467ZUT	C64x+, ARM9 DaVinci HD Video	594 (DSP) 297 (ARM)	64 K (DSP) 56 K (ARM)	128 K (DSP)	8 K (ARM)	1 16-/8-Bit EMIFA, 1 32-/16-Bit DDR2	64 Ch	1 Video Port [config. for dual 8-bit SD (BT.565), single 16-bit HD (BT.1120), or single 8-/10-/12-bit raw capture chs]. 1 Video Port [config. for dual 8-bit SD (BT.565) or single 16-bit HD (BT.1120) display chs]. 2 Transport Stream I/F for MPEG Transport Stream. 1 VDCE for Horz./Vert. Downscaling, Chroma Conversion, Edge Padding, Anti-Alias Filtering	2 McASPs, I2C, SPI, 3 UARTs (with IrDA and CIR support)	32-Bit PCI (33 MHz), USB 2.0, PHY, VLYNQ™, 10/100/1000 EMAC, (w/ MII, GMII, & MDIO support) 32-/16-Bit HPI	Async SRAM, DDR2 SDRAM, Smart Media/ SSFDC/xD, NAND Flash, NOR Flash	1.2	1.8/ 3.3	529 BGA 19 × 19 mm	87.58

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

New devices are listed in red.

TMS320DM6467 digital media processor block diagram. For more information, visit
www.ti.com/dm6467

Development Tools for the TMS320DM6467 Processor

Description	Part Number	$U.S.[1]
For Evaluation:		
TMS320DM6467 Digital Video Evaluation Module (DVEVM)*	TMDXEVM6467	1,995
Code Composer Studio™ (CCStudio) Integrated Development Environment (IDE)*	TMDSCCSALL-1	3,595[2]
Blackhawk XDS560™ JTAG PCI Emulator (optional)	TMDSEMU560PCI	2,995
Blackhawk XDS560 JTAG USB Emulator (optional)	TMDSEMU560U	2,999
For Production:		
Digital Video Software Production Bundle (DVSPB)[3]* MontaVista Pro Software and TI DVSDK	TMDSDVSPBA9-L	6,995
Digital Video Software Production Bundle (DVSPB) MontaVista Pro Software and TI DVSDK, CCStudio IDE + XDS560R Emulator	TMDSDVSPBA9-3L	10,995
Code Composer Studio™ IDE*	TMDSCCSALL-1	3,595[2]
Blackhawk XDS560 JTAG PCI Emulator (optional)	TMDSEMU560PCI	2,995
Blackhawk XDS560 JTAG USB Emulator (optional)	TMDSEMU560U	2,999

[1] Prices are quoted in U.S. dollars and represent year 2008 suggested resale pricing. All prices are subject to change. Customers are advised to obtain the most current and complete pricing information from TI prior to placing orders. TI may verify final pricing prior to accepting any order.
[2] Free trial version of Code Composer Studio IDE available as part of the free evaluation tools found at www.ti.com/ccstudiofet
[3] Requires prior purchase of DVEVM
* Required for digital media software evaluation and/or production
Please see the features supported by platform matrix on page 60 for more details.

WHITE PAPERS AND RESOURCES

Texas Instruments
DaVinci

Learn about all the possibilities of a whole new world enabled by digital media 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

DaVinci Technology Training

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

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

Silicon

TMS320DM355 Digital Media Processor

Optimized for HD video, the TMS320DM355 digital media processor achieves its impressive performance by integrating a video/imaging co-processor to enable ultra-low power consumption. The DM355 processor comp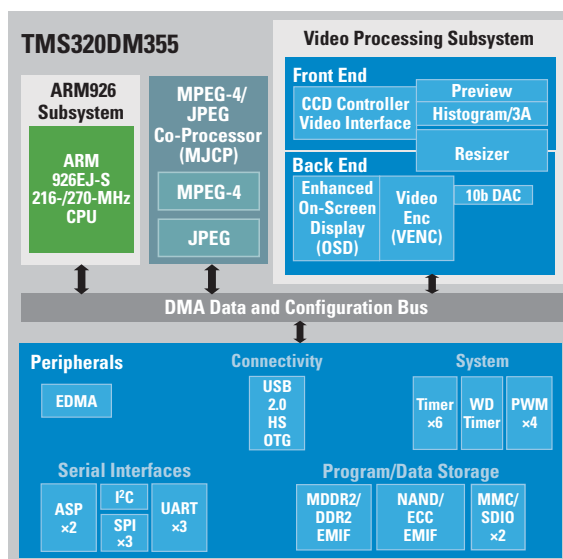rises an integrated video processing subsystem, an MPEG-4/JPEG co-processor (MJCP), an ARM926 processor and peripherals. This latest processor utilizes DaVinci technology and is tuned for applications such as digital cameras, wireless IP video cameras, digital photo frames and video baby monitors.

Other applications that will benefit from implementing the DM355 digital media processor include commercial products, such as medical imaging, ultra-low-cost digital video recorders and portable test equipment.

Device	CPU	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) Core	I/O	Packaging	100-U Price[1]
TMX320DM355ZCE216 TMX320DM355ZCE270	ARM9, DaVinci Video	216 270	–	–	8 K	1 16-/8-Bit EMIFA, 1 16-Bit MDDR/DDR2	64 Ch	1 Input, 1 Output	3 SPI, 2 ASP, 3 UARTs, I2C	USB 2.0 HS	Async SRAM, MDDR/DDR2 SDRAM, NAND Flash, SmartMedia/xD	1.3	1.8/ 3.3	329 BGA 13 × 13 mm	14.25 16.90

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

New devices are listed in red.

TMS320DM355 digital media processor block diagram. For more information, visit www.ti.com/dm355

Development Tools for the TMS320DM355 Processor

Description	Part Number	$U.S.[1]
For Evaluation:		
TMS320DM355 Digital Video Evaluation Module (DVEVM)*	TMDXEVM355	495
Code Composer Studio™ (CCStudio) Integrated Development Environment (IDE)*	TMDSCCSALL-1	3,595[2]
Blackhawk XDS560™ JTAG PCI Emulator (optional)	TMDSEMU560PCI	2,995
Blackhawk XDS560 JTAG USB Emulator (optional)	TMDSEMU560U	2,999
For Production:		
Digital Video Software Production Bundle (DVSPB)[3]* MontaVista Pro Software and TI DVSDK	TMDSDVSPBA9-L	6,995
Digital Video Software Production Bundle (DVSPB) MontaVista Pro Software and TI DVSDK, CCStudio IDE + XDS560R Emulator	TMDSDVSPBA9-3L	10,995
Code Composer Studio™ IDE*	TMDSCCSALL-1	3,595[2]
Blackhawk XDS560 JTAG PCI Emulator (optional)	TMDSEMU560PCI	2,995
Blackhawk XDS560 JTAG USB Emulator (optional)	TMDSEMU560U	2,999

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

[2] Free trial version of Code Composer Studio IDE available as part of the free evaluation tools found at www.ti.com/ccstudiofet

[3] Requires prior purchase of DVEVM

* Required for digital media software evaluation and/or production

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.
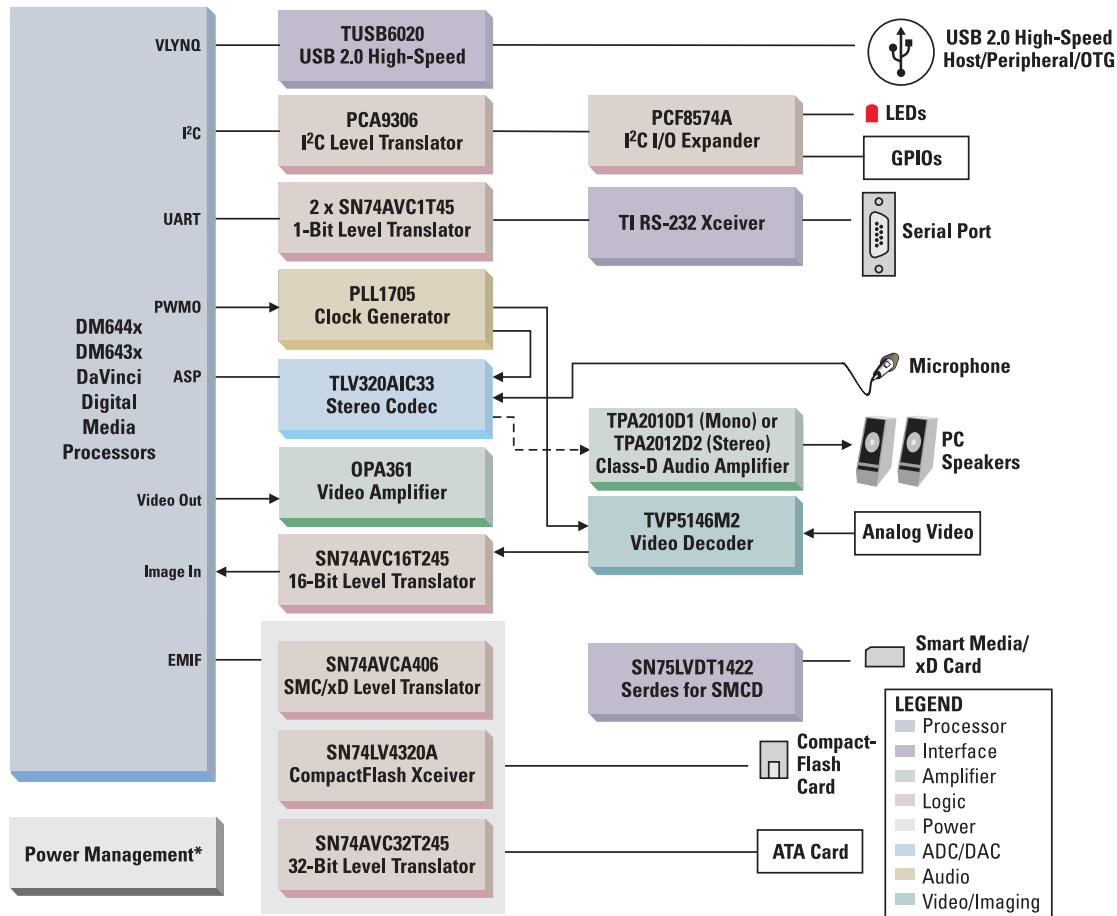
TI offers a broad range of compatible Analog products to complement the Digital Video Evaluation Module (DVEVM).

OMAP™ Applications Processors

Silicon

OMAP™ Platform

System-Level Applications Processors

Get samples, data sheets, tools and app reports at: www.omap.com

Applications
- Portable media players (PMPs)
- Portable navigation devices (PNDs)
- Advanced portable consumer electronics
- Digital video cameras
- Portable data collection
- Point of sale (POS)
- Gaming
- Web tablets
- Medical
- Smart white goods
- Smart home controllers
- Low-cost PCs
- And more….

Key Features
- Highest-performance ARM® core
  - Up to 600-MHz Cortex™-A8 with 256-KB L2 cache
- Low power
  - Clock gating and integrated sleep modes reduce power without loss of performance
  - SmartReflex technology and dynamic voltage frequency scaling
- Scalable roadmap for enhanced graphics and video
  - Cortex-A8 core and multimedia rich peripherals: USB 2.0, UART, MMC/SD, display, camera interface
  - Graphics accelerator with software library for 3D graphics
  - TMS320C64x+™ DSP and hardware video accelerator with DaVinci™ software
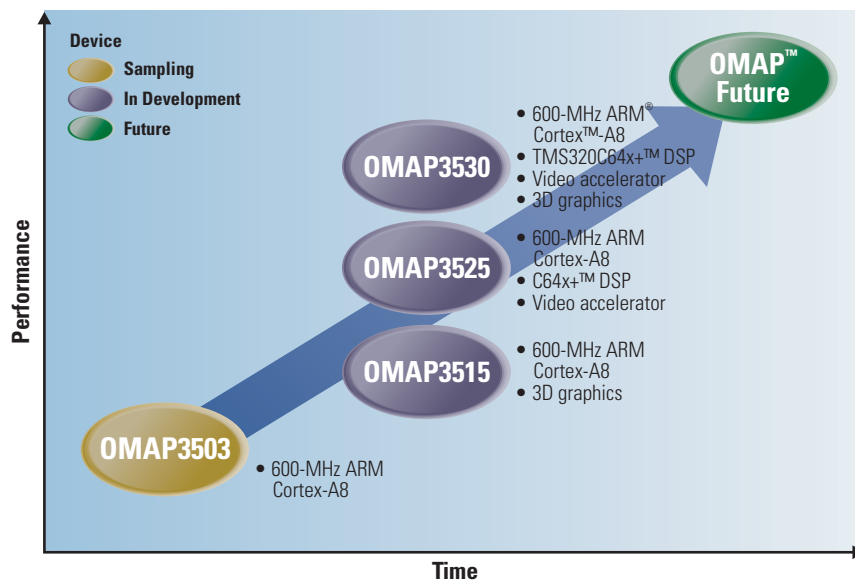
OMAP Platform Roadmap
The scalable OMAP roadmap offers a variety of combination options including the Cortex-A8 core, multimedia rich peripherals, accelerators and TMS320C64x+ DSP to address customer's needs for increased graphics, web browsing capabilities and other market demands.
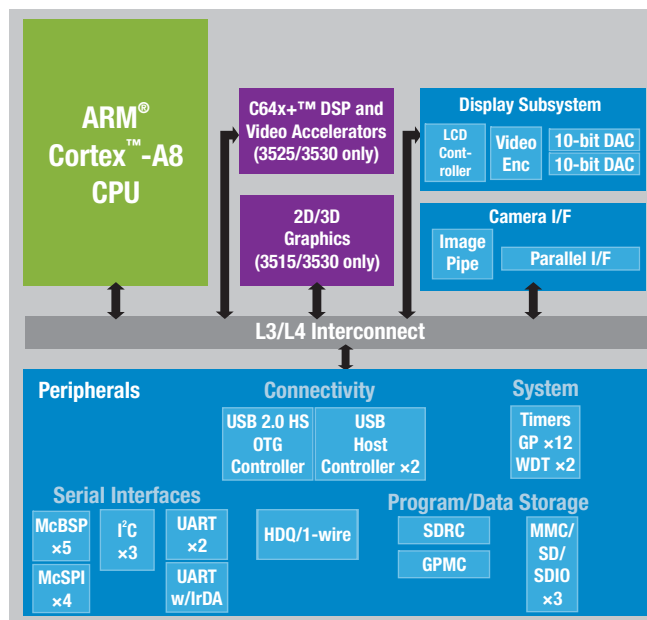
OMAP35x Block Diagram
The OMAP3503 processor includes a Cortex-A8 core with integrated peripherals and is sampling today. The Cortex-A8 superscalar processor provides more than a 4× performance lift over the ARM9. At more than 1200 Dhrystone MIPS, the Cortex-A8 can run operating systems such as Windows® CE and Linux.

OMAP

OMAP Platform

OMAP Processors Turn Everyday Products into New Ways to Work, Socialize and Entertain

Targeting applications such as portable navigation devices, Internet appliances, portable media players and personal medical equipment, TI's new scalable OMAP platform offers four distinct single-chip processors with a variety of combinations of the Cortex™-A8 core, multimedia rich peripherals, OPENGL® ES 2.0-compatible graphics engine and DaVinci™ technology for applications wanting to incorporate video. The OMAP35x applications processors are pin-for-pin compatible to make it easy for OEMs to efficiently create a complete product portfolio based on the single platform.

Complete Hardware, Software and Tools Solution

The modular and extensible OMAP35x Evaluation Module (EVM) provides all the components needed to begin developing today on the OMAP3503 processor. This EVM includes a complementary, integrated power management and analog solution specifically for OMAP. The modular design allows you to easily upgrade to future devices. Included with the EVM is the OMAP3503 Linux board support package based on the 2.6.22 kernel. A Windows® CE

BSP will be available for developers in 3Q08 and open source software will be available for the OMAP platform later this year.
- OMAP35x Evaluation Module (EVM) available today
  - Hardware:
    – OMAP35x processor
    – 128-MB LPDDR
    – 128-MB OneNAND™ Flash
    – Touchscreen LCD display with landscape/portrait modes
    – Expansion connector provides flexible interface capability
  - Emulator support: TI XDS560™
- Software
  - OMAP3503 Linux BSP:
    – Kernel 2.6.22
    – Peripheral drivers
    – U-boot for boot loading
    – Busybox-based root file system
  - Open source development tools
  - Reference schematics
- Connectivity
  - Daughter card connectivity
  - Ethernet, USB 2.0, SDIO, I^{2}C, JTAG, keypad
  - CompactFlash™, SD/MMC, DDR
  - S-Video output via NTSC/PAL and YPbPr/RGB

www.ti.com/omap35x

Extensive Developer Network Support

Additional applications expertise and support is available from the more than 400 members of the OMAP Developer Network to help customers take their designs from concept to production as quickly as possible.
www.ti.com/omap35x

OMAP35x On-Line Videos

Get an inside technical look at the new OMAP35x generation of processors' hardware, software and an internal perspective on the possibilities for this uniquely compelling generation of OMAP processors.
www.ti.com/omap35xvideos

OMAP35x Technical Webcast

View the on-line presentation to learn more about TI's four new OMAP processors with an unprecedented combination of high performance and low power for automotive infotainment, consumer, medical, industrial and embedded applications.
www.ti.com/omap35xwebcast

OMAP35x Tech Docs CD-ROM

Register to receive the OMAP35x Technical Documentation CD-ROM complete with data sheets, user's guides and errata.
www.ti.com/omap35xcd

Silicon and Tools

OMAP Applications Processors

Part Number	CPU	Frequency (MHz)*	L1P (Bytes)	L1D (Bytes)	L2 (Bytes)	RAM (Bytes)	ROM (Bytes)	External Memory I/F	DMA	Timers	Serial Ports	Misc	Voltage (V) Core*	I/O	Packaging	100-U Price[1]
OMAP3530	C64x+™	430	32K	32K + 48K SRAM	64K + 32K shared RAM		16K	LPDDR,	64 Ch	12 GP, 2 WDT	5 McBSP, 4 McSPI, 3 I²C, 1 HS USB OTG, 1 HS USB Host (3 port), 1 HDQ/1-Wire, 3 UART (1 IrDA+CIS)	HW video accelerator, NEON coprocessor, Graphic accelerator, LCD, TV out, Camera I/F, MMU, 3 MMC/SD/SDIO, 196 GPIO (shared)	1.35	1.8/ 3.3	0.4 mm 515-pin pBGA (12mm×12mm) 0.65 mm 423-pin pBGA (16mm×16mm)	2H08
	ARM Cortex-A8	600	16K	16K	256K	64K	112K	SDRAM, DDR1, SRAM, NOR, NAND, OneNAND	32 Ch							
OMAP3525	C64x+	430	32K	32K + 48K SRAM	64K + 32K shared RAM		16K	LPDDR,	64 Ch	12 GP, 2 WDT	5 McBSP, 4 McSPI, 3 I²C, 1 HS USB OTG, 1 HS USB Host (3 port), 1 HDQ/1-Wire, 3 UART (1 IrDA+CIS)	HW video accelerator, NEON coprocessor, LCD, TV out, Camera I/F, MMU, 3 MMC/SD/SDIO, 196 GPIO (shared)	1.35	1.8/ 3.3	0.4 mm 515 pin pBGA (12mm×12mm) 0.65 mm 423 pin pBGA (16mm×16mm)	2H08
	ARM Cortex-A8	600	16K	16K	256K	64K	112K	SDRAM, DDR1, SRAM, NOR, NAND, OneNAND	32 Ch							
OMAP3515	ARM Cortex-A8	600	16K	16K	256K	64K	112K	LPDDR, SDRAM, DDR1, SRAM, NOR, NAND, OneNAND	64 Ch 32 Ch	12 GP, 2 WDT	5 McBSP, 4 McSPI, 3 I²C, 1 HS USB OTG, 1 HS USB Host (3 port), 1 HDQ/1-Wire, 3 UART (1 IrDA+CIS)	NEON coprocessor, Graphic accelerator, LCD, TV out, Camera I/F, MMU, 3 MMC/SD/SDIO, 196 GPIO (shared)	1.35	1.8/ 3.3	0.4 mm 515-pin pBGA (12mm×12mm) 0.65 mm 423-pin pBGA (16mm×16mm)	2H08
OMAP3503	ARM Cortex-A8	600	16K	16K	256K	64K	112K	LPDDR, SDRAM, DDR1, SRAM, NOR, NAND, OneNAND	64 Ch 32 Ch	12 GP, 2 WDT	5 McBSP, 4 McSPI, 3 I²C, 1 HS USB OTG, 1 HS USB Host (3 port), 1 HDQ/1-Wire, 3 UART (1 IrDA+CIS)	NEON coprocessor, LCD, TV out, Camera I/F, MMU, 3 MMC/SD/SDIO, 196 GPIO (shared)	1.35	1.8/ 3.3	0.4 mm 515-pin pBGA (12mm×12mm) 0.65 mm 423-pin pBGA (16mm×16mm)	26.13

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

New devices are listed in red.

OMAP Applications Processor Hardware and Software Development Tools

Description	Part #	$U.S.[1]
Evaluation Module (EVM)		
OMAP35x Evaluation Module	TMDXEVM3503 (U.S. part number)	1,499
JTAG Emulators		
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
Software Development Tools		
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

[1] Prices are quoted in U.S. dollars and represent year 2008 suggested resale pricing. All prices are subject to change. Customers are advised to obtain the most current and complete pricing information from TI prior to placing orders. TI may verify final pricing prior to accepting any order.
[2] 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.

New tools are shown in red.

Power Management Products for the OMAP3503 and OMAP3515 Applications Processors

Get samples, data sheets, Evaluation Modules (EVMs) and app reports at: **power.ti.com**

The TPS62350 is a high frequency synchronous step-down DC/DC converter optimized for portable applications that use the OMAP3503 and OMAP3515 processors. Intended for low-power operation, the TPS62350 supports up to 800-mA load current and allows the use of tiny, low-cost inductors and capacitors.

The TPS62350 operates at a 3-MHz fixed switching frequency, and enters into a power-save-mode operation at light-load currents to maintain high efficiency over the entire load current range. The device's serial interface is compatible with fast/standard and high-speed mode I^2C specification, allowing transfers at up to 3.4 Mbps.
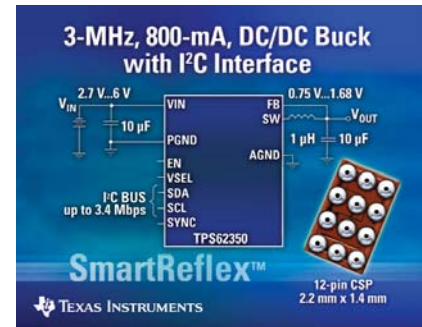
Example OMAP3503/OMAP3515 Processor Power Supply Design
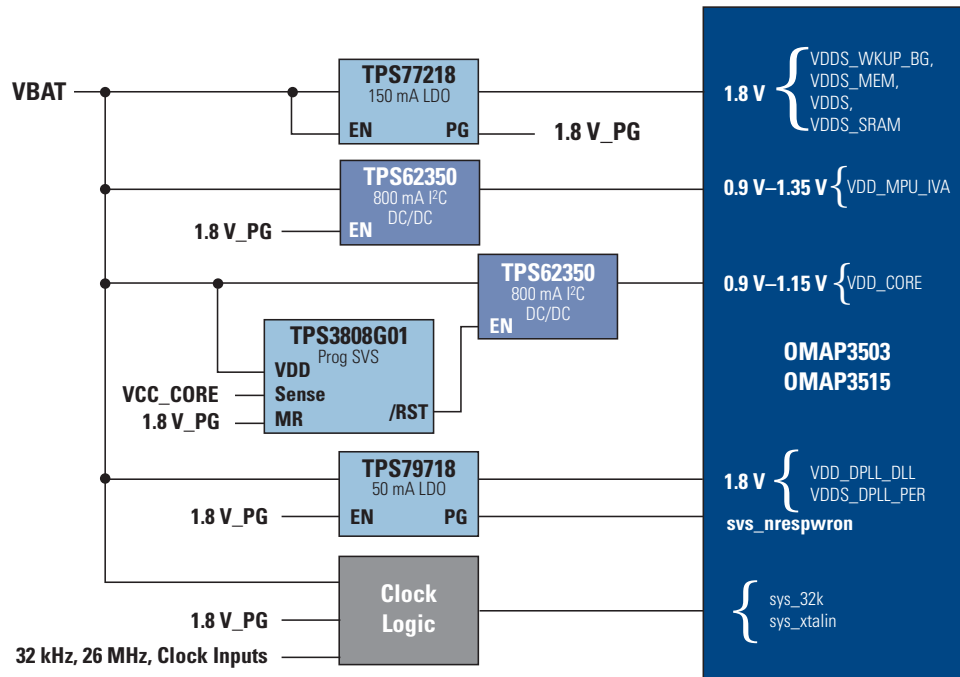
For additional power supply designs for TI processors, please visit **www.ti.com/processorpower**.

