TI EUROPE University Program

For more information about the University Program
http://www.ti.com/europe/university

Real-Time DSP in Academia

DSP tools for projects and teaching

Signal Processing is a core subject in any electronics degree, but it is not always taught at a practical level. Including vital hands-on experience dramatically enhances student learning, and it has never been easier to do. TI's University Programme started in 1994 with a simple goal: to enable the widest possible use of real-time signal processing to be achieved in the classroom using industry standard TI processors and software. TI provides universities with teaching materials, workshops, technical support and special pricing.

There are three DSP processor families: C6000, C5000 and C2000. The most popular choices are:

C6000

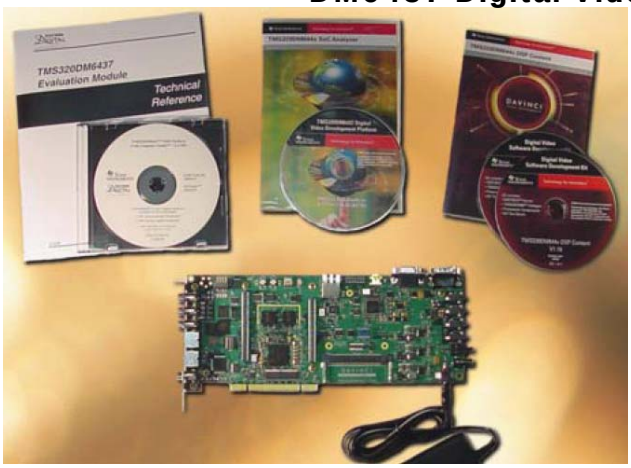
The focus of the C6000 DSP family is high-performance. Typical applications include professional audio, video and image processing, and software defined radio (SDR). There are both fixed (C64xx) and floating-point (C67xx) CPUs. Latst developments include the "DaVinci" processors (C64x+) optimised for video applications.

C2000

The focus of the C2000 DSP family is control. Typical applications are digital motor control, mechatronics and robotics. The fixed-point 32-bit C28x CPU runs at speeds up to 150MHz, and with on-chip ADC and PWM, the C2000 provides a one-chip solution for many signal control projects. A floating-point device (F283xx) will be released in 2008.

Step into Video...

DM6437 Digital Video Development Platform



http://focus.ti.com/docs/toolsw/folders/print/tmdxvdp6437.html

Part#: TMDXVDP6437

Price: $495

Typical Applications:

- Automotive vision
- Machine-vision systems
- Robotics
- Video security and video telephony
- In-flight entertainment systems

Features:

- 600-MHz C64x+ DaVinci CPU (4800 MIPS)
- One Video input via NTSC/PAL or RAW data
- One Video output via NTSC/PAL and YPbPr/RGB
- Audio I/O: S/PDIF Interface, analog, and optical
- PCI, 10/100 Ethernet MAC
- UART, CAN I/O, and VLYNQ
- 16 Mbytes of non-volatile Flash memory, 64 Mbytes NAND Flash, 2 Mbytes SRAM
- 128 Mbytes of DDR2 DRAM

The DM6437 is a low-cost video platform. With a high-performance C64x+ processor at 600MHz, it provides enough MIPS to implement real-time video algorithms. Because the DVDP has an on-board emulator, no additional parts need to be purchased to start using this board. The video input accepts RAW data, or YUV video data in numerous formats. With pro-audio, networking and other peripherals on-board, this platform is suitable for implementing almost any DSP project.

Related Workshop Materials

DM6437 DaVinci Technology One-Day Workshop
DSP/BIOS OS Design Workshop (4-day, C6416)
C6000 DSP Optimization Workshop (4-day C6416)
DM644x DaVinci Technology Workshop (4-day)

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For Projects

C6455 DSK

http://focus.ti.com/docs/toolsw/folders/print/tmdxdsk6455.html

Part#
TMDXDSK6455-OE

Price:
$595

The C6455 DSK includes TI's most powerful DSP, with 8000 MIPS. This is the only DSK to feature Serial RapidIO, an interface allowing users to implement high-speed multi-DSP & FPGA projects.

Typical Applications

Multi-DSP processing, video and voice transcoding, wireless base station transceivers, SDR, HD radio, medical imaging, and photo labs and printing.

Features

- C64x+ CPU at 1GHz (8000 MIPS/MMACS)
- Four 1x Serial RapidIO® Links (or One 4x), v1.2 Compliant
- 10/100 Mb/s Ethernet MAC
- High-quality 24-bit stereo codec
- 4 3.5mm jacks for mic in, line in, speaker and line out
- Onboard embedded IEEE 1149.1 JTAG controller with USB interface
- 128MB Memory and 8MB Flash
- Compatible with 5-6K Analog interface board for easy connection to TI Data Converters

Related Workshop Materials

C6455 Integration Workshop (4-day)
DSP/BIOS OS Design Workshop (4-day, C6416)
C6000 DSP Optimization Workshop (4-day C6416)

F28335 eZdsp

http://focus.ti.com/docs/toolsw/folders/print/tmdsezs2808.html

Part#
TMDSEZ28335

Price
$495

The F28335 is a floating point signal controller, running at 150MHz. The F28335 eZdsp is suited for high-precision control applications. This board is, allowing the DSP to be changed to any F2823x (fixed point) or F2833x (floating point) device.