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

MSP430 Microcontrollers
Ultra-Low-Power, Easy-to-Use, 16-Bit RISC Microcontrollers

Get samples, data sheets, tools and app reports at: **www.ti.com/msp430**

Key Applications
- Utility metering
- Portable medical and instrumentation
- Low-power wireless applications
- Intelligent sensing
- Consumer electronics
- Security systems

Key Features
- **16-bit RISC CPU** enables new applications at a fraction of the code size
- **Ultra-low-power** architecture and flexible clock system extends battery life:
  - 0.1-µA RAM retention
  - 0.8-µA real-time clock mode
  - 250-µA/MIPS active
- **Integrated intelligent peripherals** including a wide range of high-performance analog and digital peripherals offload the CPU
- **Easy to get started:** Complete development tools starting at only U.S. $20 with integrated development environments available free of charge
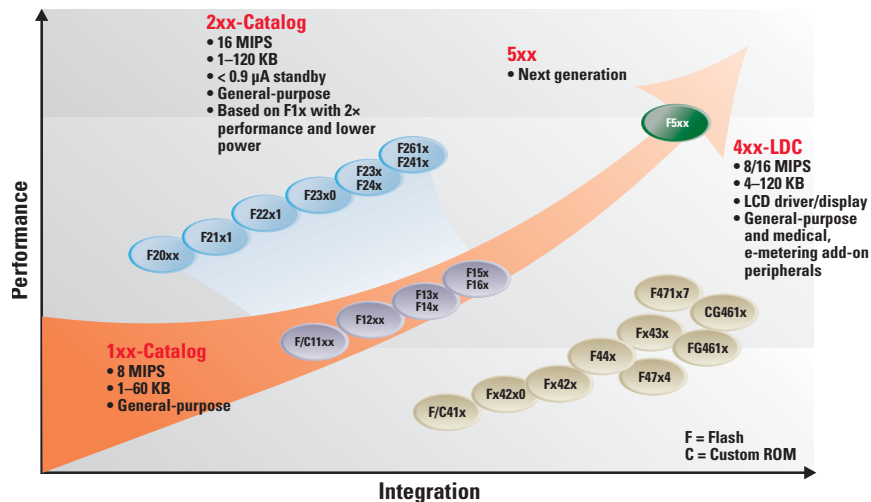
MSP430 roadmap
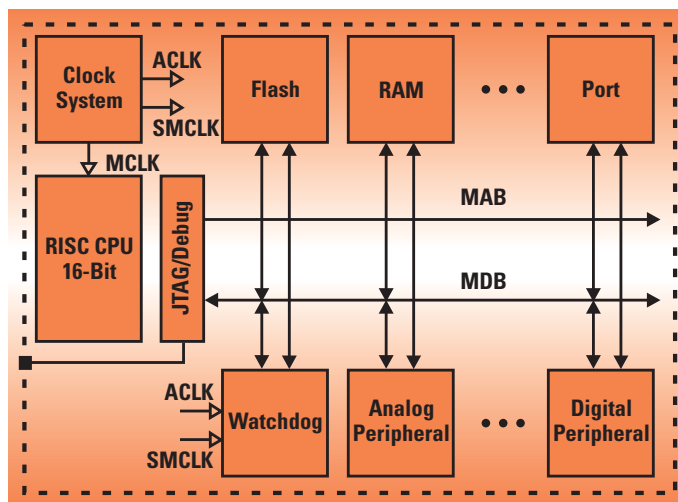
MSP430 von-Neumann architecture — all program, data memory and peripherals share a common bus structure. Consistent CPU instructions and addressing modes are used.

16-Bit RISC CPU

- Large register file eliminates accumulator bottleneck
- Optimized for C and assembler programming
- Compact core design reduces power and cost
- Up to 16 MIPS of performance available

The MSP430 MCU's orthogonal architecture provides the flexibility of 16 fully addressable, single-cycle 16-bit CPU registers and the power of a RISC. The modern design of the CPU offers versatility using only 27 easy-to-understand instructions and seven consistent-addressing modes. This results in a 16-bit low-power CPU that has more effective processing, is smaller-sized and more code-efficient than other 8-/16-bit microcontrollers. Develop new ultra-low-power, high-performance applications at a fraction of the code size.

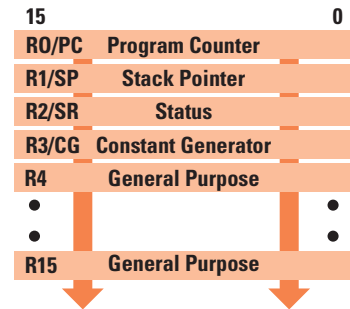| 15		0
RO/PC	Program Counter	
R1/SP	Stack Pointer	
R2/SR	Status	
R3/CG	Constant Generator	
R4	General Purpose	
•		•
•		•
R15	General Purpose	

The MSP430 CPU core with sixteen 16-bit registers, 27 single-cycle instructions and seven addressing modes results in higher processing efficiency and code density.

Ultra-Low-Power Performance

The MSP430 is designed specifically for ultra-low-power applications. A flexible clocking system, multiple operating modes and zero-power always-on brown-out reset (BOR) are implemented to reduce power consumption and dramatically extend battery life. The MSP430 BOR function is always active, even in all low-power modes to ensure the most reliable performance possible. The MSP430 CPU architecture with 16 registers and 16-bit data and address buses minimizes power consuming fetches to memory and a fast vectored-interrupt structure reduces the need for wasteful CPU software flag polling. Intelligent hardware peripheral features were also designed to allow tasks to be completed more efficiently and independent of the CPU. Many MSP430 customers have developed battery-based products that will last for over 10 years from the original battery!

Ultra-Low-Power Checklist:
- Multiple operating modes
  - 0.1-µA power down
  - 0.8-µA standby
  - 250-µA / MIPS @ 3 V
- Instant-on stable high-speed clock
- 1.8-V to 3.6-V operation
- Zero-power BOR
- <50-nA pin leakage
- CPU that minimizes CPU cycles per task
- Low-power peripheral options

Flexible Clock System

- Low-frequency auxiliary clock for ultra-low-power stand-by mode
- High-speed master clock for high-performance processing
- Stability over time and temperature

The MSP430 MCU clock system is designed specifically for battery-powered applications. Multiple oscillators are utilized to support event-driven burst activity. A low-frequency Auxiliary Clock (ACLK) is driven directly from a common 32-kHz watch crystal or the internal very-low-power oscillator (VLO) — with no additional external components. The ACLK can be used for a background real-time clock self wake-up function. An integrated high-speed digitally controlled oscillator (DCO) can source the master clock (MCLK) used by the CPU and sub-main clock (SMCLK) used by the high-speed peripherals. By design, the DCO is active and stable in 1 µs (F2xx) or 6 µs (x1xx, x4xx). MSP430 device-based solutions efficiently use 16-bit RISC CPU high performance in very short burst intervals. This results in very-high performance and ultra-low power consumption.
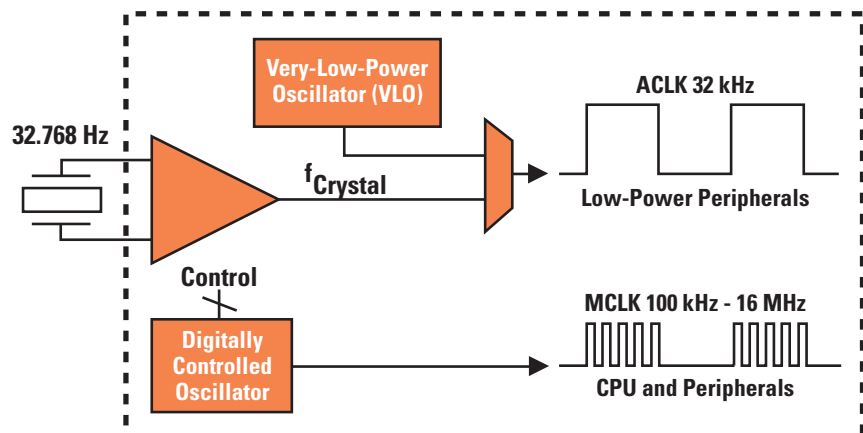
Multiple oscillator clock system.

→

Silicon

Device Configuration
- 1-KB to 120-KB ISP Flash
- RAM up to 10 KB
- 14- to 100-pin options

Ultra-Low Power
- Zero-power Brown Out Reset (BOR)
- 1-µs clock startup
- <50-nA pin leakage

Integrated Peripherals
- 10-/12-bit SAR ADC
- 16-bit Sigma Delta ADC
- 12-bit DAC
- Comparator
- LCD driver
- Supply voltage supervisor (SVS)
- Op-amps
- 16-bit and 8-bit timers
- Watchdog timer
- UART/LIN
- I^2C
- SPI
- IrDA
- Hardware multiplier
- DMA controller
- Temperature sensor

MSP430 Flash Emulation Tools
- JTAG-based real-time in-system debugging and programming
- 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 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 systems using JTAG.

The eZ430-F2013 USB development tool is available for only U.S. $20 and includes all the software and hardware you need to start your MSP430 design.

(F) Flash	Program (KB)	SRAM (B)	I/O	16-Bit Timers A	16-Bit Timers B	Watchdog
Flash-Based F2xx MCU Platform (V_{CC} 1.8–3.6 V), Up to 16 MIPS[1]						
MSP430F2001	1	128	10	2	—	✔
MSP430F2011	2	128	10	2	—	✔
MSP430F2002	1	128	10	2	—	✔
MSP430F2012	2	128	10	2	—	✔
MSP430F2003	1	128	10	2	—	✔
MSP430F2013	2	128	10	2	—	✔
MSP430F2101	1	128	16	3	—	✔
MSP430F2111	2	128	16	3	—	✔
MSP430F2121	4	256	16	3	—	✔
MSP430F2131	8	256	16	3	—	✔
MSP430F2232	8	512	32	3	3	✔
MSP430F2252	16	512	32	3	3	✔
MSP430F2272	32	1024	32	3	3	✔
MSP430F2234	8	512	32	3	3	✔
MSP430F2254	16	512	32	3	3	✔
MSP430F2274	32	1024	32	3	3	✔
MSP430F2330	8	1024	32	3	3	✔
MSP430F2350	16	2048	32	3	3	✔
MSP430F2370	32	2048	32	3	3	✔
MSP430F233	8	1024	48	3	3	✔
MSP430F235	16	2048	48	3	3	✔
MSP430F247	32	4096	48	3	7	✔
MSP430F248	48	4096	48	3	7	✔
MSP430F249	60	2048	48	3	7	✔
MSP430F2410	56	4096	48	3	7	✔
MSP430F2471	32	4096	48	3	7	✔
MSP430F2481	48	4096	48	3	7	✔
MSP430F2491	60	2048	48	3	7	✔
MSP430F2416	92	4096	48/64	3	7	✔
MSP430F2417	92	8192	48/64	3	7	✔
MSP430F2418	116	8192	48/64	3	7	✔
MSP430F2419	120	4096	48/64	3	7	✔
MSP430F2616	92	4096	48/64	3	7	✔
MSP430F2617	92	8192	48/64	3	7	✔
MSP430F2618	116	8192	48/64	3	7	✔
MSP430F2619	120	4096	48/64	3	7	✔
MSP430F2112	2	256	22	3	—	✔
MSP430F2122	4	512	22	3	—	✔
MSP430F2132	8	512	22	3	—	✔

[1]See **www.ti.com/msp430** for pricing and additional information

[2] USCI channel 1 supports UART/LIN, IrDA and SPI; USCI channel 2 supports I^2C and SPI.

BOR	SVS	USI I²C/SPI	USCI		DMA	MPY	Comp_A+	Temp Sensor	ADC Ch/Res	Additional Features	Package(s)
			Ch A: UART/LIN/ IrDA/SPI	Ch B: I²C/SPI							
✔	—	—	—	—	—	—	✔	—	slope	—	14 PW, N, 16 RSA
✔	—	—	—	—	—	—	✔	—	slope	—	14 PW, N, 16 RSA
✔	—	✔	—	—	—	—	—	✔	8ch, ADC10	—	14 PW, N, 16 RSA
✔	—	✔	—	—	—	—	—	✔	8ch, ADC10	—	14 PW, N, 16 RSA
✔	—	✔	—	—	—	—	—	✔	4ch, SD16	—	14 PW, N, 16 RSA
✔	—	✔	—	—	—	—	—	✔	4ch, SD16	—	14 PW, N, 16 RSA
✔	—	—	—	—	—	—	✔	—	slope	—	20 DGV, DW, PW, 24 RGE
✔	—	—	—	—	—	—	✔	—	slope	—	20 DGV, DW, PW, 24 RGE
✔	—	—	—	—	—	—	✔	—	slope	—	20 DGV, DW, PW, 24 RGE
✔	—	—	—	—	—	—	✔	—	slope	—	20 DGV, DW, PW, 24 RGE
✔	—	—	1	1	—	—	—	✔	12ch, ADC10	—	38 DA, 40 RHA
✔	—	—	1	1	—	—	—	✔	12ch, ADC10	—	38 DA, 40 RHA
✔	—	—	1	1	—	—	—	✔	12ch, ADC10	—	38 DA, 40 RHA
✔	—	—	1	1	—	—	—	✔	12ch, ADC10	(2) OPAMP	38 DA, 40 RHA
✔	—	—	1	1	—	—	—	✔	12ch, ADC10	(2) OPAMP	38 DA, 40 RHA
✔	—	—	1	1	—	—	—	✔	12ch, ADC10	(2) OPAMP	38 DA, 40 RHA
✔	—	—	1	1	—	✔	✔	—	slope	—	40 RHA
✔	—	—	1	1	—	✔	✔	—	slope	—	40 RHA
✔	—	—	1	1	—	✔	✔	—	slope	—	40 RHA
✔	✔	—	1	1	—	✔	✔	✔	8ch, ADC12	—	64 PM, 64 RGC
✔	✔	—	1	1	—	✔	✔	✔	8ch, ADC12	—	64 PM, 64 RGC
✔	✔	—	2	2	—	✔	✔	✔	8ch, ADC12	—	64 PM, 64 RGC
✔	✔	—	2	2	—	✔	✔	✔	8ch, ADC12	—	64 PM, 64 RGC
✔	✔	—	2	2	—	✔	✔	✔	8ch, ADC12	—	64 PM, 64 RGC
✔	✔	—	2	2	—	✔	✔	✔	8ch, ADC12	—	64 PM, 64 RGC
✔	✔	—	2	2	—	✔	✔	—	slope	—	64 PM, 64 RGC
✔	✔	—	2	2	—	✔	✔	—	slope	—	64 PM, 64 RGC
✔	✔	—	2	2	—	✔	✔	—	slope	—	64 PM, 64 RGC
✔	✔	—	2	2	—	✔	✔	✔	8ch, ADC12	—	64 PM, 80 PN
✔	✔	—	2	2	—	✔	✔	✔	8ch, ADC12	—	64 PM, 80 PN
✔	✔	—	2	2	—	✔	✔	✔	8ch, ADC12	—	64 PM, 80 PN
✔	✔	—	2	2	—	✔	✔	✔	8ch, ADC12	—	64 PM, 80 PN
✔	✔	—	2	2	✔	✔	✔	✔	8ch, ADC12	(2) DAC12	64 PM, 80 PN
✔	✔	—	2	2	✔	✔	✔	✔	8ch, ADC12	(2) DAC12	64 PM, 80 PN
✔	✔	—	2	2	✔	✔	✔	✔	8ch, ADC12	(2) DAC12	64 PM, 80 PN
✔	✔	—	2	2	✔	✔	✔	✔	8ch, ADC12	(2) DAC12	64 PM, 80 PN
✔	—	—	1	1	—	—	✔	✔	8ch, ADC10	—	28 PW, 32 RHB
✔	—	—	1	1	—	—	✔	✔	8ch, ADC10	—	28 PW, 32 RHB
✔	—	—	1	1	—	—	✔	✔	8ch, ADC10	—	28 PW, 32 RHB

[3]USI supports I²C or SPI.

New products are listed in bold red.

→ **Silicon**

Flash/ROM-Based x1xx MCU Platform (V_{CC} 1.8–3.6 V), Up to 8 MIPS*

(C) ROM (F) Flash	Program (KB)	SRAM (B)	I/O	USART 16-Bit Timers A	B	Watchdog	BOR	SVS	(UART/ SPI)	DMA	MPY	Comp_A	Temp Sensor	ADC Ch/Res	Additional Features	Package(s)
MSP430F1101A	1	128	14	3	—	✔	—	—	—	—	—	✔	—	slope	—	20 DGV, DW, PW, 24 RGE
MSP430C1101	1	128	14	3	—	✔	—	—	—	—	—	✔	—	slope	—	20 DW, PW, 24 RGE
MSP430F1111A	2	128	14	3	—	✔	—	—	—	—	—	✔	—	slope	—	20 DGV, DW, PW, 24 RGE
MSP430C1111	2	128	14	3	—	✔	—	—	—	—	—	✔	—	slope	—	20 DW, PW, 24 RGE
MSP430F1121A	4	256	14	3	—	✔	—	—	—	—	—	✔	—	slope	—	20 DGV, DW, PW, 24 RGE
MSP430C1121	4	256	14	3	—	✔	—	—	—	—	—	✔	—	slope	—	20 DW, PW, 24 RGE
MSP430F1122	4	256	14	3	—	✔	✔	—	—	—	—	—	✔	5ch, ADC10	—	20 DW, PW, 32 RHB
MSP430F1132	8	256	14	3	—	✔	✔	—	—	—	—	—	✔	5ch, ADC10	—	20 DW, PW, 32 RHB
MSP430F122	4	256	22	3	—	✔	—	—	1	—	—	✔	—	slope	—	28 DW, PW, 32 RHB
MSP430F123	8	256	22	3	—	✔	—	—	1	—	—	✔	—	slope	—	28 DW, PW, 32 RHB
MSP430F1222	4	256	22	3	—	✔	✔	—	1	—	—	—	✔	8ch, ADC10	—	28 DW, PW, 32 RHB
MSP430F1232	8	256	22	3	—	✔	✔	—	1	—	—	—	✔	8ch, ADC10	—	28 DW, PW, 32 RHB
MSP430F133	8	256	48	3	3	✔	—	—	1	—	—	✔	✔	8ch, ADC12	—	64 PM, PAG, RTD
MSP430F135	16	512	48	3	3	✔	—	—	1	—	—	✔	✔	8ch, ADC12	—	64 PM, PAG, RTD
MSP430C1331	8	256	48	3	3	✔	—	—	1	—	—	✔	—	slope	—	64 PM, RTD
MSP430C1351	16	512	48	3	3	✔	—	—	1	—	—	✔	—	slope	—	64 PM, RTD
MSP430F147	32	1024	48	3	7	✔	—	—	2	—	✔	✔	✔	8ch, ADC12	—	64 PM, PAG, RTD
MSP430F148	48	2048	48	3	7	✔	—	—	2	—	✔	✔	✔	8ch, ADC12	—	64 PM, PAG, RTD
MSP430F149	60	2048	48	3	7	✔	—	—	2	—	✔	✔	✔	8ch, ADC12	—	64 PM, PAG, RTD
MSP430F1471	32	1024	48	3	7	✔	—	—	2	—	✔	✔	—	slope	—	64 PM, RTD
MSP430F1481	48	2048	48	3	7	✔	—	—	2	—	✔	✔	—	slope	—	64 PM, RTD
MSP430F1491	60	2048	48	3	7	✔	—	—	2	—	✔	✔	—	slope	—	64 PM, RTD
MSP430F155	16	512	48	3	3	✔	✔	✔	1 with I^2C	✔	—	✔	✔	8ch, ADC12	(2) DAC12	64 PM, RTD
MSP430F156	24	1024	48	3	3	✔	✔	✔	1 with I^2C	✔	—	✔	✔	8ch, ADC12	(2) DAC12	64 PM, RTD
MSP430F157	32	1024	48	3	3	✔	✔	✔	1 with I^2C	✔	—	✔	✔	8ch, ADC12	(2) DAC12	64 PM, RTD
MSP430F167	32	1024	48	3	7	✔	✔	✔	2 with I^2C	✔	✔	✔	✔	8ch, ADC12	(2) DAC12	64 PM, RTD
MSP430F168	48	2048	48	3	7	✔	✔	✔	2 with I^2C	✔	✔	✔	✔	8ch, ADC12	(2) DAC12	64 PM, RTD
MSP430F169	60	2048	48	3	7	✔	✔	✔	2 with I^2C	✔	✔	✔	✔	8ch, ADC12	(2) DAC12	64 PM, RTD
MSP430F1610	32	5120	48	3	7	✔	✔	✔	2 with I^2C	✔	✔	✔	✔	8ch, ADC12	(2) DAC12	64 PM, RTD
MSP430F1611	48	10240	48	3	7	✔	✔	✔	2 with I^2C	✔	✔	✔	✔	8ch, ADC12	(2) DAC12	64 PM, RTD
MSP430F1612	55	5120	48	3	7	✔	✔	✔	2 with I^2C	✔	✔	✔	✔	8ch, ADC12	(2) DAC12	64 PM, RTD

*See www.ti.com/msp430 for pricing and additional information.

Flash/ROM-Based x4xx MCU Platform (V_{CC} 1.8–3.6V), Up to 8 MIPS (unless noted[1])*

(C) ROM (F) Flash	Program (KB)	SRAM (B)	I/O	16-Bit Timers A	16-Bit Timers B	Watchdog and Basic Timer	BOR	SVS	USART (UART/SPI)	USCI Ch A: UART/LIN/ IrDA/SPI	USCI Ch B: I²C/SPI	LCD Segments	DMA	MPY	Comp_A	Temp Sensor	ADC Ch/Res	Additional Features	Package(s)
MSP430F412	4	256	48	3	—	✔	✔	✔	—	—	—	96	—	—	✔	—	slope	—	64 PM, RTD
MSP430C412	4	256	48	3	—	✔	✔	✔	—	—	—	96	—	—	✔	—	slope	—	64 PM, RTD
MSP430F413	8	256	48	3	—	✔	✔	✔	—	—	—	96	—	—	✔	—	slope	—	64 PM, RTD
MSP430C413	8	256	48	3	—	✔	✔	✔	—	—	—	96	—	—	✔	—	slope	—	64 PM, RTD
MSP430F415	16	512	48	3,5	—	✔	✔	✔	—	—	—	96	—	—	✔	—	slope	—	64 PM, RTD
MSP430F417	32	1024	48	3,5	—	✔	✔	✔	—	—	—	96	—	—	✔	—	slope	—	64 PM, RTD
MSP430F423	8	256	14	3	—	✔	✔	✔	1	—	—	128	—	✔	—	✔	(3) SD16	—	64 PM
MSP430F425	16	512	14	3	—	✔	✔	✔	1	—	—	128	—	✔	—	✔	(3) SD16	—	64 PM
MSP430F427	32	1024	14	3	—	✔	✔	✔	1	—	—	128	—	✔	—	✔	(3) SD16	—	64 PM
MSP430FW423	8	256	48	3,5	—	✔	✔	✔	—	—	—	96	—	—	✔	—	slope	Flow-meter	64 PM
MSP430FW425	16	512	48	3,5	—	✔	✔	✔	—	—	—	96	—	—	✔	—	slope	Flow-meter	64 PM
MSP430FW427	32	1024	48	3,5	—	✔	✔	✔	—	—	—	96	—	—	✔	—	slope	Flow-meter	64 PM
MSP430FE423A	8	256	14	3	—	✔	✔	✔	1	—	—	128	—	✔	—	✔	(3) SD16	E-meter	64 PM
MSP430FE425A	16	512	14	3	—	✔	✔	✔	1	—	—	128	—	✔	—	✔	(3) SD16	E-meter	64 PM
MSP430FE427A	32	1024	14	3	—	✔	✔	✔	1	—	—	128	—	✔	—	✔	(3) SD16	E-meter	64 PM
MSP430F4250	16	256	32	3	—	✔	✔	—	—	—	—	56	—	—	—	✔	5 ch, SD16	DAC12	48 DL, RGZ
MSP430F4260	24	256	32	3	—	✔	✔	—	—	—	—	56	—	—	—	✔	5 ch, SD16	DAC12	48 DL, RGZ
MSP430F4270	32	256	32	3	—	✔	✔	—	—	—	—	56	—	—	—	✔	5 ch, SD16	DAC12	48 DL, RGZ
MSP430FG4250	16	256	32	3	—	✔	✔	—	—	—	—	56	—	—	—	✔	5 ch, SD16	DAC12, (2) OPAMP	48 DL, RGZ
MSP430FG4260	24	256	32	3	—	✔	✔	—	—	—	—	56	—	—	—	✔	5 ch, SD16	DAC12, (2) OPAMP	48 DL, RGZ
MSP430FG4270	32	256	32	3	—	✔	✔	—	—	—	—	56	—	—	—	✔	5 ch, SD16	DAC12, (2) OPAMP	48 DL, RGZ
MSP430F435	16	512	48	3	3	✔	✔	✔	1	—	—	128/160	—	—	✔	✔	8 ch, ADC12	—	80 PN, 100 PZ
MSP430F436	24	1024	48	3	3	✔	✔	✔	1	—	—	128/160	—	—	✔	✔	8 ch, ADC12	—	80 PN, 100 PZ
MSP430F437	32	1024	48	3	3	✔	✔	✔	1	—	—	128/160	—	—	✔	✔	8 ch, ADC12	—	80 PN, 100 PZ
MSP430F4351	16	512	48	3	3	✔	✔	✔	1	—	—	128/160	—	—	✔	✔	slope	—	80 PN, 100 PZ
MSP430F4361	24	1024	48	3	3	✔	✔	✔	1	—	—	128/160	—	—	✔	✔	slope	—	80 PN, 100 PZ
MSP430F4371	32	1024	48	3	3	✔	✔	✔	1	—	—	128/160	—	—	✔	✔	slope	—	80 PN, 100 PZ
MSP430FG437	32	1024	48	3	3	✔	✔	✔	1	—	—	128	✔	—	✔	✔	12 ch, ADC12	(2) DAC12, (3) OPAMP	80 PN
MSP430FG438	48	2048	48	3	3	✔	✔	✔	1	—	—	128	✔	—	✔	✔	12 ch, ADC12	(2) DAC12, (3) OPAMP	80 PN
MSP430FG439	60	2048	48	3	3	✔	✔	✔	1	—	—	128	✔	—	✔	✔	12 ch, ADC12	(2) DAC12, (3) OPAMP	80 PN
MSP430F447	32	1024	48	3	7	✔	✔	✔	2	—	—	160	—	✔	✔	✔	8 ch, ADC12	—	100 PZ
MSP430F448	48	2048	48	3	7	✔	✔	✔	2	—	—	160	—	✔	✔	✔	8 ch, ADC12	—	100 PZ
MSP430F449	60	2048	48	3	7	✔	✔	✔	2	—	—	160	—	✔	✔	✔	8 ch, ADC12	—	100 PZ
MSP430FG4616	92	4096	80	3	7	✔	✔	✔	1	1	1	160	✔	✔	✔	✔	12 ch, ADC12	(2) DAC12, (3) OPAMP	100 PZ, 113 ZQW
MSP430FG4617	92	8192	80	3	7	✔	✔	✔	1	1	1	160	✔	✔	✔	✔	12 ch, ADC12	(2) DAC12, (3) OPAMP	100 PZ, 113 ZQW
MSP430FG4618	116	8192	80	3	7	✔	✔	✔	1	1	1	160	✔	✔	✔	✔	12 ch, ADC12	(2) DAC12, (3) OPAMP	100 PZ, 113 ZQW
MSP430FG4619	120	4096	80	3	7	✔	✔	✔	1	1	1	160	✔	✔	✔	✔	12 ch, ADC12	(2) DAC12, (3) OPAMP	100 PZ, 113 ZQW
MSP430CG4616	92	4096	80	3	7	✔	✔	✔	1	1	1	160	✔	✔	✔	✔	12 ch, ADC12	(2) DAC12, (3) OPAMP	100 PZ
MSP430CG4617	92	8192	80	3	7	✔	✔	✔	1	1	1	160	✔	✔	✔	✔	12 ch, ADC12	(2) DAC12, (3) OPAMP	100 PZ
MSP430CG4618	116	8192	80	3	7	✔	✔	✔	1	1	1	160	✔	✔	✔	✔	12 ch, ADC12	(2) DAC12, (3) OPAMP	100 PZ
MSP430CG4619	120	4096	80	3	7	✔	✔	✔	1	1	1	160	✔	✔	✔	✔	12 ch, ADC12	(2) DAC12, (3) OPAMP	100 PZ
MSP430F4783[1]	48	2480	72	3	3	WDT+	✔	✔	—	2	2	160	—	32×32	✔	✔	(3) SD16	—	100 PZ
MSP430F4793[1]	60	2560	72	3	3	WDT+	✔	✔	—	2	2	160	—	32×32	✔	✔	(3) SD16	—	100 PZ
MSP430F4784[1]	48	2048	72	3	3	WDT+	✔	✔	—	2	2	160	—	32×32	✔	✔	(4) SD16	—	100 PZ
MSP430F4794[1]	60	2560	72	3	3	WDT+	✔	✔	—	2	2	160	—	32×32	✔	✔	(4) SD16	—	100 PZ

[1] Up to 16 MIPS.
*See www.ti.com/msp430 for pricing and additional information.

New products are listed in bold red.

Silicon

Intelligent Peripherals

With purely software-driven functions, the CPU is 100% active and consuming power. Effectively utilizing peripherals allows the CPU to be turned off to save power or work on other activities to achieve the highest performance. MSP430 device peripherals are designed to require the least amount of software service. Additional hardware features allow CPU resources to focus more on differentiated application-specific features and less on basic data handling. Lower-cost systems can be implemented using less software and lower power.

Peripheral Overview

ADC10/ADC12—The ADC10/12 module supports fast, >200ksps, 10- or 12-bit analog-to-digital conversions. The module features a 10- or 12-bit SAR core with 5, 8 or 12 input channels, sample select control, 1.5/2.5V reference generator and internal temperature sensor. ADC10 features a data transfer controller (DTC) and ADC12 features a 16-word conversion-and-control buffer. These added features allow samples to be converted and stored without CPU intervention.

BOR—The brown-out reset (BOR) circuit detects low supply voltages and reset circuit resets the device by triggering a POR signal when power is applied or removed. MSP430's zero-power BOR circuit is continuously turned on, including in all low-power modes.

Comparator_A/Comparator_A+—The Comparator_A/A+ module supports precision slope analog-to-digital conversions, supply voltage supervision and monitoring of external analog signals for accurate voltage and resistor value measurement. The module features a selectable reference voltage generator and input multiplexer. (Comp A+)

DAC12—The DAC12 module is a 12-bit, voltage output DAC featuring internal or external reference selection, programmable settling time for optimal power consumption and can be configured in 8- or 12-bit mode. When multiple DAC12 modules are present, they may be grouped together for synchronous update operation.

DMA—The direct memory access (DMA) controller transfers data from one address to another, without CPU intervention, across the entire address range. The DMA increases the throughput of peripheral modules and reduces system power consumption. The module features up to three independent transfer channels.

ESP430 (integrated in FE42x devices)—The ESP430CE1 module incorporates the SD16, hardware multiplier and ESP430 embedded processor engine for single-phase energy metering applications. The module performs metering calculations independent of the CPU.

FLASH—The MSP430 Flash memory is bit-, byte- and word-addressable and programmable. The main memory segment size is 512 Bytes. Each MSP430 also has up to 256 Bytes of Flash Information Memory for EEPROM emulation. Flash can be read, erased and written (100,000 cycles) through the JTAG debugging interface, the Bootstrap Loader and in-system.

I/O—MSP430 devices have up to ten digital I/O ports implemented, P1–P10. Each port has eight I/O pins. Every I/O pin is configurable for input or output direction, and can be individually read or written to. Ports P1 and P2 have interrupt capability. MSP430F2xx devices feature built-in individually configurable pull-up or pull-down resistors.

LCD/LCD_A—The LCD/LCD_A controller directly drives LCD displays with automatic signal generation for up to 160 segments. The MSP430 LCD controller can support static, 2-mux, 3-mux and 4-mux LCDs. The LCD_A module includes an integrated charge pump for contrast control.

MPY—The hardware multiplier module supports 8-/16-bit × 8-/16-bit signed and unsigned multiply with optional "multiply and accumulate" functionality. It is a peripheral which does not interfere with CPU activities and can be accessed by the DMA. The MPY on new F47xx devices features up to 32-×32-bit operation.

OA—The MSP430 integrated operational amplifiers feature single-supply, low-current operation with rail-to-rail outputs and programmable settling times. Internal, programmable feedback resistors and connections between multiple op amps allow for a variety of software-selectable configuration options including: unity gain mode, comparator mode, inverting PGA, non-inverting PGA, differential and instrumentation amplifier.

SCAN IF—The Scan IF module is a programmable state machine with analog front end used to automatically measure linear or rotational motion with the lowest possible power consumption. The module features support for different types of LC and resistive sensors and for quadrature encoding.

SD16/SD16_A—The SD16/SD16_A module features up to three 16-bit sigma-delta A/D converters with an internal 1.2-V reference. Each has up to eight fully differential multiplexed inputs including a built-in temperature sensor. The converters are second-order over-sampling sigma-delta modulators with selectable oversampling ratios of up to 1024 (SD16_A) or 256 (SD16).

SVS—The supply voltage supervisor (SVS) is a configurable module used to monitor the AVCC supply voltage or an external voltage. The SVS can be configured to set a flag or generate a POR reset when the supply voltage or external voltage drops below a user-selected threshold.

Timer A/Timer B—Timer_A and Timer_B are asynchronous 16-bit timer/counters with up to seven capture/compare registers and four operating modes. The timers support multiple capture/compares, PWM outputs and interval timing and also have extensive interrupt capabilities.

USART—The universal synchronous/asynchronous receive/transmit (USART) peripheral interface supports asynchronous RS-232 and synchronous SPI communication with one hardware module. The MSP430F15x and MSP430F16x USART module also supports I2C. The module supports programmable baud rate and independent interrupt capability for receive and transmit.

USCI—The universal serial communication interface (USCI) module features two independent channels which can be used simultaneously. The asynchronous channel (USCI_A) supports UART mode, SPI mode, pulse shaping for IrDA and automatic baud rate detection for LIN communications. The synchronous channel (USCI_B) supports I2C and SPI modes.

USI—The universal serial interface (USI) module is a synchronous serial communication interface with a data length of up to 16 bits and can support SPI and I2C communication with minimal software.

Starter Kits

Part Number	PC Port	Contents Include	Pin Count	Devices Supported	Price[1]
eZ430-F2013	USB	USB stick interface and target board		MSP430F20xx	20
eZ430-RF2500	USB	USB stick interface and two 2.4-GHz wireless target boards		MSP430F20xx	49
				MSP430F22xx	
				CC2500	
MSP-FET430U14	USB	Interface and 14-pin target board w/ socket	14-pin	PW (TSSOP)	149
MSP-FET430U28	USB	Interface and 28-pin target board w/ socket	20-/28-pin	DW (SOIC)	149
MSP-FET430U23x0	USB	Interface and MSP430F23x0 40-pin target board w/ socket	40-pin	MSP430F23x0 RHA (QFN)	149
MSP-FET430U38	USB	Interface and 38-pin target board w/ socket	38-pin	DA (TSSOP)	149
MSP-FET430U48	USB	Interface and 48-pin target board w/ socket	48-pin	DL (SSOP)	149
MSP-FET430U64	USB	Interface and 64-pin target board w/ socket	64-pin	PM (QFP)	149
MSP-FET430U80	USB	Interface and 80-pin target board w/ socket	80-pin	PN (QFP)	149
MSP-FET430U100	USB	Interface and 100-pin target board w/ socket	100-pin	PZ (QFP)	149

MSP430 Experimenter Boards

Part Number		Contents Include	Devices Supported	Price
MSP-EXP430FG4618		Board only – No programming interface	MSP430FG4618, MSP430F2013, Chipcon wireless modules	99

Software Development Tools

Part Number		Contents Include	Devices Supported	Price
IAR-KICKSTART		Free 4-KB IDE – IAR Embedded Workbench Kickstart	All	Free
MSP-CCE430		Free 8-KB IDE – Code Composer Essentials	All	Free
MSP-CCE430PRO		Full-version IDE – Code Composer Essentials Professional	All	499

Debugging and Programming Interfaces

Part Number	PC Port	Contents Include	Devices Supported	Price
MSP-FET430UIF	USB	Interface only	All	99
MSP-FET430PIF	Parallel	Interface only	All	49
MSP-GANG430	Serial	Production programmer	All (8 devices at a time)	199

[1] Suggested resale price in U.S. dollars.

eXpressDSP™ Software and Development Tools

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

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

Standardization and Software Reuse Move Development to a New Level

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

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

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

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

SoC (ARM® + DSP)

*NDK only applicable to DSP-centric design
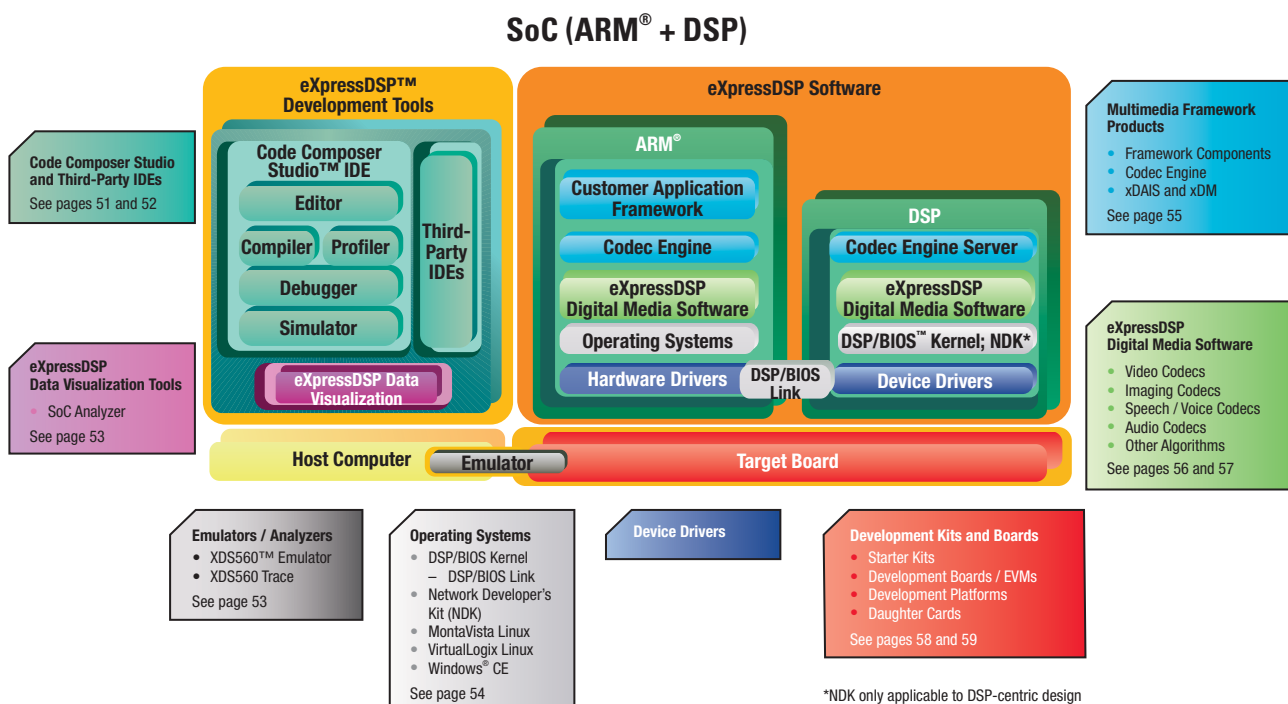
eXpressDSP

Code Composer Studio™ IDE and TI Developer Network Development Tools

Integrated Development Environment and Debuggers

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

Code Composer Studio Development Tools Simplify DSP Development

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

IDE
- Integrated IDE and debugger
- CodeWright Editor
- Project manager

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

Real-Time Debug
- Non-intrusive memory access
- Handle interrupts while halted

Advanced Event Triggering
- Watchpoints
- Event sequences
- Non-intrusive counters

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

Code-Generation Tools
- Industry-leading performance
- Program-level optimization

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

Host Operating System Support
- Windows®
- Linux (compilers only)

Integrated Development Environment

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

Debugger

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.

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

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

Code Composer Studio IDE supports the development of complex systems with multiple boards or multiple processors on a single target board. Global breakpoints are also available for multiprocessor systems. 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 PDM can be used to broadcast commands to different groups of CPUs in the JTAG scan path. A global breakpoint command on one processor can halt other processors when this breakpoint is encountered.

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

CCStudio IDE also supports popular external scripting languages such as Perl and VBA to help developers automate application testing and validation.
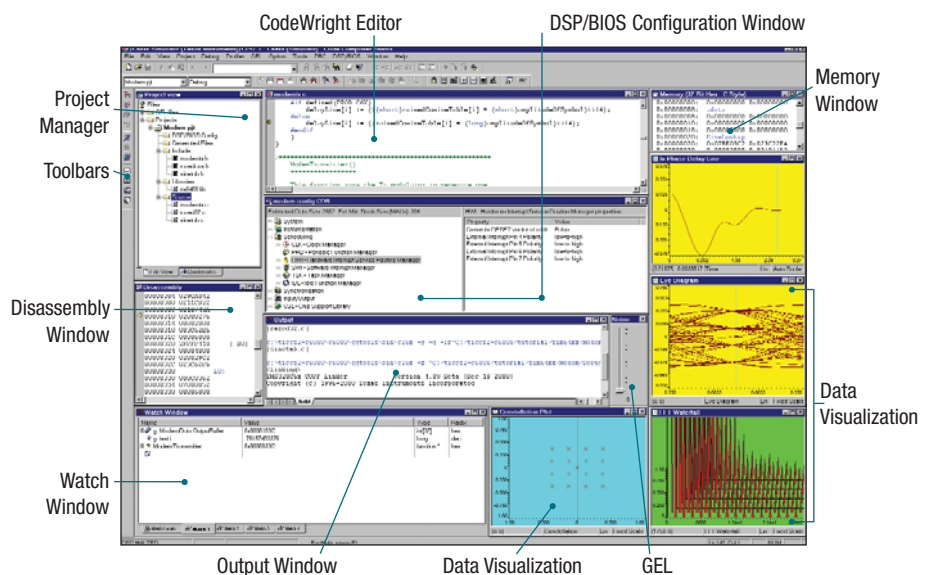
Code Composer Studio Development Tools include the features you need to edit, build, debug and visualize your applications.

Software and Development Tools

eXpressDSP™ Development Tools

Real-Time Debug

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

Advanced Event Triggering

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

Code-Generation Tools

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

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

Simulation

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

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

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

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

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

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

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

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

Real-Time Data Exchange

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

Profiling

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

Developer Network Development Tools

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

Green Hills MULTI®

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

Lauterbach Trace32

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

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

JTAG Debug and eXpressDSP Data Visualization
Emulators and Analysis Tools

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

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

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

Non-Intrusive Debugging
TI devices include advanced emulation features which provide simple, inexpensive and speed-independent access to the CPU for debugging. Access to registers and memory can be non-intrusive and real-time mode provides for the debugging of code that interacts with interrupts that must not be disabled. Real-time mode

allows you to suspend background code at break events while continuing to execute time-critical interrupt service routines.

- Advanced Event Triggering (AET) allows a user to halt the CPU or trigger other events based on complex events or sequences such as invalid data or program memory accesses and invalid program accesses. It can non-intrusively measure performance and count system events (for example, cache events).
- Real Time Data Exchange (RTDX™) and High-Speed RTDX (HS-RTDX) allow a developer to exchange data between the target and the host PC, without stopping the target application, thus providing a bi-directional "data pipe" between the application and the host. This allows developers to access data from the application for real-time visibility, or to simulate data input to the device, shortening development time by giving developers a realistic view of the way their systems operate.
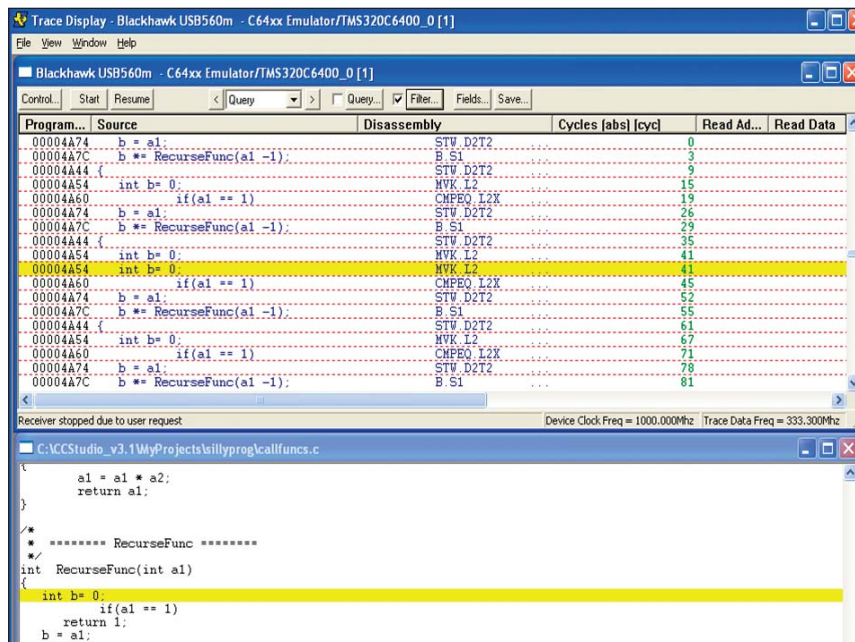
XDS560 Trace
The XDS560 Trace module helps customers find previously "invisible" complex real-time bugs. Trace can detect the really hard to find bugs – race conditions between events, intermittent real-time glitches, crashes from stack overflows, runaway code and false interrupts without stopping the processor. Trace is a completely non-intrusive debug method that relies on a debug unit inside the DSP so it does not interfere or change the application's real-time behavior.

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

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

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

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

Operating Systems

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

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

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

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

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

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

DSP/BIOS kernel is frequently deployed as the real-time DSP kernel on multicore devices like TI's DaVinci and OMAP SoC processors. In such applications, the DSP/BIOS Link inter-processor communication provides powerful interconnection service to ARM-side operating systems like Linux and Windows CE. DSP/BIOS

Link is typically used with TI's codec engine, as shown in the DaVinci software pages of this guide (see page 55).

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

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

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

Algorithm Standards and Frameworks
Standards for Algorithm Interoperability and Integration

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

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

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

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

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

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

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

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

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

An important feature of Codec Engine is the consistent APIs that it provides across TI SoC and DSP devices, enabling scalable development for multiple TI devices and easier migration to new TI architectures.
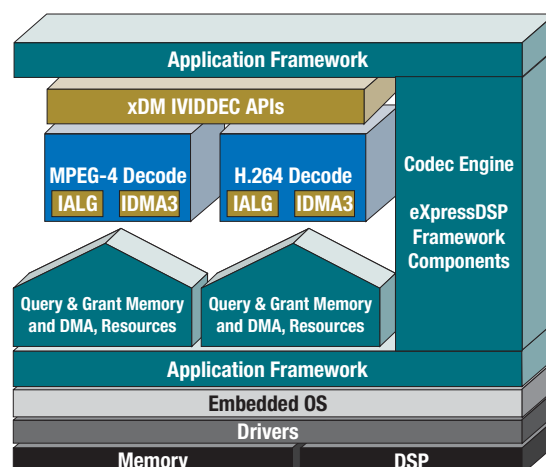
Use of xDAIS and xDM APIs enable easy integration of multiple algorithms into an application.

eXpressDSP™ Digital Media Software

Digital Media Software Portfolio
Encoders, Decoders, Codecs and Libraries

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

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

Features and Benefits
- High-quality encoding
  - Tested against PC-based reference encoders to within 0.5 dB PSNR at typical bit rates

- Robust, error-resilient decoding
  - Tested with ITU standard test streams and error streams

- Application-specific libraries
  - Video Analytics for security applications
  - Graphics for 2D and 3D video on DaVinci™ technology

- All TI Digital Media Software is compliant to the xDM API and integrated with the DaVinci software infrastructure

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

Visit **www.ti.com/digitalmediasoftware** to:
- Evaluate digital media software on your TI DVEVM or DVDP board at no charge for 60 days (requires a simple click-wrap license)
- Learn more about flexible production licensing that allows for a range of pricing options based on project quantity

- View published suggested resale pricing options.

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

Broad eXpressDSP Digital Media Software Portfolio

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

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

Voice / Speech DSP Codecs

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

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

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

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

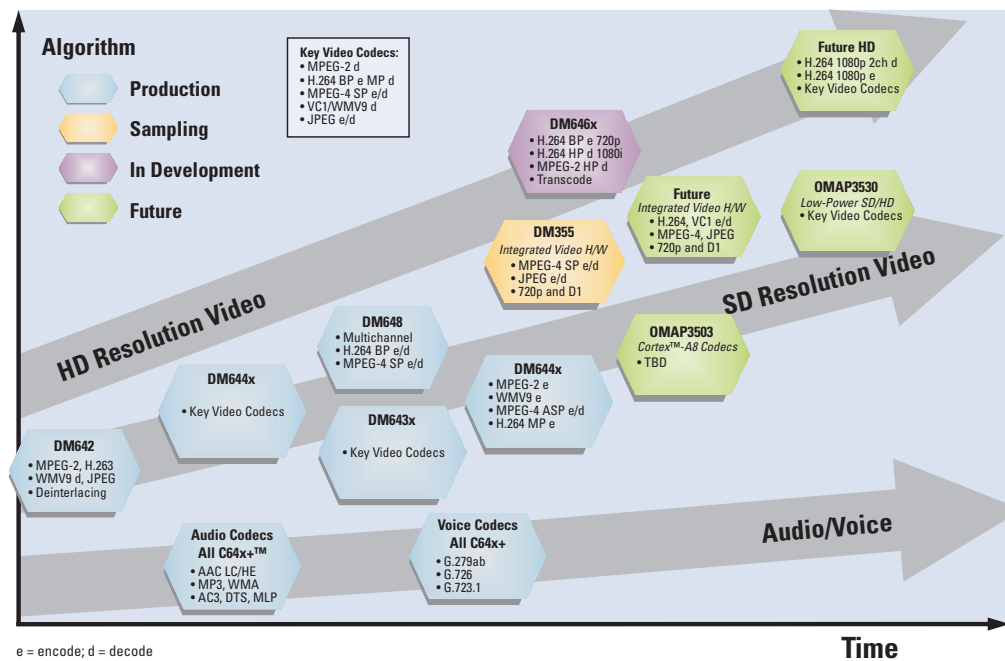## Authorized Software Providers Support TI Digital Media Software

The TI Digital Media Software portfolio is a collection of optimized encoders, decoders, codecs and libraries licensed by TI and TI Authorized Software Providers (ASPs) to customers worldwide. Each software component was developed by TI or TI

Developer Network members in compliance with the xDAIS eXpressDSP Algorithm Interface Standard and xDM extension for digital media, and each component is packaged for easy integration with DaVinci™ and eXpressDSP

software framework building blocks. The entire portfolio is available with support from highly qualified, trained ASPs, who can also offer additional software IP products or custom engineering services to enable rapid time to market for TI customers.

Authorized Software Providers by Region

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

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

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

Customers have several entry points to designing with TI SoC and DSP processors, ranging from high-level frameworks and applications to low-level functions. The concept of multiple development entry points is also incorporated in eXpressDSP Digital Media Software, which enables a

low-level entry point at the codec API layer and also allows higher-level entry points through Codec Engine and application software built on it. Because all TI Digital Media Software components have been tested and integrated with Codec Engine and the full DaVinci software infrastructure,

mid-level entry points are fully enabled. Even higher-level entry points are possible via applications and operating systems built on the DaVinci software foundation; some examples include Windows® CE with the DirectShow media framework and GStreamer for Linux.

eXpressDSP™ Software and Development Tools

Getting Started
Integrated Development Environment, Codecs, Training and Kits

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Code Composer Studio™ Integrated Development Environment Free Evaluation Tools
- Supports TMS320C2000™, TMS320C5000™, TMS320C6000™, OMAP™ and DaVinci™ processors
- 120-day full-featured trial
- On-line tutorials and multimedia feature demos show off key capabilities
- Order CD-ROM on-line or download at www.ti.com/freetools

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

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

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

DSP Starter Kits
Starting at just U.S. $395, Digital Signal Processing Starter Kits (DSKs) and eZdsp™ Starter Kits are a low-cost entry-level means of evaluating TI processor platforms and eXpressDSP development tools. TI, partnered with Spectrum Digital Inc., offers a variety of processor selections in each platform to let developers test algorithms, benchmark code and write simple programs to prove out designs and evaluate the processor architecture. The DSKs are bundled with a special Code Composer Studio (CCStudio) IDE that runs exclusively through the embedded emulation on the target board, so that developers can explore the rich feature set that CCStudio IDE has to offer. Nearly a dozen DSKs are available today for the TMS320C2000, TMS320C5000 and TMS320C6000 processor platforms. See page 60 for ordering information.

DaVinci Development Tools/Kits
Comprehensive ARM®/DSP system-level tooling helps developers jump start development of any digital video application. The DaVinci kits are designed to simplify

development of digital video applications such as video phones, automotive info-tainment, digital still cameras, streaming media, IP set-top boxes, video security systems and digital video products that have yet to be invented. See page 59 for details.

- **Digital Video Development Platform (DVDP)** includes both hardware and software to enable immediate evaluation of DaVinci DSP-based processors. Available today for both the TMS320DM648 and TMS320DM6437 digital media processors, the DVDP provides developers with a comprehensive platform that can be used throughout the entire design process.

- **Digital Video Evaluation Module (DVEVM),** comprised of both hardware and software, enables developers to start instantaneous evaluation of DaVinci ARM9-based processors and begin building digital video applications. Available today on TMS320DM6446, TMS320DM355 and TMS320DM6467 digital media processors.

- **Digital Video Software Production Bundle (DVSPB),** recommended for Linux developers going into production with DaVinci ARM9-based processors, is a software development bundle designed to tune complex DaVinci-based digital video systems quickly and efficiently. The DVSPB combines Monta-Vista's proven Linux OS and system-tested Linux board support package with the eXpressDSP Linux-based Digital Video Software Development Kit (DVSDK) providing developers with improved software integration and system visibility. The DVSPB includes a one-year subscription to the MVZone and MontaVista's Dev Rocket IDE. DSP developers should consider the DVSPB bundled with CCStudio IDE and Spectrum Digital XDS560R JTAG emulator.

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eXpressDSP™ Software and Development Tools

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

DaVinci™ Development Tools and Software
Evaluation, Development and Production Kits

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

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

	DaVinci ARM® and ARM+DSP Tools					DaVinci DSP	
	Evaluation and Development			Production		Evaluation, Development and Production	
	DM6446 DVEVM U.S. $2,495	DM355 DVEVM U.S. $495	DM6467 DVEVM U.S. $1,495	DVSPB-L U.S. $6,995	DVSPB-3L U.S. $10,995	DM6437 DVDP U.S. $495	DM648 DVDP U.S. $1,295
Hardware							
DaVinci target board	✔	✔	✔			✔	✔
Video camera/LCD	✔						
Power supply w/ U.S., EU and UK cables	✔	✔	✔			✔	✔
Connectivity cables	✔	✔	✔			✔	✔
Mass storage	40-GB HDD	2-GB NAND Flash	40-GB HDD				
IR remote control	✔	✔	✔				
XDS560R USB EMU					✔		
On-board EMU						✔	
Software							
Linux-based DVSDK	✔	✔	✔	✔	✔		
DSP/BIOS™ kernel-based DVSDK						✔	✔
MontaVista Linux Pro	Demo	Demo	Demo	License	License		
TI Developer Network software demos and evals	GHS MULTI®					VirtualLogix	Ittiam
TMS320C64x+™ Linux code-generation tools	Eval	Eval	Eval	✔	✔	Eval	
Code Composer Studio™ IDE v3.3					License	H/W version	FET

OMAP™ Development Tools and Software
Evaluation, Development and Production Kits

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

OMAP ARM	OMAP35x EVM
Evaluation and Development	U.S. $1,495
Hardware	
OMAP target board	✔
Power supply with U.S., EU, and UK cables	✔
Connectivity cables	✔
Memory	64-MB mobile DDR SDRAM 128-MB NAND Flash
Display with touch screen	✔
Software	
TI platform support (SDK)	✔
Linux BSP (kernel 2.6.22)	✔
TI Developer Network software demonstrations and evaluations	Sourcery G++™ evaluation tools from CodeSourcery™

DSP Development Tools
Evaluation and Development Kits

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

DSP Starter Kits

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

Digital Signal Processing Development Tools Feature Matrix

TI Part Number	Tool Description	Annual Subscription	Code Composer Studio™ IDE	DSP/BIOS™ Real-Time Operating System/Kernel Services	TMS320™ DSP Algorithm Standard Developer's Kit	Code-Generation Tools C/C++ Compiler/Assembler/Linker	Target Board (Hardware)	Standalone Emulator	Linux DVSDK	DSP/BIOS DVSDK	Price $ U.S.[1]
TMDSCCSALL-1	Code Composer Studio (CCStudio) IDE Development Tools Platinum Edition	✔	✔	✔	✔	✔					3,595
TMDSCCS2000-1	TMS30C2000™ Code Composer Studio IDE Development Tools[2]	✔	✔[2]	✔[2]	✔	✔[2]					495
SPRC119	Code Composer Studio IDE Free Evaluation Tools		L	L	✔	L					Free
TMDXEVM3503	OMAP35x Evaluation Module (EVM)						✔				1,495
TMDXEVM355	DM355 Digital Video Evaluation Module (DVEVM)						✔		✔		495
TMDSEVM6446	DM644x Digital Video Evaluation Module (DVEVM)						✔		✔		2,495
TMDXEVM6467	DM6467 Digital Video Evaluation Module (DVEVM)						✔		✔		1,995
TMDXVDP6437	DM6437 Digital Video Development Platform (DVDP)		✔[3]	✔[3]	✔	✔[3]	✔			✔	495
TMDXDVP648	DM648 Digital Video Development Platform (DVDP)		L	L	✔	L	✔			✔	1,295
TMDSDVSPBA9-L	MontaVista Pro Digital Video Software Production Bundle (DVSPB)	✔[4]							✔		6,995
TMDSDVSPBA9-3L	MontaVista Pro Digital Video Software Production Bundle w/ CCStudio+EMU	✔[4]	✔	✔	✔	✔		✔	✔		10,995
TMDXEVM6424	C6424 Evaluation Module (EVM)		✔[3]	✔[3]	✔	✔[3]	✔				495
TMDXEVM6452	C6452 Evaluation Module (EVM)						✔				1,295
TMDSDSK6713	C6713 DSP Starter Kit (DSK)[5]		✔[3]	✔[3]	✔	✔[3]	✔				395
TMDSDSK6416-T	C6416 DSP Starter Kit (DSK)[5]		✔[3]	✔[3]	✔	✔[3]	✔				495
TMDSDSK6455	C6455 DSP Starter Kit (DSK)		✔[3]	✔[3]	✔	✔[3]	✔				595
TMDXEVM6455	C6455 Evaluation Module (EVM) w/ SRIO[5]		✔[3]	✔[3]	✔	✔[3]	✔				1,795
TMDXEVM642	DM642 Evaluation Module (EVM)						✔				1,995
TMDSDMK642	DM642 Digital Media Development Kit	✔	✔	✔	✔	✔	✔	✔			6,495
TMDXVSK642	Video Security Over Internet Protocol (VSIP) Development Platform[5]	✔	✔	✔	✔	✔	✔	✔			15,000
TMDXVSK642-3	Video Security Over IP (VSIP) with ATEME Emulator (NTSC)[5]	✔	✔	✔	✔	✔	✔	✔			16,000
TMDSPDK6727	Pro Audio Development Kit (PADK)						✔				1,995
TMDSPDB6727	Pro Audio Development Kit (PADK) Bundle	✔	✔	✔	✔	✔	✔	✔			5,995
TMDSDSK5416	C54x™ DSP Starter Kit (DSK)[5]		✔[3]	✔[3]	✔	✔[3]	✔				395
TMDSDSK5510	C55x™ DSP Starter Kit (DSK)[5]		✔[3]	✔[3]	✔	✔[3]	✔				395
TMDSDSK5509	C5509 DSP Starter Kit (DSK)[5]		✔[3]	✔[3]	✔	✔[3]	✔				495
TMDXEZ28335	F28335 eZdsp™ Starter Kit		✔[3]	✔		✔	✔				495
TMDS3P701016A	LF2407A Evaluation Module (EVM)[5]		✔			✔	✔	✔			1,995
TMDXEZ28044	F28044 eZdsp Starter Kit		✔[3]			✔	✔				495
TMDSEZD2407	LF2407A eZdsp Starter Kit[5]		✔[3]			✔	✔				345
TMDSEZD2812	F2812 eZdsp Starter Kit[5]		✔[3]	✔		✔	✔				395
TMDSEZS2812	F2812 eZdsp Starter Kit (Socketed)[5]		✔[3]	✔		✔	✔				495
TMDSEZS2808	F2808 eZdsp Starter Kit (Socketed)		✔[3]	✔		✔	✔				495
TMDSEVP2812	F2812 Development Bundle (Parallel Port)		✔	✔		✔	✔	✔			1,995
TMDSEVU2812	F2812 Development Bundle (USB)		✔	✔		✔	✔	✔			2,295
TMDSEMU560PCI	XDS560™ Blackhawk PCI-Bus High-Performance JTAG Emulator							✔			2,995
TMDSEMU560U	XDS560 Blackhawk USB High-Performance Emulator							✔			2,999
TMDSEMU560T	XDS560 USB Trace Emulator							✔			9,995
TMDSEMUPP	XDS510PP-Plus Spectrum Digital (Parallel Port) Emulator[5]							✔			1,095
TMDSEMUUSB	XDS510™ Spectrum Digital USB-Based Emulator for Windows							✔			1,495

[1] Prices are quoted in U.S. dollars and represent year 2008 suggested resale pricing. All prices are subject to change. Customers are advised to obtain the most current and complete pricing information from TI prior to placing orders. TI may verify final pricing prior to accepting any order.
[2] C2000 target support only. DSP/BIOS kernel and C++ compiler are supported on C28x™ platform only.
[3] Code Composer Studio IDE is limited to use with the target hardware board ONLY.
[4] MontaVista Pro license
[5] Orderable part number will vary to specify European power cords
✔ = included   L = Full featured – Limited to 120 days

A Wide Variety of DSP Solutions

Utilize the TI Developer Network for:

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

eXpressDSP™-Compliant Products

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

TI Developer Network Overview

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

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

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

as emulation tools, reference designs and user guides

Developer Network Product Catalog on TI's Website

For information regarding the vast array of products available from TI's Developer Network, check out:

www.ti.com/dncatalog. Extensive information can be found through searchable listings of members located worldwide. Search hundreds of listings by company, device supported, keywords, product name or product category.

Developer Network Logo Indicates TMS320™ Processor-Based Solution

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

TEXAS INSTRUMENTS
DSP Developer Network

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

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

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

End-Equipment Solutions
- Video and imaging
- Communications and telecom
- Security
- Wireless

Solutions to reduce development time.

→ *Audio*

Audio Systems Solutions

Get additional information at: **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**

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
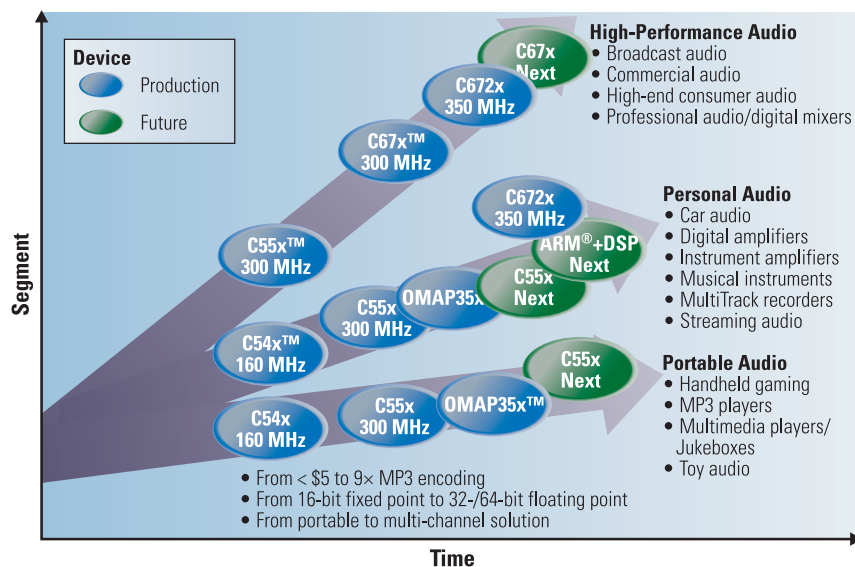
Audio solutions roadmap

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**

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**

Audio Application Notes

Application Note	Web Search Literature #
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
TMS320C6000™ McBSP to Voice Band Audio Processor (VBAP) Interface	SPRA489

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

Application Note	Web Search Literature #
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

System Solutions

HiRel DSPs

HiRel Defense and Aerospace Solutions

Get additional information at: **www.ti.com/hirel**

Targeted Applications
- Defense
  - Software-defined radio
  - Secure communications
  - Radar
  - Sonar
  - Smart munitions
  - Communications
  - Graphics
  - Image processing
- Aerospace
  - Motor control
  - Pumps
  - Braking systems
  - Noise cancellation
  - Sensors
  - Imaging
  - Security
  - Communications
  - Radar
- Space
  - Satellites
  - Space-based radar
  - Critical control systems
  - Launch vehicles
  - Data processing
  - Imaging
  - Motor control

TI HiRel offers a vast portfolio of ICs that provide extended temperature, enhanced processing and packaging for aerospace, defense and down-hole drilling applications. TI HiRel supplies a wide range of TI products to meet rugged and extreme environments. Process capabilities include QML Class Q and Enhanced Product (EP) for defense and avionics applications and QML Class V for space requirements.

The DSP selection from HiRel includes ceramic hermetic packaging and QML versions from all the TI DSP generations. From the earliest TMS320C1x to the latest TMS320C6000™ DSP devices, we continue to offer the best parts for defense and military applications. HiRel can support long design and production cycles and help alleviate obsolescence concerns.

The Enhanced Product offerings provide plastic packaging options for applications that require extended temperature and controlled baselines. If hermetic packaging is not a concern, EP parts offer alternatives to ceramic and military-specified parts. EP can provide plastic parts that are suitable for a number of applications in the avionics and aerospace market.

TMS320C6000 DSP Platform

Fixed Point

SM320C6201B	HiRel Fixed-Point Digital Signal Processor
SMJ320C6201B	HiRel Fixed-Point Digital Signal Processor
SMJ320C6203	HiRel Fixed-Point Digital Signal Processor
SMJ320C6415	HiRel Fixed-Point Digital Signal Processor
SM320DM642-EP	HiRel Enhanced Product Fixed-Point Digital Signal Processor
SM320C6455-EP	HiRel Enhanced Product Fixed-Point Digital Signal Processor
SM320C6414-EP	HiRel Enhanced Product Fixed-Point Digital Signal Processor
SM320C6415-EP	HiRel Enhanced Product Fixed-Point Digital Signal Processor
SM320C6416-EP	HiRel Enhanced Product Fixed-Point Digital Signal Processor
SM32C6416T-EP	HiRel Enhanced Product Fixed-Point Digital Signal Processor
SM320C6201-EP	HiRel Enhanced Product Fixed-Point Digital Signal Processor
SM320C6202-EP	HiRel Enhanced Product Fixed-Point Digital Signal Processor

Floating Point

SMJ320C6701	HiRel Floating-Point Digital Signal Processor
SM320C6701-EP	HiRel Enhanced Product Floating-Point Digital Signal Processor
SM320C6711D-EP	HiRel Enhanced Product Floating-Point Digital Signal Processor
SM320C6712D-EP	HiRel Enhanced Product Floating-Point Digital Signal Processor
SM320C6713B-EP	HiRel Enhanced Product Floating-Point Digital Signal Processor

TMS320C5000™ DSP Platform

SMJ320LC549	HiRel Fixed-Point Digital Signal Processor
SMJ320VC5416	HiRel Fixed-Point Digital Signal Processor
SM320VC5510A-EP	HiRel Enhanced Product Fixed-Point Digital Signal Processor
SM320VC5416-160-EP	HiRel Enhanced Product Fixed-Point Digital Signal Processor
SM320VC5409-EP	HiRel Enhanced Product Fixed Point Digital Signal Processor
SM320VC5421-EP	HiRel Enhanced Product Fixed-Point Digital Signal Processor

TMS320C2000™ Digital Signal Controller Platform

SM320F2812	HiRel Fixed-Point Digital Signal Controller
SMJ320F240	HiRel Fixed-Point Digital Signal Controller
SM320F2812-EP	HiRel Enhanced Product Digital Signal Controller
SM320F2801-EP	HiRel Enhanced Product Digital Signal Controller
SM320F2808-EP	HiRel Enhanced Product Digital Signal Controller
SM320LF2407A-EP	HiRel Enhanced Product Digital Signal Controller

Other Platforms Available in QML Ceramic

SMJ320C15, SMJ320C25, SMJ320C3x, SMJ320C40, SMJ320C50, SMJ320C80 DSPs

QML-V Space-Level DSP

SMJ320C6701-SP	Rad-Tolerant Class V, Floating-Point Digital Signal Processor

Digital Control Systems Solutions

Get additional information at: **www.ti.com/digitalcontrol**

Targeted Applications
- Green energy
  - Solar inverters
  - Wind turbines
  - Fuel cells
- Digital power supplies
  - Telecom rectifiers and complex DC/DC converters
  - Server rectifiers
  - Industrial power supplies
  - HDTV power supplies
  - DC/DC modules
  - Uninterruptible power supplies (UPS)
- Lighting
  - LED billboards
  - Streetlight control and networking
- Home appliances
  - Washer drives
  - Compressor motor
  - Induction cooktops
- Industrial control
  - Variable-speed AC drives
  - Soft starters
  - Process control
  - Servo control
  - Stepper motor control
- Automotive
  - Radar for blind spot detection, lane departure warning and automatic cruise control
  - Electric power steering
  - Wiper control
  - HVAC blowers
- Medical
  - CPAP motor control
  - Patient transport
  - Blood analysis
- Metering
  - Power line modem for electricity automated meter infrastructure
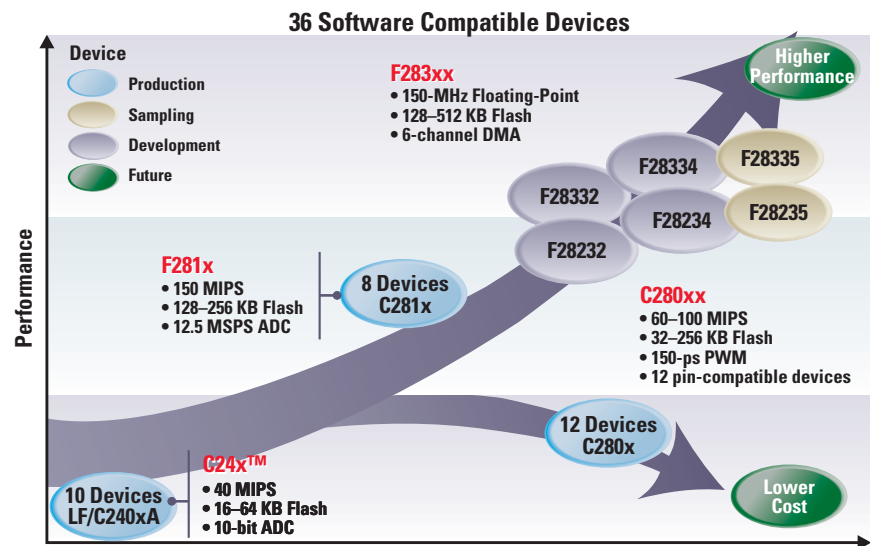 - Flow meters

Industrial Solutions Overview

The TMS320C2000™ digital signal controller (DSC) 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™ DSCs are ideal for embedded industrial applications such as digital motor control, digital power supplies and intelligent sensor applications.

Digital Control Overview

TI delivers DSP performance with microcontroller 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.

36 Software Compatible Devices

Device
- Production
- Sampling
- Development
- Future

F283xx
- 150-MHz Floating-Point
- 128–512 KB Flash
- 6-channel DMA

Higher Performance

F28334 F28335
F28332 F28234 F28235
F28232

F281x
- 150 MIPS
- 128–256 KB Flash
- 12.5 MSPS ADC

8 Devices C281x

C280xx
- 60–100 MIPS
- 32–256 KB Flash
- 150-ps PWM
- 12 pin-compatible devices

Performance

12 Devices C280x

C24x™
- 40 MIPS
- 16–64 KB Flash
- 10-bit ADC

10 Devices LF/C240xA

Lower Cost

Digital control solutions roadmap

Industrial

Digital Motor Control Systems Solutions

Get additional information at: **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 sensorless 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 and 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 sensored and sensorless control systems.

Digital Power Systems Solutions

Get additional information at: **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.

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
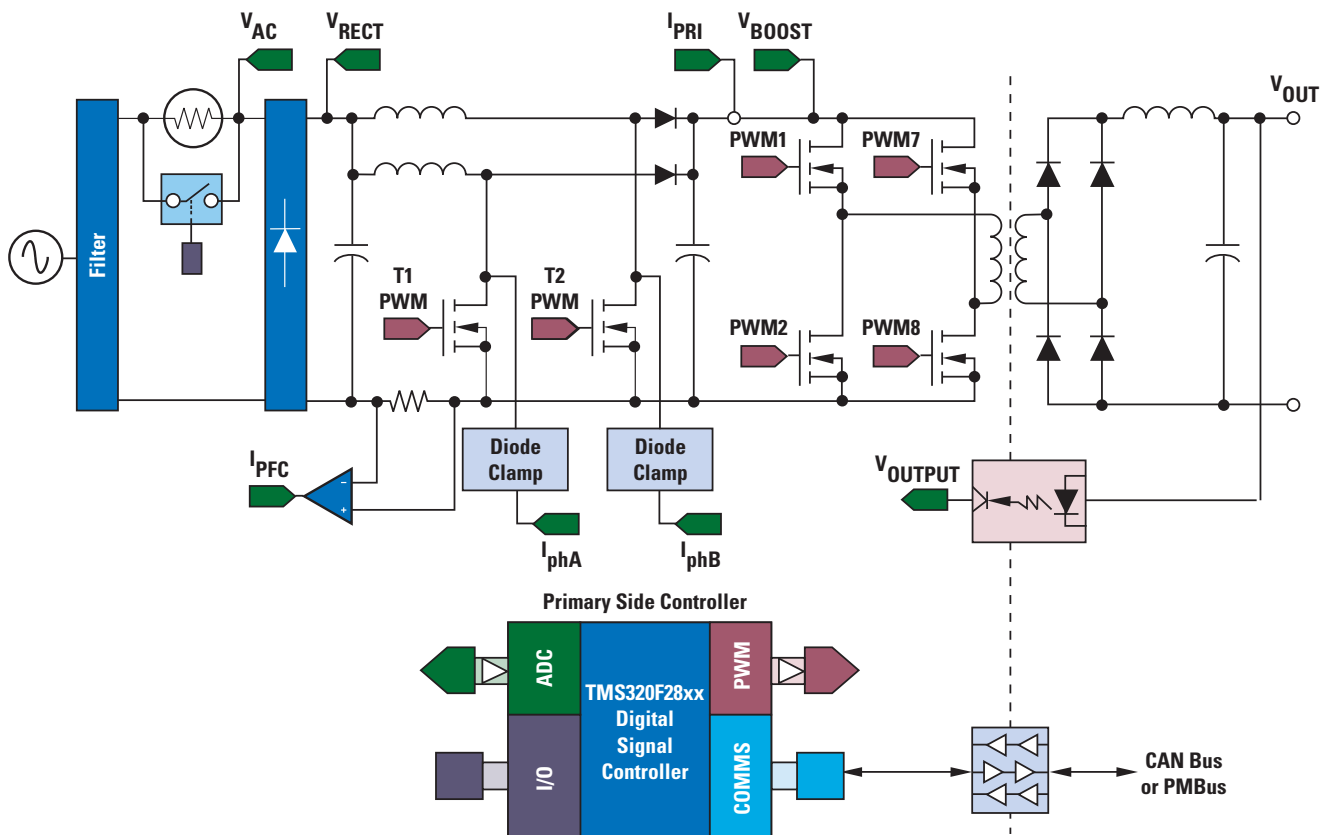
Telecom rectifier (DC-DC converter) example

System Solutions

Industrial

Power Line Communications Systems Solutions

Get additional information at: **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**). 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.
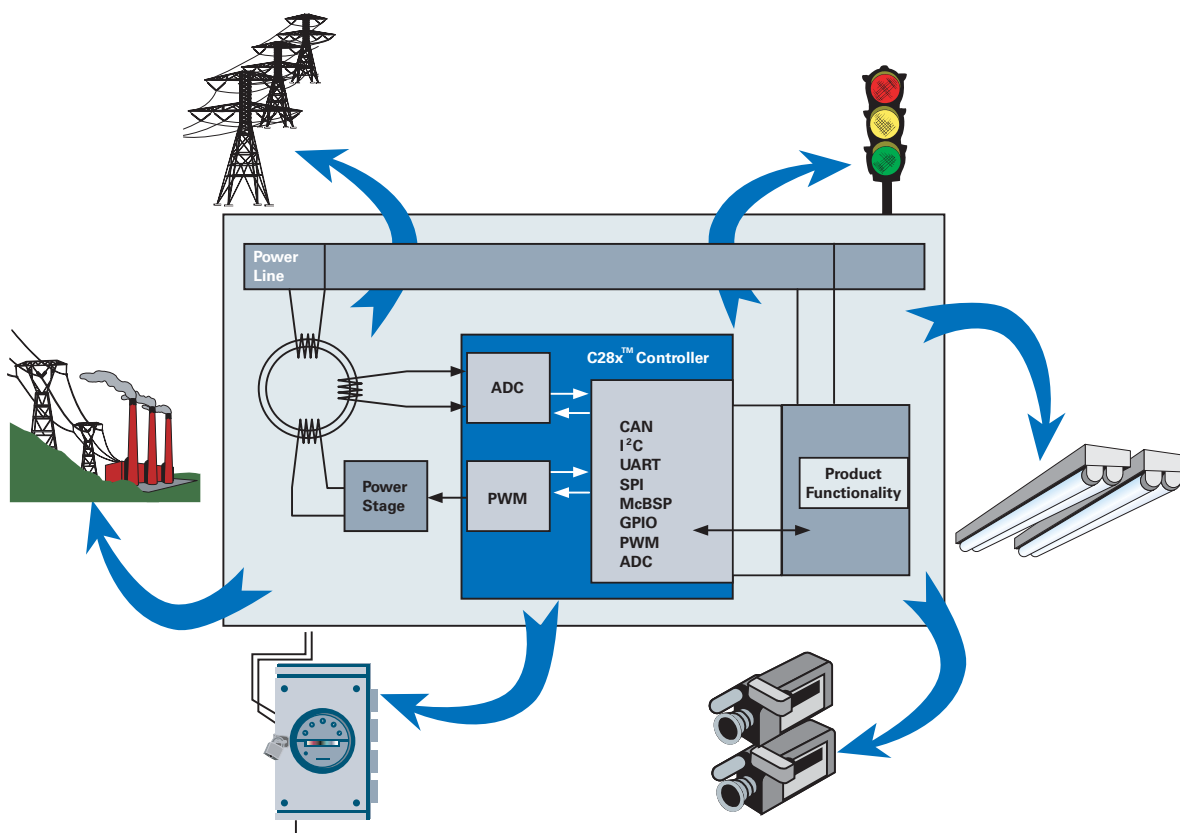
Power line communications implementation

Solar Inverter Systems Solutions

Get additional information at: **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.
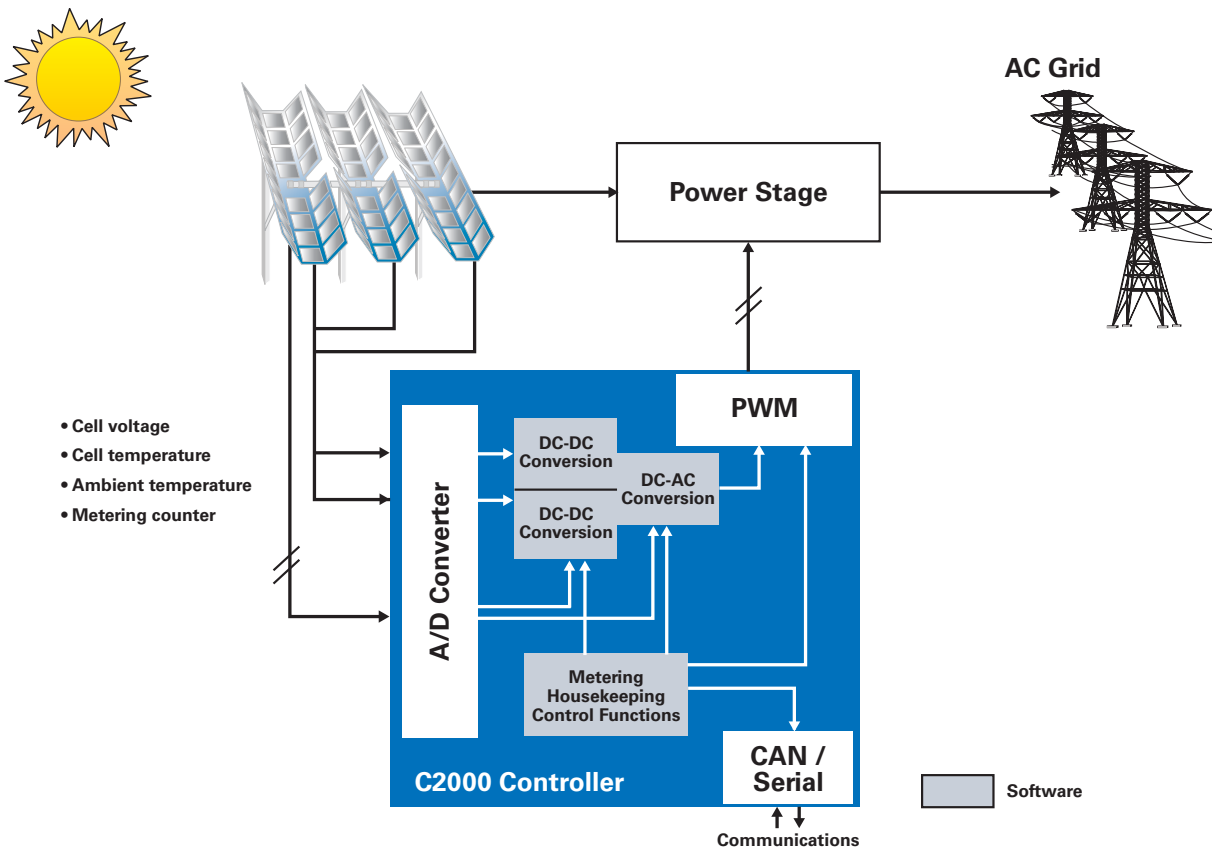
Solar inverter example

System Solutions

→ *Industrial*

TMS320C2000™ Controller Platform Hardware and Software Development Tools

Description	Part #	$U.S.[1]
Starter Kits		
TMS320F28044 eZdsp™ Starter Kit	TMDXEZ28044 (WW part number)	495
Includes target board with socket, USB cable, Code Composer Studio™ (CCStudio) IDE for eZdsp, power supply		
TMS320F28335 eZdsp Starter Kit	TMDXEZ28335 (WW part number)	495
Includes target board with socket, USB cable, CCStudio IDE for eZdsp, power supply		
TMS320F2808 eZdsp Starter Kit	TMDSEZS2808 (U.S./Asia part number)	495
Includes target board with socket, USB cable, CCStudio IDE for eZdsp, power supply	TMDSEZS2808-0E (European part number)	495
TMS320F2812 eZdsp Starter Kit	TMDSEZS2812 (U.S./Asia part number)	495
Includes target board with socket, parallel port cable, CCStudio IDE for eZdsp, power supply	TMDSEZS2812-0E (European part number)	495
TMS320F2812 eZdsp Starter Kit	TMDSEZD2812 (U.S./Asia part number)	395
Includes target board, parallel port cable, CCStudio IDE for eZdsp, power supply	TMDSEZD2812-0E (European part number)	395
TMS320LF2407 eZdsp Starter Kit	TMDSEZD2407 (U.S./Asia part number)	345
Includes target board, parallel port cable, CCStudio IDE for eZdsp, power supply	TMDSEZD2407-0E (European part number)	345
Evaluation Modules		
F2812 Development Bundle[2]	TMDSEVP2812 (U.S. part number)	1,995
Includes eZdsp (socketed), CCStudio IDE, XDS510PP-Plus	TMDSEVP2812-0E (European part number)	
F2812 Development Bundle[2]	TMDSEVU2812 (U.S. part number)	2,295
Includes eZdsp (socketed), CCStudio IDE, XDS510™ USB Emulator	TMDSEVU2812-0E (European part number)	
JTAG Emulators		
JTAGjet-TMS-C2000 USB Emulator for Windows	www.signum.com	595
Blackhawk USB2000 Controller	www.blackhawk-dsp.com	299
XDS510 USB-Based Emulator	TMDSEMUUSB	1,995
Software Development Tools		
C2000™ DSP Code Composer Studio Development Tools Bundled with Annual Software Subscription	TMDSCCS2000-1	495
Supports TMS320C24x™ and TMS320C28x™ DSC products		
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
Code Composer Studio IDE Free Evaluation Tools	SPRC119	Free
Includes C6000, C5000, C2000, DaVinci and OMAP processor CCStudio 120-Day Free Evaluation Tools[3]	www.ti.com/freetools	
TMS320C2000 Flash Programming Utilities	www.ti.com/c2000flashtools	Free
TMS320C2000 Digital Motor Control Software	www.ti.com/c2000appsw	Free
TMS320C2000 Digital Power Software	www.ti.com/dpslib	Free
TMS320C2000 Signal Processing Libraries	www.ti.com/c2000sigproclib	Free

[1]*Prices are quoted in U.S. dollars and represent year 2008 suggested resale pricing. All prices are subject to change. Customers are advised to obtain the most current and complete pricing information from TI prior to placing orders. TI may verify final pricing prior to accepting any order.*
[2]*Includes Code Composer Studio IDE, code-generation tools with C compiler/assembler/linker, target board and device drivers.*
[3]*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), Spectrum Digital (www.spectrumdigital.com), Technosoft (www.technosoft.ch) and Softronics (www.softronx.com).*
Please see the features supported by platform matrix on page 60 for more details.

Low-Power Medical Processor Solutions

Get additional information at: **www.ti.com/**medical

Targeted Applications

- Diagnostic, patient monitoring and therapy
  - Electrocardiogram (ECG/portable ECG/heart-rate monitor)
  - Electroencephalogram (EEG)
  - Fetal monitoring
  - Remote (wired and wireless) patient monitoring
  - Data logging
  - Blood oxygen (pulse oximetry) and other blood gas analyzers
  - Digital stethoscopes
  - Automated external defibrillator (AED) and defibrillators
  - CPAP and BIPAP therapy devices
  - Ventilation/respiration
  - Point-of-care testing

TI Medical Solutions Benefits

- Programmable solution accommodates customer's ever-changing IP in medical algorithm implementation enabling faster time to market
- High performance at low power for portable medical applications
- Higher integration and extensive peripheral support reducing system cost
- Extensive roadmap for scalability and better differentiation
- Offering ARM-only, ARM-based GPP and DSP and DSP-only architectures

Medical Diagnostics and Patient Monitoring Overview

TI's complete end equipment solutions for medical applications leverage our product expertise in microcontrollers, Digital Signal Processors (DSPs), SoCs (System-on-Chip devices) and high-performance analog for consumer medical and diagnostic patient monitoring systems.
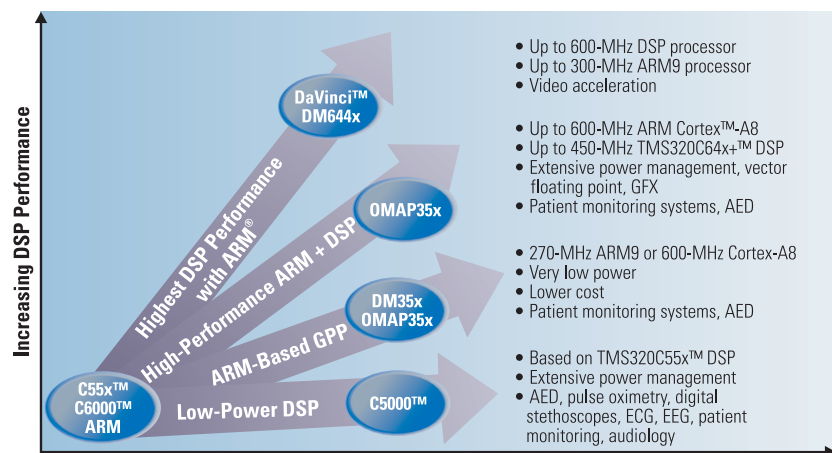
Digital signal processing technology enables medical manufacturers to develop cost-effective, state-of-the-art diagnostic and patient-monitoring instruments based on advanced DSP algorithms and bring these products to market quickly. Signal-processing algorithms are used for signal conditioning, performing measurements, running analytics on measurements to determine the health condition and graphical display of this measured data. Being able to perform such processing at low power is increasingly important for a variety of portable and small-factor medical and consumer devices. Low-power TMS320C55x™ DSP-based SoC devices provide the processing performance and peripherals to support such low-power applications. For processing-intensive applications, TMS320DM644x DSPs provide the processing performance required.

User control and interaction is becoming more and more important as medical devices become increasingly sophisticated.

Low-power ARM®-based general-purpose processors are extremely useful in this aspect. TI has several ARM-based solutions in this area, including members of the TMS320DM35x and OMAP35x platforms. Furthermore, DSP-based solutions, such as C55x™ DSPs, have an extensive peripheral set and can perform significant user control and interaction for portable systems without the need of an ARM-based processor.

The ever-increasing need to minimize healthcare costs is driving remote patient monitoring and telemedicine. These complex yet portable systems need both ARM and DSP processing. For reduced form factor and lower power, it is desirable to have a single-chip solution which has these cores. OMAP™ and DaVinci™ architectures employ this dual-core architecture enabling optimized system partitioning and performance.

With TI's extensive portfolio and roadmap, customers have the freedom to choose an ARM-only, DSP-only or ARM+DSP solution. TI also provides an extensive set of analog, low-power wireless and connectivity solutions to complement the low-power medical processors for portable remote patient-monitoring applications.

Low-power medical processor families

- Up to 600-MHz DSP processor
- Up to 300-MHz ARM9 processor
- Video acceleration

- Up to 600-MHz ARM Cortex™-A8
- Up to 450-MHz TMS320C64x+™ DSP
- Extensive power management, vector floating point, GFX
- Patient monitoring systems, AED

- 270-MHz ARM9 or 600-MHz Cortex-A8
- Very low power
- Lower cost
- Patient monitoring systems, AED

- Based on TMS320C55x™ DSP
- Extensive power management
- AED, pulse oximetry, digital stethoscopes, ECG, EEG, patient monitoring, audiology

→ **Medical Imaging**

Medical Imaging Solutions

Get additional information at: **www.ti.com/medical**

Targeted Applications
- Ultrasound
- Digital x-ray
- Magnetic resonance imaging (MRI)
- Computed tomography (CT)
- Positron emission tomography (PET)
- Nuclear medicine
- Bone densitometer
- Endoscopy
- Medical digital video recorder (DVR)

Additional Information
For more information on TI compo-
nents that might be useful in your
application, download TI's Medical
Applications Guide (SLYB108B) at
www.ti.com/medical.

Medical Imaging Systems Overview

Advances in imaging technologies have
led to extraordinarily powerful medical
imaging equipment, yielding faster and
more accurate diagnosis and treatment.
This advancement is aided by high-per-
formance DSPs. TI's high-performance
DSP cores are ideal for meeting real-time
requirements in imaging modalities such
as ultrasound, while the high-bandwidth
interfaces and ability to connect multiple
DSPs together ensure that there will be
enough processing power available in your
medical-imaging system. As the algo-
rithms continue to advance, TI's program-
mable platforms allow for quick adoption
and speed time to market.

DSP technology is also at the forefront of
another amazing trend in medical imaging
products: the trend to go portable. As doc-
tors and care givers endeavor to reach
more people, creating smaller, more
portable medical equipment is a must. TI's
OMAP™ and DaVinci™ architectures are
designed for low-power, portable applica-
tions enabling medical imaging equip-
ment, such as hand-carried ultrasound
units, to be powerful yet power efficient.

TI's SoC solutions utilizing embedded
high-performance DSP and ARM® proces-
sors enable smaller end-product foot
prints and reduce system boot times while
enabling image processing, high-level
operating systems, user interface and
control functions at low power for extend-
ed battery life.

TI provides complete signal chain solu-
tions for your medical imaging needs. In
addition to DSPs, TI's medical product
portfolio includes amplifiers, clocks, data
converters, temperature sensors, interface
logic, microcontrollers, power management
and RF ICs.

TI Medical Imaging Solutions Benefits
- High-performance DSPs enable latest
  imaging algorithms while allowing room
  for product differentiation
- Programmable solution and range of
  software-compatible processors pro-
  vides scaleable imaging platforms,
  saving redesign
- Broad range of high-performance cores
  and highly integrated SoCs
- Easy-to-use software and tools get you
  to market faster
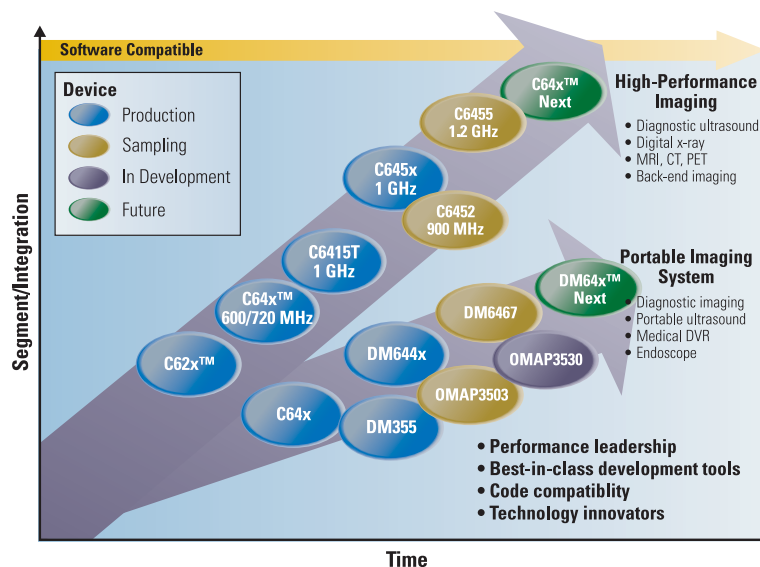
Medical imaging processor families

Telecom Systems Solutions

Get additional information at: **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 data, voice, telephony and connectivity 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.
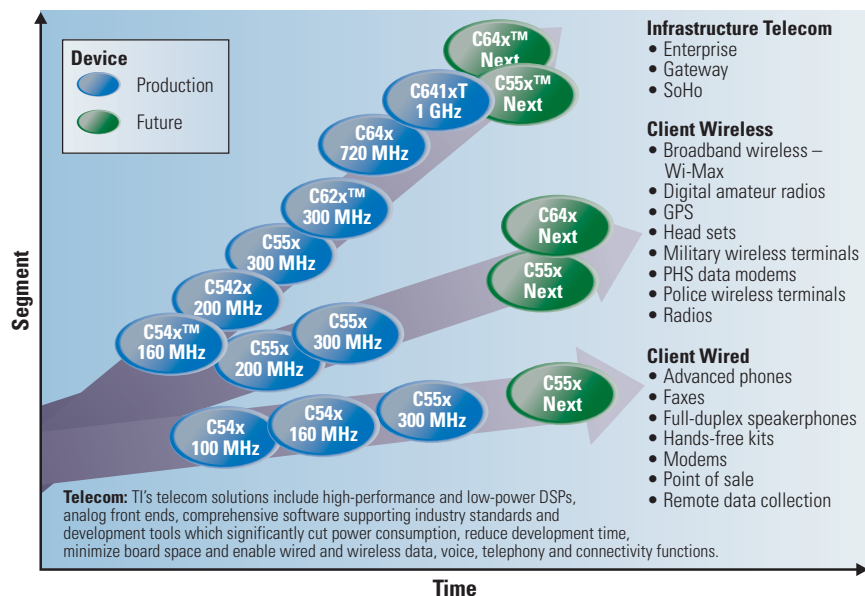
Telecom solutions roadmap

System Solutions

Video and Imaging

Video and Imaging Systems Solutions

Get additional information at: **www.ti.com/videoandimaging**

Targeted Applications

- Automotive infotainment
- Automotive video sensing
- Automotive vision
- Broadcast systems
- Cable head-end video equipments (routers)
- Digital camcorders
- Digital cameras
- Digital media adapters
- Digital photo frames
- Digital TV and server head-ends
- Digital video recorders
- IP network cameras
- IP-based video-conferencing endpoints
- IP-based video phones
- IP set-top boxes
- Hard-copy appliances
- Machine vision
- Media encoder/decoder appliances
- Media gateways
- Medical imaging
- Personal video recorders
- Portable media players
- Professional-grade video broadcast equipment
- Robotics
- Security recording systems
- Streaming video appliances
- Video broadcast transcoding
- Video-conferencing, multi-point conference units (MCUs)/gateways
- Video infrastructure
- Video jukeboxes
- Digital video security recorders (DVRs)
- Video surveillance cameras
- Webpads
- Wireless cameras

Video and Imaging Systems Overview

As the video and imaging markets continue to evolve with new functionality requirements and multiple emerging video standards, 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 power consumption and support for real-time video processing such as video coding, transcoding, transrating and video/imaging instruction sets. TI's processors provide the processing performance and programmability other processors are unable to provide.

TI offers a large product portfolio including hardware, software and integrated system solutions that are perfect for a variety of digital video applications. TI's large processor portfolio for digital video applications includes:

- DaVinci™ Digital Media Technology (see page 26)
- TMS320C6000™ DSP Platform (see page 14)
- TMS320C5000™ DSP Platform (see page 8)
- OMAP™ Platform (see page 38)

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.
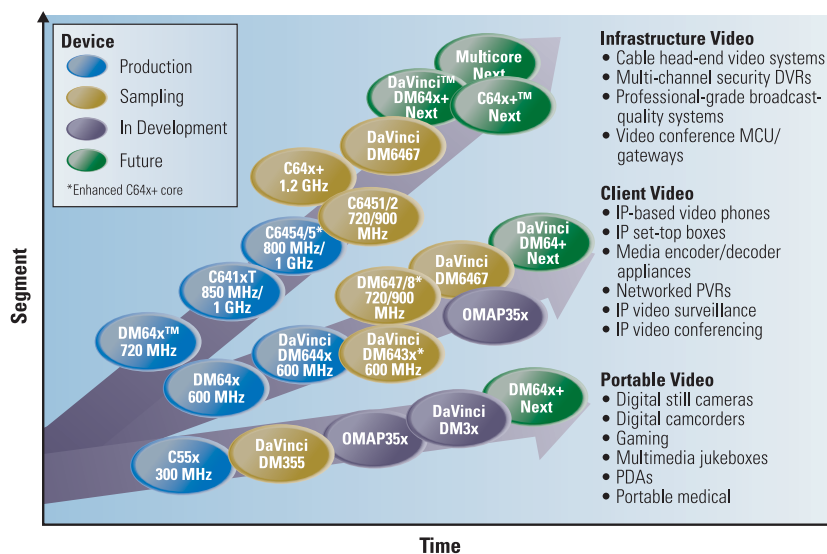
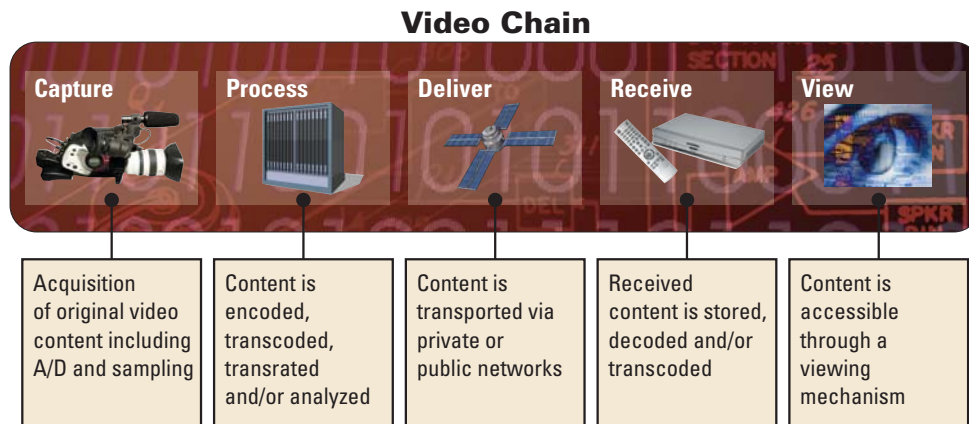*Video and imaging solutions roadmap*

TI's Solutions Cover the Entire Video Chain

TI has a 25+ year involvement in 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 of market segments. TI has a number of customized solutions for various market segments which simplify development by

providing access to software, tools, the TI DSP Developer Network and local support. For more information on TI's market expertise and solutions for the entire video chain, please visit **www.ti.com/video**.

Video Chain

Capture	Process	Deliver	Receive	View
Acquisition of original video content including A/D and sampling	Content is encoded, transcoded, transrated and/or analyzed	Content is transported via private or public networks	Received content is stored, decoded and/or transcoded	Content is accessible through a viewing mechanism

Additional Resources

Video/Imaging On-Line Information
A wealth of video/imaging information awaits you at **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.

YouTube Video Resources
TI has a number of information videos on its TMS320DM355 and TMS320DM6467 solutions. These can be found at **www.ti.com/dm355** and **www.ti.com/dm6467**. Additionally, TI has these videos on YouTube. Check out TI's YouTube channel for a growing list of TI homegrown videos: **www.ti.com/youtube**.

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**

Subscribe to the *Digital Media Focus* 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 Focus* 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** to subscribe.

System Solutions

Video and Imaging

Video and Imaging Development Tools

TI has a number of hardware/software development tools that can be used for a variety of digital video designs. Two of the newest tools are highlighted below: the TMS320DM355 Digital Video Evaluation Module and the TMS320DM6467 Digital Video Evaluation Module.

TMS320DM6467 Digital Video Evaluation Module (DM6467 DVEVM) – The TMS320DM6467 Digital Video Evaluation Module (DVEVM) includes both hardware and software enabling developers

TMS320DM6467 Digital Video Evaluation Module

to start immediate evaluation of the DM6467 processor. DVEVMs come complete with a demo version of MontaVista Linux Pro 4.0, drivers, Codec Engine, evaluation codecs and an evaluation board. The DVEVM can be used for the development of digital video applications such as surveillance digital video servers/recorders, media gateways, multi-point control units digital media adapters, set-top boxes and many other high-definition video applications.

The DM6467 DVEVM allows developers to write production-ready application code for the ARM® and provides access to the TMS320C64x+™ DSP and HD-Video/Imaging Co-Processor core using DaVinci™ APIs to begin immediate application development for the DM6467 digital media processor.

The Digital Video Software Production Bundle (DVSPB) MontaVista Linux companion product is recommended for production.

For more information, contact your authorized TI distributor or visit **www.ti.com/dm6467dvevmdsg**.

TMS320DM355 Digital Video Evaluation Module (DM355 DVEVM) – The TMS320DM355 Digital Video Evaluation Module (DVEVM) includes both hardware and software enabling developers to start immediate evaluation of the DM355 processor. DVEVMs come complete with a demo version of MontaVista Linux Pro 4.0, drivers, Codec Engine, evaluation codecs and an evaluation board. Registered DVEVM users may download TI's JPEG and HD MPEG-4 SP production codecs and G.711 codec free of charge from the DaVinci software updates site. The DVEVM can be used for the development of digital video applications such as IP security cameras, digital photo frames, digital cameras, video doorbells, portable medical and portable digital video products that have yet to be invented.

The DVEVM allows developers to write production-ready application code for the ARM and provides access to the MPEG/JPEG co-processor core using DaVinci APIs to begin immediate application development for DM355 digital media processors.

The Digital Video Software Production Bundle (DVSPB) MontaVista Linux companion product is recommended for production.

TMS320DM355 Digital Video Evaluation Module

For more information, contact your authorized TI distributor or visit **www.ti.com/dm355dvevmdsg**.

For a complete listing of all of TI's video/imaging hardware and software development tools, please see the chart on the next page.

Video and Imaging Hardware and Software Development Tools

Description	Part Number	Price[1]
Hardware Development Tools		
TMS320DM642 Digital Media Development Kit (DM642 DMDK)	TMDSDMK642 (U.S. part number)	6,495
	TMDSDMK642-0E (European part number)	
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)	
Evaluation Modules (EVMs)		
TMS320DM6446 Digital Video Evaluation Module (DVEVM)	TMDSEVM6446	2,495
OMAP35x Evaluation Module	TMDXEVM3503 (U.S. part number)	1,499
TMS320DM642 Evaluation Module (EVM)	TMDSEVM642	1,995
TMS320DM6437 Digital Video Development Platform (DVDP)	TMDXVDP6437	495
TMS320DM648 Digital Video Development Platform (DVDP)	TMDXDVP648	1,295
TMS320DM355 Digital Video Evaluation Module (DVEVM)	TMDXEVM355	495
TMS320DM6467 Digital Video Evaluation Module (DVEVM)	TMDXEVM6467	1,995
JTAG Emulators		
Spectrum Digital XDS510PP-Plus Emulator	TMDSEMUPP (U.S. part number)	1,095
Spectrum Digital XDS510PP-Plus Emulator with European Cords	TMDSEMUPP-0E (European part number)	1,095
Spectrum Digital XDS510™ USB Emulator	TMDSEMUUSB	1,495
Blackhawk XDS560™ JTAG PCI Emulator	TMDSEMU560PCI	2,995
Blackhawk XDS560 USB High-Performance JTAG Emulator	TMDSEMU560U	2,999
XDS560 USB Trace Emulator[2]	TMDSEMU560T	9,995
Software Development Tools		
Digital Video Software Production Bundle (DVSPB)	TMDSDVSPBA9-L	6,995
Digital Video Software Production Bundle (DVSPB) + CCStudio IDE and XDS560R Emulator	TMDSDVSPBA9-3L	10,995
Code Composer Studio™ (CCStudio) IDE 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
Code Composer Studio IDE Free Evaluation Tools Includes C6000 DSP and DaVinci CCStudio IDE 120-Day Free Evaluation Tools[3]	SPRC119 (www.ti.com/freetools)	Free
TMS320C62x™ DSP Image Library	SPRC093	Free
TMS320C64x™ DSP Image Library	SPRC094	Free

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

New tools are listed in bold red.

[2] The XDS560 Trace is designed for use with trace-enabled digital signal processors. Currently the following processors are fully supported by trace: TMS320C6418, TMS320C6416T, TMS320C6415T, TMS320C6414T, TMS320C6413, TMS320C6412, TMS320C6411, TMS320C6410, TMS320DM648, TMS320DM647, TMS320DM643, TMS320DM642, TMS320DM641 and TMS320DM640 processors.

[3] 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

System Solutions

Video and Imaging

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

Get samples, data sheets, Evaluation Modules (EVMs) and app reports at: **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	Multiple-Output Converter
3.3 V	TPS75401	TPS40041	TPS64200	TPS62040		TPS65023
5 V	TPS75401	TPS40042	TPS64200	TPS62040	TPS54350	TPS65023 TPS54386
12 V		TPS40190 TPS5124†	TPS40200		TPS5420	TPS54386
24 V		TPS5124†	TPS40200*		TPS5420*	TPS54386

†Dual-output controller
*Due to Vout/Vin ratio core voltage may have to be stepped down from I/O voltage
I/O supply 3.3 V, current up to 1 A
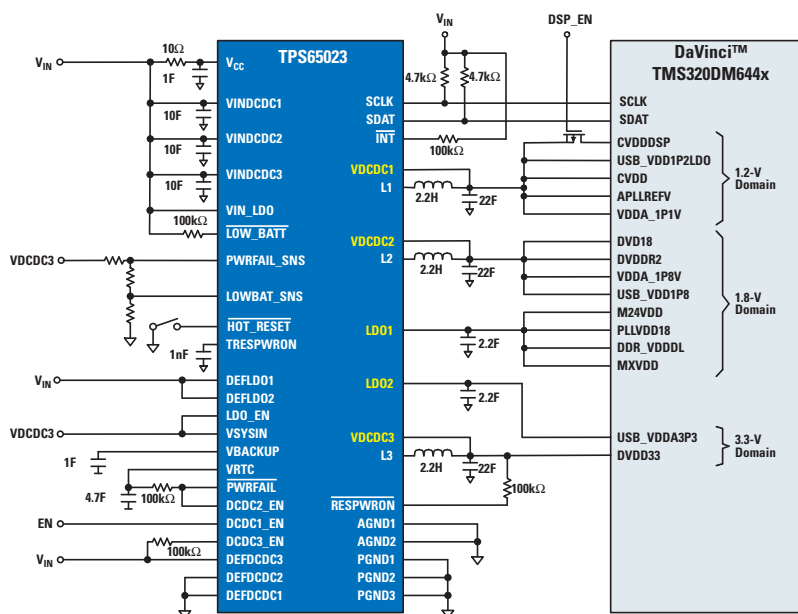Core supply down to 1.0 V, current up to 2 A

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	Multiple-Output Converter
3.3 V	TPS75401	TPS40041	TPS64200	TPS54317		PTH04070		TPS65023
5 V	TPS75401	TPS40042	TPS40200	TPS54317	TPS54350	PTH04070		TPS65023 TPS54386
12 V		TPS40190 TPS5124†	TPS40200	TPS54350	TPS54350	PTH08080		TPS54386
24 V		TPS40057 TPS5124†	TPS40200*		TPS5430*	PTN78000*	PTB78560*	TPS54386
48 V		TPS40061	TPS40200*				PTMA403033*	

†Dual-output controller
*Due to Vout/Vin 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

Application schematic: TPS65023 driving DaVinci™ TMS320DM644x — 1.2-V Domain, 1.8-V Domain, and 3.3-V Domain.

DSP Support
Design Answers at Your Fingertips

Obtain additional information on training, technical documentation and more at: **www.ti.com/dspsupportdsg**

Get to market easily and quickly by leveraging TI DSP support. Customers can access fast and accurate support for their DSP applications. From Getting Started with DSP to technical documentation and much more, TI offers the technical support you need when YOU need it. On-line training, webcasts, workshops and the TI Developer Conference provide convenient training choices.

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 introductory DSP content, thus decreasing the learning curve and speeding products to market.
www.ti.com/gettingstarteddsg

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™ IDE Platinum Edition for the TMS320C2000™, TMS320C5000™ and TMS320C6000™ DSP platforms, and DaVinci™ and OMAP™ processor platforms. Download today at **www.ti.com/ccsfetsdsg**

Video Casts: Engineering in Front of the Camera
TI provides a variety of quick videos, all under five minutes, showcasing the OMAP35x and DaVinci processors. These on-demand video casts feature complete platform information including hardware, software, system block diagrams and much more.

- **DM355 Video Casts** – The DM355 video casts give engineers the technical meat on the DM355 processor and solutions. Topics include: Codec Engine, software, tools, an architectural overview and discussions on the future of video. **www.ti.com/dm355videocasts**
- **DM6467 Video Casts** – View one or all of the DM6467 video casts for a look at why this DaVinci SoC is ideal for HD transcoding. TI experts discuss the future of transcoding, as well as the DM6467 processor, DVEVM and video surveillance. **www.ti.com/dm6467videocasts**
- **OMAP35x Video Casts** – Download the newest video casts discussing the benefits of the OMAP35x applications processor and the Open Source Community. **www.ti.com/omap35xvideocasts**

Podcasts
The podcasts feature industry news, technology updates and practical tips regarding the latest innovations from TI in digital signal processing. Check out the archive at **www.ti.com/podcasts**

Blogs
Check out the latest posts by TI DSP leaders. 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/video360blogdsg**

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/kbasedsg**

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, OMAP and DaVinci technology webcasts are available via the webcast archives. **www.ti.com/webcasts**

Support

TI Open Source Software

TI sees open source as a means to drive innovation, ultimately enabling our customers to create market-leading devices that push the envelope with performance and advanced capabilities. TI participates in a number of open source industry initiatives such as the Open Handset Alliance, ARM®'s Mobile Linux Initiative, The Linux Foundation, GStreamer, Eclipse and Helix, among others. This site will serve to foster collaboration between TI and the open source community and provides a list of ongoing open source projects we support.
opensource.ti.com

Technical Documentation

Find complete and easy-to-use data sheets, user's guides and application reports for all TI DSP platforms and corresponding DSP software development tools.
www.ti.com/techdocsdsg

DaVinci™ Developers' Wiki

The DaVinci Technology Developers' Wiki provides a collaborative environment for digital media engineers using Texas Instruments DaVinci processors to share technical tips and open source code. The Developers' Wiki is designed to get you to market faster by shortening the design knowledge ramp, assist other developers innovate and foster a growth of DaVinci technology knowledge on hardware and software.
www.ti.com/davinciwikidsg

Publications
eTech Innovations eNewsletter

Receive the latest digital signal processing news from TI including: DSP silicon, software, systems applications and support information. Subscribe today for this free monthly eNewsletter to be delivered right to your inbox in html or text format.
www.ti.com/etechdsg

Digital Media Focus eNewsletter

Subscribe to the monthly *Digital Media Focus* eNewsletter to receive the latest TI video/imaging 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 to subscribe.

My.TI.com Newsletter

Receive a customized weekly e-Newsletter and choose the topics and stories that you want to read. Learn about the latest technology in audio, communications, control, security, systems, telecom, video/imaging and much more.
www.ti.com/myti

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/dspsupportdsg

TI DSP Discussion Groups

Join the community of DSP users and share information about signal processing application design. Peer-to-peer discussion groups cover topics on OMAP™ and DaVinci processors, along with other TMS320™ DSPs and controllers.
www.ti.com/discussgroupdsg

TI On-Line Community

TI's new on-line support communities empower engineers to be heard – TI is hosting a new on-line "Support Communities" web site to answer the difficult questions via forums, blogs and videos in key categories including DSP, analog, software and more.
www.ti.com/community

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**

TI Developer Conference

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
• Lighting & Displays
• Medical
• Systems & Trends
• Tools & Embedded Software
• Video & Imaging

Visit **www.ti.com/tidc**

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, DaVinci™ and analog applications, easy-to-use software development tools and more.

Visit **www.ti.com/onlinetrainingdsg** for more FREE courses!

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 Question & Answer session with the technical engineering presenter specializing in the topic. To access the library, visit **www.ti.com/webcastsdsg**

TI Technology Days

TI Technology Days include technical design seminars that focus on the techniques of practical design applications illustrated along with technology exhibits. The sessions include topics within multiple tracks on analog signal chain, digital signal processing, low-power RF, MSP430 microcontrollers and power management. There are also representatives available at various booths for dialog on specific TI products.
www.ti.com/titechdaysdsg

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/1dayworkshopsdsg** for a complete list of courses.

TMS320DM6437 DaVinci Technology One-Day Workshop
• In-depth look at the core device architecture of TMS320DM643x processors and an overview of the software infrastructure
• Audio and video driver usage in DSP/BIOS™ kernel and Linux-based systems
• Codec Engine framework
• Capabilities of the DSP/BIOS™ kernel and Linux operating systems
www.ti.com/dm64371dwdsg

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
www.ti.com/f2808ezdsp1dwdsg

→ **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.

TMS320DM644x DaVinci™ Technology Workshop
- Introduction to DaVinci technology: device, software and tools
- Application layer programming
- Signal-processing layer programming
- Advanced system programming details
www.ti.com/dm644xmdwdsg

TMS320DM64x™ Video System Integration Workshop
- 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
www.ti.com/dm64xmdwdsg

TMS320C6000™ DSP Optimization Workshop
- C6000™ DSP architecture and pipeline
- Introduction to Code Composer Studio IDE using C programs
- Optimizing code
- Software pipelining techniques
- Numerical issues with fixed-point processors
- Writing high-speed interruptible code
- Internal memory and cache
www.ti.com/c6000optmdwdsg

TMS320C645x DSP System Integration Workshop
- Architectural overview
- Code Composer Studio IDE basics
- Introduction 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
www.ti.com/c645xmdwdsg

TMS320C64x™/C67x™ DSP System Integration Workshop
- Use Code Composer Studio Platinum Edition 3.1 IDE
- Design a real-time double-buffered system
- DSP/BIOS kernel scheduling
- McBSP serial ports multi-channel features
- EDMA´s advanced features
- Evaluate and use C6000 boot loader
- Setting up a bootable image in Flash ROM
www.ti.com/c64xc67xmdwdsg

DSP/BIOS OS Design Workshop
- Real-time system concepts
- Work with software development tools provided by Code Composer Studio IDE and TMS320C6416 DSP
- Software interrupts (SWI)
- Multi-tasking
- Communicating with tasks
- Writing device drivers
- Memory management/dynamic object creation capabilities
www.ti.com/dspbiosmdwdsg

TMS320C28x™ DSP Workshop
- Architectural overview
- Programming development environment
- Peripheral register header files
- Reset and interrupts system
- Initialization analog-to-digital
- Converter control peripherals
- Numerical concepts and IQMath
- Using DSP/BIOS kernel
- System design communications
www.ti.com/c28xmdwdsg

Registration
To register for these workshops, please visit **www.ti.com/multidayworkshopsdsg**
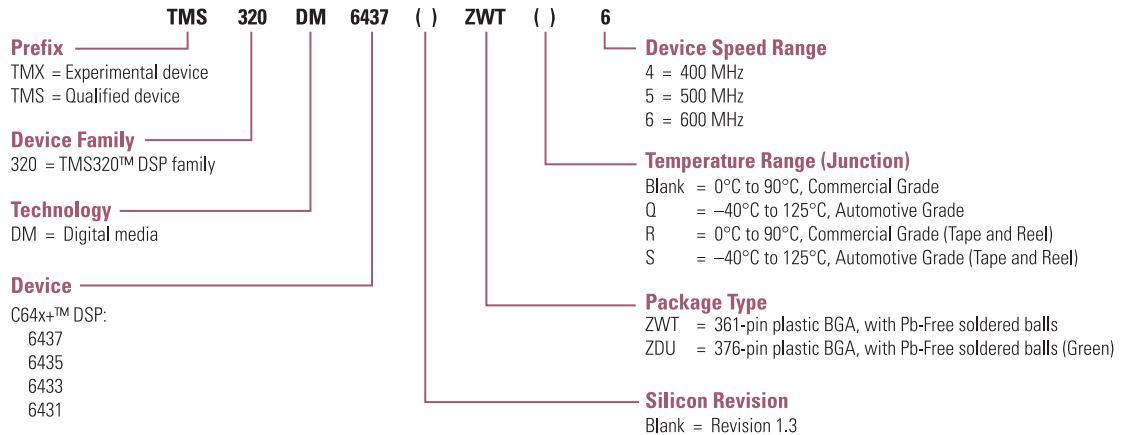
Texas Instruments DSP device nomenclature includes a prefix (signifying the device qualification status), the device family number (i.e., 320 or 32 for TI DSPs), a technology symbol, the device number (typically three to five alpha-numeric characters), a two- or three-character package typ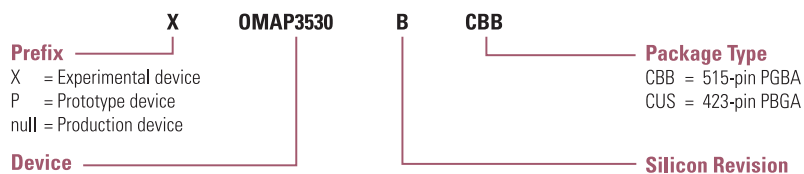e code, an optional temperature range character, and the device speed designation. Other variations do exist on a limited basis. See the specific device data sheet for additional information on device nomenclature for that device.

For the most updated information, visit **www.ti.com/dsp**

Typical Digital Signal Processor Nomenclature

TMS 320 DM 6437 ( ) ZWT ( ) 6

Prefix
TMX = Experimental device
TMS = Qualified device

Device Family
320 = TMS320™ DSP family

Technology
DM = Digital media

Device
C64x+™ DSP:
    6437
    6435
    6433
    6431

Device Speed Range
4 = 400 MHz
5 = 500 MHz
6 = 600 MHz

Temperature Range (Junction)
Blank = 0°C to 90°C, Commercial Grade
Q = –40°C to 125°C, Automotive Grade
R = 0°C to 90°C, Commercial Grade (Tape and Reel)
S = –40°C to 125°C, Automotive Grade (Tape and Reel)

Package Type
ZWT = 361-pin plastic BGA, with Pb-Free soldered balls
ZDU = 376-pin plastic BGA, with Pb-Free soldered balls (Green)

Silicon Revision
Blank = Revision 1.3

Typical Applications Processor Nomenclature

X OMAP3530 B CBB

Prefix
X = Experimental device
P = Prototype device
null = Production device

Device

Package Type
CBB = 515-pin PGBA
CUS = 423-pin PBGA

Silicon Revision

Complementary Products for the TMS320™ DSP Family

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 of 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^2C 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_{CC} 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	Ron (max)	Ron Flatness (max)	Ron Mismatch (max)	V+ (V) (min)	V+ (V) (max)	ON Time (ns) (max)	OFF Time (ns) (max)	Pins / Package
SPST								
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
SPST x 2								
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
SPST x 4								
TS3A4751	0.9	0.4	0.05	1.65	3.6	14	9	14/TSSOP
SPDT								
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
SPST x 4								
TS3A4751	0.9	0.4	0.05	1.65	3.6	14	9	14/TSSOP
SPDT								
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
SPDT x 2								
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
SPDT x 4								
TS3A5018	10	7	0.8	1.65	3.6	8	6.5	16/SOIC, SSOP (QSOP), TSSOP, TVSOP, QFN
SP3T								
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
SP4T x 2								
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_{CCA} (V)	V_{CCB} (V)	Smallest Package
TXB0101	1	1.2 to 3.6	1.65 to 5.5	6-pin NanoStar™/NanoFree™
TXB0102	2	1.2 to 3.6	1.65 to 5.5	8-pin NanoStar/NanoFree
TXB0104	4	1.2 to 3.6	1.65 to 5.5	12-pin NanoStar/NanoFree
TXB0108	8	1.2 to 3.6	1.65 to 5.5	20-ball BGA
TXS0101	1	1.2 to 3.6	1.65 to 5.5	6-pin NanoStar/NanoFree
TXS0102	2	1.2 to 3.6	1.65 to 5.5	8-pin NanoStar/NanoFree
TXS0104E	4	1.2 to 3.6	1.65 to 5.5	12-pin NanoStar/NanoFree
TXS0108E	8	1.2 to 3.6	1.65 to 5.5	20-pin NanoStar/NanoFree
SN74AVC1T45[1]	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[1]	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[1]	4	1.2 to 3.6	1.2 to 3.6	16-pin QFN
SN74AVC8T245[1]	8	1.2 to 3.6	1.2 to 3.6	24-pin QFN
SN74LVC8T245[1]	8	1.65 to 5.5	1.65 to 5.5	24-pin QFN
SN74AVC16T245[1]	16	1.2 to 3.6	1.2 to 3.6	56-ball VFBGA
SN74AVCA164245[1]	16	1.4 to 3.6	1.4 to 3.6	56-ball VFBGA
SN74AVCB164245[1]	16	1.4 to 3.6	1.4 to 3.6	56-ball VFBGA
SN74LVC16T245[1]	16	1.65 to 5.5	1.35 to 5.5	56-ball VFBGA
SN74AVC20T245[1]	20	1.2 to 3.6	1.2 to 3.6	56-ball VFBGA
SN74AVC24T245[1]	24	1.2 to 3.6	1.2 to 3.6	83-ball VFBGA
SN74AVC32T245[1]	32	1.2 to 3.6	1.2 to 3.6	96-ball VFBGA
SN74AVCB324245[1]	32	1.2 to 3.6	1.2 to 3.6	96-ball VFBGA

[1] Bus hold option available.

Low-Voltage I/O Expanders Selection Guide

Device	Max Frequency (kHz)	I²C Address	V_{CC} Range (V)	Bit or Channel Width	Additional Features					I/O Type	
					Low Power	Interrupt	Reset	Configuration Registers	5-V-Tolerant I/O	Push-Pull	Open-Drain
TCA6408	400	0100 00x	1.65 to 5.5	8-bit	✔	✔	✔	✔	✔	✔	
TCA6416	400	0100 00x	1.65 to 5.5	16-bit	✔	✔	✔	✔	✔	✔	

*Preview products are listed in **bold blue**.*

I/O Expanders Selection Guide

Device	Max Frequency (kHz)	I²C Address	V_{CC} Range (V)	Bit or Channel Width	Additional Features					I/O Type	
					Low Power	Interrupt	Reset	Configuration Registers	5-V-Tolerant I/O	Push-Pull	Open-Drain
PCA9536	400	1000 001	2.3 to 5.5	4-bit				✔	✔	✔	
PCA6107	400	0011 xxx	2.3 to 5.5	8-bit	✔	✔	✔	✔	✔	✔	✔
PCA9534	400	0100 xxx	2.3 to 5.5	8-bit	✔	✔		✔	✔	✔	
PCA9534A	400	0111 xxx	2.3 to 5.5	8-bit	✔	✔		✔	✔	✔	
PCA9538	400	1110 0xx	2.3 to 5.5	8-bit	✔	✔	✔	✔	✔	✔	
PCA9554A	400	0111 xxx	2.3 to 5.5	8-bit		✔		✔	✔	✔	
PCA9554	400	0100 xxx	2.3 to 5.5	8-bit		✔		✔	✔	✔	
PCA9557	400	0011 xxx	2.3 to 5.5	8-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		✔		✔	✔	✔	
PCF8574	100	0100 xxx	2.5 to 6.0	8-bit		✔				✔	
PCF8574A	100	0111 xxx	2.5 to 6.0	8-bit		✔				✔	
PCF8575	400	0100 xxx	2.5 to 5.5	16-bit		✔				✔	
PCF8575C	400	0100 xxx	4.5 to 5.5	16-bit	✔						✔

*Preview products are listed in **bold blue**.*

Linear and Logic Products

LED Driver Selection Guide

Device	Max Frequency (kHz)	I²C Address	V_CC Range (V)	Bit or Channel Width	No. of PWMs	Interrupt	Enable Pin	Dimming and Brightness Control Registers	5-V Tolerant I/O	Push-Pull	Open-Drain
								Additional Features		I/O Type	
TCA6507	400	100 0101	1.65 to 3.6	7-channel	2		✔	✔	✔		✔

Bus Interface for TMS320 DSPs

Device	Description	Supply Voltage	$t_{pd\ max}$ (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)

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	$t_{pd\ max}$ (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), DSBGA (5)
SN74AUP1G57	Low-power configurable multiple-function gate	3.3 V	5.3	SOT (6), DSBGA (6)
SN74AUP1G58	Low-power configurable multiple-function gate	3.3 V	5.3	SOT (6), DSBGA (6)
SN74AUP1G97	Low-power configurable multiple-function gate	3.3 V	5.3	SOT (6), DSBGA (6)
SN74AUP1G98	Low-power configurable multiple-function gate	3.3 V	5.3	SOT (6), DSBGA (6)

Data Converters

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/dcplug-in**.

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

For More Information

For additional information on TI data converters, visit **www.ti.com/dataconverters**.

Device	Description	C28x™ DSP	C54x™ DSP	C55x™ DSP	C67x™ DSP	C64x™ DSP
ADCs						
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	—
ADS1256	24-bit, 8-ch, 30kSPS, very low noise	—	—	X[1]	X[1]	X[1]
ADS1258	24-bit, 16-ch, 125kSPS, fast channel cycling	—	—	X[1]	X[1]	X[1]
ADS1271	24-bit, 1-ch, 105kSPS	—	—	—	X[1]	—
ADS1274	24-bit, 4-ch, 128kSPS, simultaneous sampling	—	—	X[1]	X[1]	X[1]
ADS1278	24-bit, 8-ch, 128kSPS, simultaneous sampling	—	—	X[1]	X[1]	X[1]
ADS1601	16-bit, 1-ch, 1.25MSPS	—	—	X[1]	X[1]	X[1]
ADS1602	16-bit, 1-ch, 2.5MSPS	—	—	X[1]	X[1]	X[1]
ADS1605	16-bit, 1-ch (diff), 5MSPS, 3.3-V I/O, 5-V analog	—	—	X[1]	X[1]	X[1]
ADS1606	16-bit, 1-ch (diff), 5MSPS, 16-word FIFO	—	—	X[1]	X[1]	X[1]
ADS1610	16-bit, 1-ch (diff), 10MSPS, 3.3-V I/O, 5-V analog	—	—	X[1]	X[1]	X[1]
ADS1625	18-bit, 1-ch (diff), 1.25MSPS, 3.3-V I/O, 5-V analog	—	—	X[1]	X[1]	X[1]
ADS1626	18-bit, 1-ch (diff), 1.25MSPS, 16-word FIFO	—	—	X[1]	X[1]	X[1]
ADS7804	12-bit, 1-ch, 100kSPS, ±10-V input range	X	—	X[1]	X[1]	X[1]
ADS7805	16-bit, 1-ch, 100kSPS, ±10-V input range	X	—	X[1]	X[1]	X[1]
ADS7816	12-bit, 1-ch, 200kSPS	—	—	X[1]	X[1]	X[1]
ADS7817	12-bit, 1-ch, 200kSPS	—	—	X[1]	X[1]	X[1]
ADS7818	12-bit, 1-ch, 500kSPS	—	—	X[1]	X[1]	X[1]
ADS7822	12-bit, 1-ch, 200kSPS	—	—	X[1]	X[1]	X[1]
ADS7826	10-bit, 1-ch, 200kSPS	—	—	X[1]	X[1]	X[1]
ADS7827	8-bit, 1-ch, 250kSPS	—	—	X[1]	X[1]	X[1]
ADS7829	12-bit, 1-ch, 125kSPS, 2.7 V, microPower	X	—	X[1]	X[1]	X[1]
ADS7834	12-bit, 1-ch, 500kSPS	—	—	X[1]	X[1]	X[1]
ADS7835	12-bit, 1-ch, 500kSPS	—	—	X[1]	X[1]	X[1]
ADS7841	12-bit, 4-ch, 200kSPS	—	X[1]	X[1]	X[1]	X[1]
ADS7861	12-bit, 2+2-ch, 500kSPS, simultaneous sampling	X	X	X	X	X
ADS7864	12-bit, 3×2-chs, 500kSPS, simultaneous sampling	—	—	—	X[1]	X[1]
ADS7881	12-bit, 1-ch, 4MSPS, int. reference	—	—	X[1]	X[1]	X[1]
ADS7886	12-bit, 1-ch, 1MSPS	X	—	X[1]	X[1]	X[1]
ADS7891	14-bit, 1-ch, 3MSPS, int. reference	—	—	X[1]	X[1]	X[1]
ADS803	12-bit, 1-ch, 5MSPS	—	—	X[1]	X[1]	X[1]
ADS804	12-bit, 1-ch, 10MSPS	—	—	X[1]	X[1]	X[1]
ADS805	12-bit, 1-ch, 20MSPS	—	—	X[1]	X[1]	X[1]
ADS8320	16-bit, 1-ch, 100kSPS, 2.7–5.25 V	—	—	X[1]	X[1]	X[1]
ADS8321	16-bit, 1-ch, 100kSPS, 4.75–5.25 V	—	—	X[1]	X[1]	X[1]
ADS8322	16-bit, 1-ch (diff), 500kSPS, 5 V	—	—	X[1]	X[1]	X[1]
ADS8323	16-bit, 1-ch (diff), 500kSPS, 5 V	—	—	X[1]	X[1]	X[1]
ADS8324	14-bit, 1-ch, 50kSPS, 1.8–3.6 V	—	X	X[1]	X[1]	X[1]
ADS8325	16-bit, 1-ch, 100kSPS , 2.7–5.5 V	—	X	X[1]	X[1]	X[1]
ADS8328	16-bit, 2-ch, 500kSPS	—	—	X[1]	X[1]	X[1]
ADS8330	16-bit, 2-ch, 1MSPS	—	—	X[1]	X[1]	X[1]
ADS8361	16-bit, 2+2-ch, 500kSPS, simultaneous sampling	X	X	X	X	X
ADS8364	16-bit, 6-ch, 250kSPS	—	—	X[1]	X[1]	X[1]
ADS8370	16-bit, 1-ch, 600kSPS, unipolar pseudo diff, int. ref.	—	—	X[1]	X[1]	X[1]
ADS8371	16-bit, 1-ch, 750kSPS, unipolar input micro power	—	—	X[1]	X[1]	X[1]

[1] Includes DMA support.

*New devices are listed in **bold red.***

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.

Data Converters

Device	Description	C28x™ DSP	C54x™ DSP	C55x™ DSP	C67x™ DSP	C64x™ DSP
ADCs (Continued)						
ADS8372	16-bit, 1-ch (diff), 600kSPS, pseudo bipolar, int. ref.	—	—	X[1]	X[1]	X[1]
ADS8380	18-bit, 1-ch, 600kSPS, unipolar pseudo diff, int. ref.	—	—	X[1]	X[1]	X[1]
ADS8381	18-bit, 1-ch, 580kSPS	—	—	X[1]	X[1]	X[1]
ADS8382	18-bit, 1-ch (diff), 600kSPS, pseudo bipolar, int. ref.	—	—	X[1]	X[1]	X[1]
ADS8383	18-bit, 1-ch, 500kSPS	—	—	X[1]	X[1]	X[1]
ADS8401	16-bit, 1-ch, 1.25MSPS, unipolar input	X	—	X[1]	X[1]	X[1]
ADS8402	16-bit, 1-ch, 1.25MSPS, bipolar input	X	—	X[1]	X[1]	X[1]
ADS8405	16-bit, 1-ch, 1.25MSPS, unipolar input	X	—	X[1]	X[1]	X[1]
ADS8406	16-bit, 1-ch, 1.25MSPS, bipolar input	X	—	X[1]	X[1]	X[1]
ADS8411	16-bit, 1-ch, 2MSPS, unipolar input	—	—	X[1]	X[1]	X[1]
ADS8412	16-bit, 1-ch, 2MSPS, bipolar input	—	—	X[1]	X[1]	X[1]
ADS8422	16-bit, 1-ch, 4MSPS, pseudo-bipolar, differential input	—	—	X[1]	X[1]	X[1]
ADS8472	16-bit, 1-ch, 1MSPS, pseudo-bipolar, differential input	—	—	X[1]	X[1]	X[1]
ADS8481	16-bit, 1-ch, 1MSPS, pseudo-differential, unipolar input	—	—	X[1]	X[1]	X[1]
ADS8482	16-bit, 1-ch, 1MSPS, pseudo-biploar, fully differential input	—	—	X[1]	X[1]	X[1]
ADS8504	12-bit, 1-ch, 250kSPS, ±10-V input range	X	—	X[1]	X[1]	X[1]
ADS8505	16-bit, 1-ch, 250kSPS, ±10-V input range	X	—	X[1]	X[1]	X[1]
PCM1804	24-bit, stereo, 192kHz, audio ADC	—	X	X	X[1]	X[1]
PCM4202	24-bit, stereo, 192kHz, audio ADC	—	X	X	X[1]	X[1]
PCM4204	24-bit, 4-ch, 216kHz, audio ADC	—	—	—	X[1]	—
THS10064	10-bit, 4-ch, 6MSPS, 16-word FIFO	X	X	X[1]	X[1]	X[1]
THS1007	10-bit, 4-ch, 8MSPS	—	—	—	—	—
THS10082	10-bit, 2-ch, 8MSPS, 16-word FIFO	X	X	X[1]	X[1]	X[1]
THS1009	10-bit, 2-ch, 8MSPS	—	—	—	—	—
THS1206	12-bit, 4-ch, 6MSPS, 16-word FIFO	X	X	X[1]	X[1]	X[1]
THS1207	12-bit, 4-ch, 8MSPS	—	—	—	—	—
THS12082	12-bit, 2-ch, 8MSPS, 16-word FIFO	X	X	X[1]	X[1]	X[1]
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	—

[1] Includes DMA support.

*New devices are listed in **bold red**.*

NOTE: An X indicates that the data converter plug-in generates the interface software for the specified TMS320 DSP generation, which not only fanfigures 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.

Data Converters

Device	Description	C28x™ DSP	C54x™ DSP	C55x™ DSP	C67x™ DSP	C64x™ DSP
ADCs (Continued)						
TLV1571	10-bit, 1-ch, 1.25MSPS	—	X	—	X[1]	—
TLV1572	10-bit, 1-ch, 1.25MSPS, 2.5–5.5 V	—	X	—	—	—
TLV1578	10-bit, 8-ch, 1.25MSPS	—	X	—	X[1]	—
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[1]	—
TLV2545	12-bit, 1-ch, 140-200kSPS, 2.7–5.5 V	—	X	—	—	—
TLV2548	12-bit, 8-ch, 200kSPS	—	X	—	X[1]	—
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

[1] Includes DMA support.

*New devices are listed in **bold red.***

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.

Device	Description	C28x™ DSP	C54x™ DSP	C55x™ DSP	C67x™ DSP	C64x™ DSP
DACs						
DAC1220	16-bit, 1-ch, 2 ms	—	—	—	—	—
DAC1221	16-bit, 1-ch, 2 ms	—	—	—	—	—
DAC7512	12-bit, 1-ch, 10µs, 2.7–5.5 V, int. reference	—	—	—	—	—
DAC7513	12-bit, 1-ch, 10µs, 2.7–5.5 V	—	—	—	—	—
DAC7551	12-bit, 1-ch, 5µs, ultra-low glitch	X	—	X[1]	X[1]	X[1]
DAC7552	12-bit, 2-ch, 5µs, ultra-low glitch	X	—	X[1]	X[1]	X[1]
DAC7554	12-bit, 4-ch, 5µs, 2.7–5.5 V	X	X[1]	X[1]	X[1]	X[1]
DAC8501	16-bit, 1-ch, 10µs, 2.7–5.5 V, MDAC	X	X	X[1]	X[1]	X[1]
DAC8531	16-bit, 1-ch, 10µs, 2.7–5.5 V	X	X	X[1]	X[1]	X[1]
DAC8532	16-bit, 2-ch, 10µs, 2.7–5.5 V	X	X	X[1]	X[1]	X[1]
DAC8534	16-bit, 4-ch, 10µs, 2.7–5.5 V	X	X	X[1]	X[1]	X[1]
DAC8551	16-bit, 1-ch, 5µs, ultra-low glitch	X	—	X[1]	X[1]	X[1]
DAC8552	16-bit, 2-ch, 10µs, ultra-low glitch	X	—	X[1]	X[1]	X[1]
DAC8554	16-bit, 4-ch, 10µs, ultra-low glitch	X	—	X[1]	X[1]	X[1]
DAC8560	16-bit, 1-ch, 200kSPS	X	X	X[1]	X[1]	X[1]
DAC8580	16-bit, 1-ch, 1µs	—	—	X[1]	X[1]	X[1]
DAC8581	16-bit, 1-ch, 3MSPS, voltage output	X	—	X[1]	X[1]	X[1]
DAC8814	16-bit, 4-ch, 2MSPS	—	—	X[1]	X[1]	X[1]
TLC5618A	12-bit, 2-ch, 2.5µs, 5 V	—	X	—	X[2]	—
TLV320DAC23	24-bit, stereo, 96kHz, audio DAC	—	—	—	—	—
TLV5604	10-bit, 4-ch, 3µs, 2.7–5.5 V	—	—	—	—	—
TLV5606	10-bit, 1-ch, 3µs, 2.7–5.5 V	—	X	—	X[2]	—
TLV5608	10-bit, 8-ch, 1µs, 2.7–5.5 V	—	—	—	—	—
TLV5610	12-bit, 8-ch, 1µs, 2.7–5.5 V	—	—	—	—	—
TLV5614	12-bit, 4-ch, 3µs, 2.7–5.5 V	—	—	—	—	—
TLV5616	12-bit, 1-ch, 3µs, 2.7–5.5 V	—	X	—	X[2]	—
TLV5617A	10-bit, 2-ch, 2.5µs, 2.7–5.5 V	—	X	—	X[2]	—
TLV5618A	12-bit, 2-ch, 2.5µs, 2.7–5.5 V	—	X	—	X[2]	—
TLV5623	8-bit, 1-ch, 3µs, 2.7–5.5 V	—	X	—	X[2]	—
TLV5624	8-bit, 1-ch, 1µs, 2.7–5.5 V, int. reference	—	X	—	X[2]	—
TLV5625	8-bit, 2-ch, 2.5µs, 2.7–5.5 V	—	X	—	X[2]	—
TLV5626	8-bit, 2-ch, 1µs, 2.7–5.5 V, int. reference	—	X	—	X[2]	—
TLV5629	8-bit, 8-ch, 1µs, 2.7–5.5 V	—	—	—	—	—
TLV5630	12-bit, 8-ch, 1µs, 2.7–5.5 V, int. reference	—	—	—	—	—
TLV5631	10-bit, 8-ch, 1µs, 2.7–5.5 V, int. reference	—	—	—	—	—
TLV5632	8-bit, 8-ch, 1µs, 2.7–5.5 V	—	—	—	—	—
TLV5636	12-bit, 1-ch, 1µs, 2.7–5.5 V, int. reference	—	X	—	X[2]	—
TLV5637	10-bit, 2-ch, 1µs, 2.7–5.5 V, int. reference	—	X	—	X[2]	—
TLV5638	12-bit, 2-ch, 1µs, 2.7–5.5 V, int. reference	—	X	—	X[2]	—

[1] Includes DMA support.

*New devices are listed in **bold red.***

[2] These DACs share the same driver. Result data may need to be masked.

➜ **Audio Converters and Controllers**

Audio ADCs									www.ti.com/adc
Device	Description	Portable Focus	Dynamic Range (dB)	No. of Inputs/ No. of Outputs	Sampling Rate (kHz) (max)	Audio Data Format	Power Supply (V)	Package(s)	Price[1]
PCM4222	2-Channel, High-Performance $\Delta\Sigma$ ADC	—	124	2/0	216	6-Bit Modulator, DSD, Normal, I^2S, TDM	+3.3 and +4	TQFP-48	14.95
PCM4220	2-Channel, High-Performance $\Delta\Sigma$ ADC	—	123	2/0	216	Normal, I^2S, TDM	+3.3 and +4	TQFP-48	9.95
PCM4204	4-Channel, High-Performance $\Delta\Sigma$ ADC, PCM or DSD, High-Pass Filter	—	118	4/0	216	Normal, I^2S, DSD, TDM	+3.3 and +5	TQFP-64	7.95
PCM4202	Stereo, High-Performance $\Delta\Sigma$ ADC, PCM or DSD, High-Pass Filter	—	118	2/0	216	Normal, I^2S, DSD	+3.3 and +5	SSOP-28	4.95
PCM4201	Mono, High-Performance $\Delta\Sigma$ ADC, PCM or DSD, High-Pass Filter, Wide Digital Supply Range, Low Power Dissipation	—	112	1/0	108	Normal, DSP	+3.3 and +5	TSSOP-16	2.50
PCM1804	Stereo ADC, Fully Differential, High-Pass Filter	—	112	2/0	192	Normal, I^2S, DSD	+3.3 and +5	SSOP-28	3.95
PCM1802	Stereo ADC, SE Input	—	105	2/0	96	Normal, I^2S	+3.3 and +5	SSOP-20	3.35
PCM1803A	Stereo ADC, SE Input, High-Pass Filter	—	103	2/0	96	Normal, I^2S	+3.5 and +5	SSOP-20	1.10
PCM1850/1	Stereo ADC w/ 2 × 6 Input MUX and PGA, SPI (1850) and I^2C (1851) Control	—	101	2/0	96	Normal, I^2S	+3.3 and +5	TQFP-32	4.80
PCM1807/8	Stereo ADC, SE Input, Mute w/ Fade, SPI Control, S/W (1807) H/W (1808) Controlled	—	101	2/0	96	I^2S, L	+3.5 and +5	TSSOP-14	1.00
PCM1870	Stereo ADC, SE Input, Digital Filter, Very Low Power Consumption	✔	90	2/0	50	Normal, I^2S, DSP	+2.4 and +3.6	QFN-24	1.80

Audio DACs									www.ti.com/dac
PCM1792A	Stereo, Optional DSD Format, External Filter and DSP Interface, SPI/I^2C, Differential Current Output: 7.8 mA p-p	—	132	0/2	192	Standard, I^2S, L	+3.3 and +5	SSOP-28	9.95
PCM1796/8	Stereo Advanced Segment, 123dB Dynamic Range, TDMCA Serial Interface (1798)	—	123	0/2	192	Standard, I^2S, L	+3.5 and +5	SSOP-28	2.95
PCM4104	4-Channel, High Performance, Sampling Rate up to 216kHz, H/W or S/W Controlled	—	118	0/4	216	Normal, I^2S, TDM	+3.3 and +5	TQFP-48	4.95
PCM1738/30	Stereo Advanced Segment DAC, Soft Mute (1730), 2 Optional Operation Modes (1738): External Filter and DSD Decoder for SACD Playback and Digital Attenuation	—	117	0/2	192	Normal, I^2S, DSD	+3.3 and +5	SSOP-28	5.25/ 5.00
PCM1791A	Stereo Advanced Segment DAC, Optional DSD Format, External Filter and DSP Interface, SPI/I^2C Differential Current Output: 3.2 mA p-p	—	113	0/2	192	Normal, I^2S, TDMCA	+3.3 and +5	SSOP-28	2.10
PCM1793	Stereo Advanced Segment DAC, Balanced Voltage Outputs, Improved Clock Jitter	—	113	0/2	192	Normal, I^2S, Left Justified	+3.3 and +5	SSOP-28	2.10
DSD1608	8-Channel, Enhanced Multiformat $\Delta\Sigma$ DAC, Supports DSD with TDMCA	—	108	0/8	192	Normal, I^2S, DSD	+3.3 and +5	TQFP-52	5.96
PCM1780/81/82	Stereo with Volume Control, Software (1780/82) and Hardware (1781), Open-Drain Output Zero Flag (1782), Improved Jitter Performance	—	106	0/2	192	Normal, I^2S	+5	SSOP-16	1.10
PCM1753/54/55	Stereo with Volume Control, Software (1753/55) and Hardware (1754), Open-Drain Output Zero Flag (1755)	—	106	0/2	192	Normal, I^2S	+5	SSOP-16	1.03
PCM1608	8-Channel, Highly Integrated DAC, Higher SNR	—	105	0/8	192	Normal, I^2S	+3.3 and +5	LQFP-48	4.29
PCM1606	6-Channel, Low-Cost CMOS, Multilevel	—	103	0/6	192	Normal, I^2S	+5	SSOP-20	2.00
PCM1680	8-Channel, Low-Cost DAC, Improved Jitter Performance, Pin Compatible with PCM1780	—	103	0/8	192	Normal, I^2S	+5	SSOP-24	1.50
TLV320DAC23	I^2C and SPI Control with Headphone Amp, P_{diss} = 23 mW	✔	100	0/2	96	Normal, I^2S, DSP	+1.5 to +3.3	VFBGA-80	2.00
PCM1770/1	Stereo with Integrated Headphone Driver, Software (1770) and Hardware (1771) Controlled	✔	98	0/2	48	Normal, I^2S	+1.6 to +3.6	TSSOP-28, QFN-28, TSSOP-16, QFN-20	1.25
PCM1772/3	Stereo with Integrated Line Out, Software (1772) and Hardware (1773) Controlled	✔	98	0/2	48	Normal, I^2S	+1.6 to +3.6	TSSOP-16, QFN-20	1.25
TLV320DAC26	Integrated PLL, SPI Control, Speaker/Headphone Amp, P_{diss} = 11 mW	✔	97	0/2	53	Normal, I^2S, DSP	+2.7 to +3.6	QFN-32	2.95
TLV320DAC32	Low-Power Stereo DAC with PLL and Stereo HP/Speaker Amplifiers	✔	95	0/2	96	Normal, I^2S, DSP, TDM	+2.7 to +3.6	QFN-32	2.75

[1]Suggested resale price in U.S. dollars in quantities of 1,000.
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Audio Converters and Controllers

Audio Codecs							www.ti.com/codec	
Device	Description	Portable Focus	Dynamic Range (dB)	Sampling Rate (kHz) (max)	Audio Data Format	Power Supply (V)	Package(s)	Price[1]
PCM3168	High-Performance, 6 in/8 out-Audio Codec	—	112	96	Normal, I²S, DSP, TDM	3.3 to 5	HTQFP-64	TBD
TLV320AIC34	Low-Power Quad Stereo (4-Channel) Codec, 12 Inputs (Mic/Line), 14 Outputs (Line, Headphone/Speaker), 2 PLLs and Audio Serial Buses Allow Fully Asynchronous Simultaneous Codec Operation	✔	102	96	Normal, I²S, DSP, TDM	+2.7 to 3.6	BGA-87	5.95
TLV320AIC3101	Low-Power Stereo Codec, Integrated PLL, 6 Inputs (Mic/Line), 6 Outputs (Line, Headphone/Speaker), Notch Filtering, Low-Power Analog Bypass	✔	102	96	Normal, I²S, DSP, TDM	+2.7 to 3.6	QFN-32	3.55
TLV320AIC3104	Low-Power Stereo Codec, Integrated PLL, 6 Inputs (MicLine), 6 Outputs (Line, Headphone), Notch Filtering, Low-Power Analog Bypass	✔	102	96	Normal, I²S, DSP, TDM	+2.7 to 3.6	QFN-32	3.25
TLV320AIC3105	Low-Power Stereo Codec, Integrated PLL, 6 SE Inputs (Mic/Line), 6 Outputs (Line, Headphone), Notch Filtering, Low-Power Analog Bypass	✔	102	96	Normal, I²S, DSP, TDM	+2.7 to 3.6	QFN-32	3.25
TLV320AIC3106	Low-Power Stereo Codec, Integrated PLL, 10 Inputs (Mic/Line), 7 Outputs (Line, Headphone), Notch Filtering, Low-Power Analog Bypass	✔	102	96	Normal, I²S, DSP, TDM	+2.7 to 3.6	QFN-32, BGA-80	3.85
TLV320AIC3107	Low-Power Stereo Codec, Integrated PLL, 10 Inputs (Mic/Line), 7 Outputs (Line, Headphone, Mono Integrated Class-D Amp)	✔	102	96	Normal, I²S, DSP, TDM	+2.7 to 3.6	QFN	TBD
TLV320AIC3108	Low-Power Stereo Codec, Integrated PLL, 10 Inputs (Mic/Line), 7 Outputs (Line, Headphone, Stereo Integrated Class-D Amp)	✔	102	96	Normal, I²S, DSP, TDM	+2.7 to 3.6	QFN	TBD
TLV320AIC33	Low-Power Stereo Codec, Integrated PLL, 6 Inputs, 3 Line Out and Speaker/HP Outputs	✔	102	96	Normal, I²S, DSP, TDM	+2.7 to 3.6	QFN-48, BGA-80	3.95
TLV320AIC31/32	Low-Power Stereo Codec, Integrated PLL, 6 Inputs (AIC32-6 Single-Ended, AIC31-2 Differential and 2 Single Ended) 2 Line Out and Speaker/HP Outputs	✔	100	96	Normal, I²S, DSP, TDM	+2.7 to 3.6	QFN-32	3.45
TLV320AIC23B	Low-Power, Lower Cost, Stereo Codec with Headphone Amps	✔	100	96	I²S, L, R	+2.7 to 3.3	VFBGA-80, TSSOP-28, QFN-28	3.00
TLV320AIC28/29	Low-Power, Stereo DAC, Mono ADC, Integrated PLL, Speaker/HP Amp, Additional Inputs and Outputs (AIC29 – Differential)	✔	95	53	Normal, I²S, DSP	+2.7 to 3.6	QFN-48	3.95/3.45
TLV320AIC26	Low-Power, Lower Cost, Stereo DAC, Mono ADC, Integrated PLL, Speaker/HP Amp	✔	97	53	Normal, I²S, DSP	+2.7 to 3.6	QFN-32	3.25
PCM3000	Stereo Audio Codec 18 Bits, Serial Interface, Software Controlled	✔	98	48	Normal, I²S, DSP	+4.5 to 5.5	SSOP-28	3.45
PCM3001	Stereo Audio Codec 18 Bits, Serial Interface, Hardware Controlled	✔	98	48	Normal, I²S, DSP	+4.5 to 5.5	SSOP-28	3.45
PCM3006	Low-Power, 3-V Supply, Stereo Codec, Hardware Controlled	✔	93	48	Normal	+2.7 to 3.6	SSOP-24	3.45
PCM3008	Low-Power, 2.4-V Single Supply, Stereo Codec, Low-Cost, Hardware Controlled	✔	88	48	Normal, I²S	+2.1 to 3.6	TSSOP-16	3.10
PCM3793A	Ultra-Low-Power Stereo Codec, 6 Inputs (Mic/Line), 3 Outputs (Line/HP/Class-D Speaker)	✔	93	48	Normal, I²S, DSP	+2.4 to 3.6	QFN-32	4.50
PCM3794A	Ultra-Low-Power Stereo Codec, 6 Inputs (Mic/Line), 5 Outputs (Line/HP)	✔	93	48	Normal, I²S, DSP	+2.4 to 3.6	QFN-32	4.25

[1]Suggested resale price in U.S. dollars in quantities of 1,000.
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Preview products are listed in **bold blue**.
New products are listed in **bold red.**

→ *Audio Converters and Controllers*

Voiceband Codecs — www.ti.com/codec

Device	Description	Sample Rate (kHz)	Number of Input Channel(s)	SNR (dB)	Interface	Analog Supply (V)	Logic Supply (V)	Power Supply (mW) (typ)	Package(s)	Price[1]
AIC111	Lowest Power, 20 Bit	40	1	87	SPI , DSP	1.1 to 1.5	1.1 to 3.3	0.46	QFN-32, FlipChip	4.14
TLV320AIC12K	Low Power, Mono Codec, 16 Bit, 26ksps Voiceband Codec with 8Ω Driver	26	1	90	I^{2}C, S^{2}C, DSP	1.65 to 1.95/2.7 to 3.6	1.1 to 3.6	10	TSSOP-30	1.70
TLV320AIC14K	Low Power, Mono Codec, 16 Bit 26ksps Voiceband Codec	26	1	90	I^{2}C, S^{2}C, DSP	1.65 to 1.95/2.7 to 3.6	1.1 to 3.6	10	TSSOP-30	1.50
TLV320AIC20K	Low Power, Stereo Codec, 16 Bit 26ksps Voiceband Codec with 8Ω Driver	26	2	90	I^{2}C, S^{2}C, DSP	1.65 to 1.95/2.7 to 3.6	1.1 to 3.6	20	TQFP-48	2.50
TLV320AIC24K	Low Power, Stereo Codec, 16 Bit 26ksps Voiceband Codec	26	2	90	I^{2}C, S^{2}C, DSP	1.65 to 1.95/2.7 to 3.6	1.1 to 3.6	20	TQFP-48	2.30

Audio Converters with Integrated Touch-Screen Controller — www.ti.com/touchscreencontrollers

Device	Description	Resolution (Bits) (max)	Dynamic Range (dB)	Sampling Rate (kHz) (max)	Configuration	Audio Data Format	Power Supply (V)	Package(s)	Price[1]
TSC2100	4-Wire Touch-Screen Interface, Low Power, Lower Cost, Stereo DAC, Mono ADC, Integrated PLL, Speaker/HP Amp	24	97	53	Mono/Stereo	Normal, I^{2}S, DSP	+2.7 to 3.6	QFN-32, TSSOP-32	3.95
TSC2111	4-Wire Touch-Screen Interface, Low Power, Stereo DAC, Mono ADC, Integrated PLL, Speaker/HP Amp, Additional Inputs and Outputs (TSC2111 – Differential)	24	95	53	Mono/Stereo	Normal, I^{2}S, DSP	+2.7 to 3.6	QFN-48	4.95
TSC2102	4-Wire Touch-Screen Interface, Low Power, Stereo DAC, Integrated PLL, Speaker/HP Amp, Low Cost	24	97	53	Stereo	Normal, I^{2}S, DSP	+2.7 to 3.6	TSSOP-32	3.70
TSC2300	4-Wire Touch-Screen Interface, Low Power, Stereo DAC, Mono ADC, Integrated PLL	20	98	48	Mono/Stereo	Normal, I^{2}S	+2.7 to 3.6	TQFP-64	4.75
TSC2301	4-Wire Touch-Screen Interface, Low Power, Stereo DAC, Stereo ADC, Integrated PLL, HP Amp, 4 × 4 Keypad Interface	20	98	48	Stereo/Stereo	Normal, I^{2}S	+2.7 to 3.6	TQFP-64, BGA-120	4.95
TSC2302	4-Wire Touch-Screen Interface, Low Power, Stereo DAC, Stereo ADC, Integrated PLL, HP Amp	20	98	48	Stereo/Stereo	Normal, I^{2}S	+2.7 to 3.6	QFN-48	4.50

[1]Suggested resale price in U.S. dollars in quantities of 1,000.
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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 a broad audience. 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 a scalable architecture and rich peripheral set along with high performance, exceptional quality and field-proven reliability. Typical applications include industrial systems, medical instrumentation, military systems, diagnostic equipment, motor drivers, pulse width modulation (PWM), pulse width measurement 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

Visit **www.ti.com/tms470** for more information.
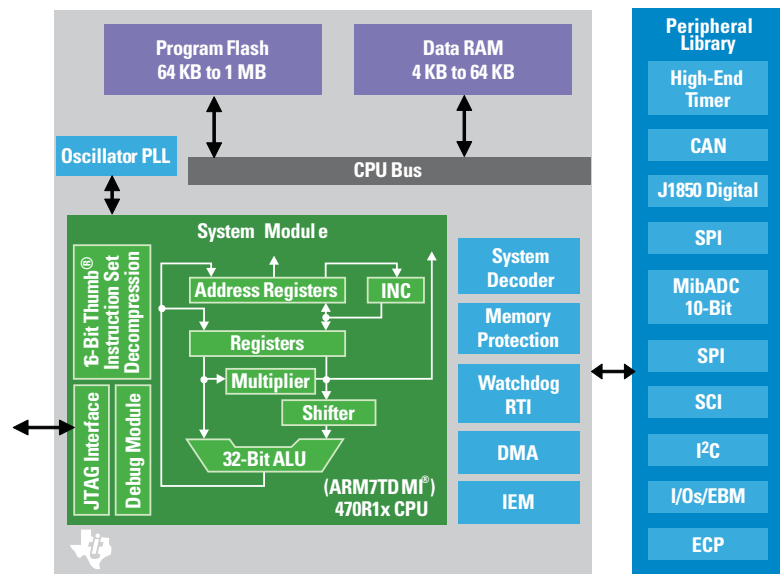
TMS470R1x Block Diagram
The TMS470R1x generation of MCUs utilizes the ARM7TDMI core combined with intelligent peripherals and embedded memory to address a wide range of application needs.

Device[1]	Speed (MHz)	Memory Flash/ROM (KB)	RAM (KB)	High-End Timer	Peripherals Mib ADC	SPI/SCI	CAN	Other	I/O 3.3 V	LQFP Package (pins)
TMS470R1A64[2]	48	64/64	8	13	8 ch, 10-bit	2/2	SCC	—	40	80
TMS470R1A128[2]	48	128/128	8	16	16 ch, 10-bit	2/2	SCC	—	50	100
TMS470R1A256[2]	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 × I2C, DMA, EBM	93	100/144
TMS470R1A384	48	384	32	12	12 ch, 10-bit	2/2	2 × SCC	3 × I2C, 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 × I2C, DMA, EBM, MSM	93	144

[1] All devices have operating temperature range of −40° to 125°C, except TMS470R1B1M has a temperature range of −40° to 85°C.
[2] Also available with ROM: TMS470R1C64, C128 and C256.

Interface Products

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 and PCI Express and 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

Visit www.ti.com/interface for additional information.

XIO2000A PCI Express® Bridge Chip

TI's PCI Express Bridge Chip, the XIO2000A, is an industry first. It is designed for seamless migration from the legacy PCI to the PCI Express interface. It bridges an x1 PCI Express bus to a 32-bit, 33-/66-MHz PCI bus capable of supporting up to six PCI devices downstream. The XIO2000A fully supports PCI Express rates of 2.5 Gbps. Its architecture supports the PCI 2.3 interface. The chip's design enables PC and I/O add-on card manufacturers to begin transitioning to native PCI Express technology while preserving compatibility with existing PCI system software and firmware.

Key Benefits
- Lowest power solution available today
  - 323 mW with two PCI cards at 33 MHz
- In MP for over two years
  - Proven capability and interoperability with leading PCIe chipsets and plethora of PCI devices
- Built-in adaptive receiver equalizer
  - Improves jitter tolerance thereby reliably increasing PCB trace, or cable length, supported by the XIO2000
- Seven buffered PCI clock outputs (33 MHz or 66 MHz)
  - Reduces external components, costs and premium board space

XIO2200A PCI Express-to-1394b Chip

The XIO2200A 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 XIO2200A 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, 12 × 12, 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 on-board memory via an I^2C 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

TUSB60xx Family of USB High-Speed OTG Devices

The TUSB60xx family of USB high-speed OTG devices enable application processors (DSPs and MCUs) that do not have integrated USB cores to function as either:
1. an USB 2.0 high-speed peripheral

2. an embedded USB 2.0 high-speed host controller
3. a full USB 2.0 high-speed OTG device

The TUSB6020 enables functionality on VLYNQ™-enabled application processors,

such as DaVinci™ TMS320DM643x and TMS320C642x DSPs.

The TUSB6010B bridges to a 16-bit MUXED-NORFLASH host interface such as the OMAP2420, OMAP1710 or OMAP3430 processor.

USB

Device	Speed	Ports	I²C	Voltage (V)	Package	Description	Price[1]
USB Hub Controllers							
TUSB2036	Full (1.1)	2/3	No	3.3	32 LQFP	2/3-port hub for USB with optional serial EEPROM interface	1.45
TUSB2046B	Full (1.1)	4	No	3.3	32 LQFP	4-port hub for USB with optional serial EEPROM interface	1.50
TUSB2077A	Full (1.1)	7	No	3.3	48 LQFP	7-port USB hub with optional serial EEPROM interface	2.45
TUSB2136	Full (1.1)	1/2	Yes	3.3	64 LQFP	2-port hub with integrated general-purpose function controller	4.10
TUSB5052	Full (1.1)	1-5	Yes	3.3	100 LQFP	5-port hub with integrated bridge to two serial ports	6.35

Device	Speed	Voltage (V)	Remote Wakeup	Package	Description	Price[1]
USB Peripherals						
TUSB3210	Full	3.3	Yes	64 LQFP	USB full-speed general-purpose device controller	3.15
TUSB3410	Full	3.3	Yes	32 LQFP	USB-to-serial converter (RS-232, RS-485)	2.85
TUSB6250	Full, High	3.3	Yes	80 TQFP	USB 2.0 high-speed, low-power ATA/ATAPI bridge solution	3.50

Device	Speed	Voltage (V)	Package	Local Bus Interface	Description	Price
USB On-The-Go (OTG) Devices						
TUSB6010B	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
TUSB6020	High	1.5, 1.8 & 3.3	80 MicroStar BGA	VLYNQ	USB 2.0 high-speed On-The-Go local bus interface bridge controller	Call

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

[1]*Suggested resale price in U.S. dollars in quantities of 100.*   *Preview devices appear in **bold blue**.*

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

Device #	# of Channels	Application	IO Capacitance	VBR (Min)	Package	Price
USB Transient Suppressors						
TPD2E001	Dual-Bit/ Single Channel	USB HS, USB FS	1.5pF	11 V	DRL, DRY, DZD	web
TPD3E001	Three-Bit/Single-Channel USB OTG ESD	USB HS OTG, USB FS OTG	1.5pF	11 V	DRL, DRY	web
TPD4E001	Four-Bit/Two Channel	USB HS, USB FS	1.5pF	11 V	DRL, DRS	web
TPD4S012	Four-Bit/Single-Channel ESD with VBUS Clamp	USB HS with VBUS Clamp	1.5pF	11 V	RSE, RSF	web
TPD4E004	Four-Bit/Two Channel	USB HS, USB FS	1.5pF	6 V	DRY	web
SN65220, SN75220	Dual-Bit/Single Channel	USB FS	35pF	6 V	DBV, YZP	web
SN65240	Four-Bit/Two Channel	USB FS	35pF	6 V	PW, P	web

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

Literature Number	Description
Application Notes	
SLLU043	TUSB3410 UART Evaluation Board
SLLA170B	USB/Serial Applications Using TUSB3410/5052 and the VCP Software
SLLAA276	MSP430 USB Connectivity Using TUSB3410

Interface Products

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
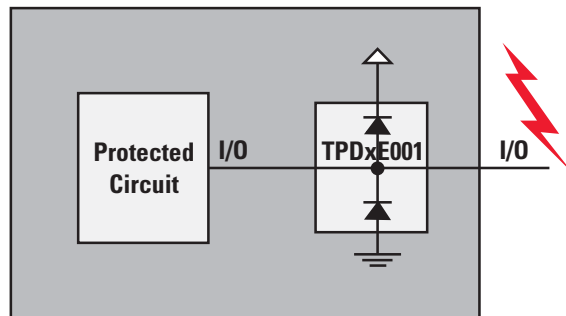
TPDxE001 Application Schematics

ESD Protection Solutions

Device #	# of Channel	V_{DD}	IO Level	Cap, Resistor	VBR (Min)	Package	RTM	Price
TPD2E001	2-Channel ESD	0.9 V–5.5 V	0 V–V_{DD}	1.5 pF	11 V	DRL, DRY, DZD	Done	web
TPD3E001	3-Channel ESD	0.9 V–5.5 V	0 V–V_{DD}	1.5 pF	11 V	DRL, DRY	Done	web
TPD4E001	4-Channel ESD	0.9 V–5.5 V	0 V–V_{DD}	1.5 pF	11 V	DRL, DRS	Done	web
TPD6E001	6-Channel ESD	0.9 V–5.5 V	0 V–V_{DD}	1.5 pF	11 V	RSE, RSF	Done	web
TPD4E004	4-Channel ESD	0.9 V–5.5 V	0 V–V_{DD}	1.5 pF	6 V	DRY	Now	web
TPD6F004	6-Channel ESD	0.9 V–5.5 V	0 V–V_{DD}	1.5 pF	6 V	RSE, RSF	Now	web
TPD4S009	4-Channel ESD	0.9 V–5.5 V	0 V–6 V	0.9 pF	9 V	DRY	1Q, 08	web
TPD12S520	12-Channel, HDMI Receiver	0.9 V–5.5 V	0 V–V_{DD}	0.9 pF	9 V	TSSOP	Now	web
TPD12S521	12-Channel, HDMI Driver	NA	0 V–V_{DD}	0.9 pF	9 V	TSSOP	1Q, 08	web
TPD8S009	8-Channel ESD	0.9 V–5.5 V	0 V–6 V	0.9 pF	9 V	DSM	1Q, 08	web

XIO

Device	Voltage	PCI Express	PCI Bus Masters	Pin/ Packages	Description	Price[1]
XIO2000A	3.3/1.5	x1	6	201/176 MicroStar BGA™	Fully compliant single-function PCI Express to PCI translation bridge	10.50
XIO2200A	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	9.50

[1]Suggested resale price in U.S. dollars in quantities of 1,000.

PCI

Device	Intel-Compatible Part No.	Speed (MHz)	Expansion Interface (bits)	Hot-Swap	MicroStar BGA™ Packaging	Voltage (V)	Package	Description	Price[1]
PCI Bridges									
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
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

[1]Suggested resale price in U.S. dollars in quantities of 1,000.

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