Typical Applications

Precision digital motor control, digital signal control, digital power supply, power inverters, robotics, power line communications.

Features

- C28x CPU at 150 MHz
- On Chip 32-bit IEEE-754 Floating Point Unit (FPU)
- 18-channel PWM (6 Hi-Res PWM)
- 16-channel ADC (12-bit)
- 3 SCI UART channels
- 2 eCAN channels
- Onboard embedded IEEE 1149.1 JTAG controller with USB interface
- 128k x 16 off-chip SRAM
- 512 KB on-chip FLASH
- Compatible with HPA-MCU Analog interface board for easy connection to TI Data Converters

Related Workshop Materials

C28x Design Workshop (4-day)
Digital Motor Control Workshop

Get a head start...

www.ti.com/training

Workshop Attendance:
To help you get started, university lecturers and supervisors get half-price attendance at workshops from TI. You will need to use the discount code when booking:
TI-University

Workshop Materials:
The student guides and labs from our workshops are available on request for academic-use only by universities. (subject to license agreement)
Request form:
https://www-a.ti.com/apps/dspuniv/workshop_materials_request.asp

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http://www.ti.com/europe/university

For Teaching

C6416 / C6713 DSKs

http://focus.ti.com/docs/toolsw/folders/print/tmdsdsk6416.html
http://focus.ti.com/docs/toolsw/folders/print/tmdsdsk6713.html

Part#
TMDSDSK6416-TE
Price
$445

Part#
TMDSDSK6713-0E
Price
$355

The 6713 DSK is the most frequent choice of academia. The C6416 and C6713 DSKs are the easiest DSKs to get started with. Many application notes, guides and other materials are available on the web for these boards.

Teaching Applications

Teaching DSP with real hardware gives the added benefit of allowing students to interact with the algorithms they are creating, enabling them to really understand the power of the math's behind DSP. For many students, this is their "Eureka moment", and often leads to enthusiastic team projects.
These boards are suited to teaching audio processing, and complex filtering.

Features

- C64x CPU at 1GHz or C67x CPU at 225MHz
- High-quality 24-bit stereo codec
- 4 3.5mm jacks for mic in, line in, speaker and line out
- Onboard JTAG controller with USB interface
- 16MB SDRAM and 512kB Flash
- Compatible with 5-6K Analog Interface Board for easy connection to TI Data Converters

F2812 eZdsp

http://focus.ti.com/docs/toolsw/folders/print/tmdsezd2812.html
http://focus.ti.com/docs/toolsw/folders/print/tmdsezs2812.html

Part#
TMDSEZS2812-0E
Price
$445

The F2812 eZdsp has all the peripherals needed to implement a control algorithm on chip. This makes it well suited for teaching signal control, as no time is spent teaching how to interface external peripherals.

Teaching Applications

This eZdsp is well suited for teaching practical digital motor control. It would fit well into any robotics, signal control, or motor control course. It could also be used later for student projects in these areas.

Features

- C28x CPU at 100 MHz
- 16-channel PWM
- 16-channel ADC (12-bit)
- 2 SCI UART channels
- 1 CAN, 1 SPI
- Onboard embedded IEEE 1149.1 JTAG controller with PP interface
- 64 K words off chip SRAM
- 128 K words on chip FLASH
- Compatible with HPA-MCU Analog Interface Board for easy connection to TI Data Converters

Teaching ROMs

C6000 Teaching ROM
This is TI's most comprehensive set of teaching materials and programs. Comprising 22 chapters, the material describes the 'C6000 architecture in detail, introduces Code Composer Studio (CCS), the Operating System (DSP/BIOS), Software Optimisation and also provides common DSP applications implemented on the C6713 and C6416 DSK platforms. Written by Author and Lecturer Dr. Naim Dahnoun of Bristol University, UK.

C2000 Teaching ROM
This CD-ROM provides a series of 16 modules with teaching material for the TMS320F2812. The contents include presentation slides, a textbook with 488 pages, along with procedures and solutions for laboratory exercises, all presented in source-code form to allow flexibility of use. The laboratory exercises are based on the TMS320F2812 eZdsp and the C programming language. Author Frank Bormann is a Lecturer in Automotive Electronics, Real-Time- Control and Digital Signal Processing at FH Zwickau, Germany.

Request your free ROM at:
https://www-a.ti.com/apps/dspuniv/teaching_rom_request.asp

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Software

Code Composer Studio IDE

http://focus.ti.com/docs/toolsw/folders/print/ccstudio.html

Code Composer Studio (CCS) is the leading Integrated Development Environment (IDE) for developing and debugging code on any TI DSP. CCS comes with many features to make writing and debugging code easier, including:

- Program in C/C++ and assembly
- Adjustable code optimizer
- DSP/BIOS real-time kernel
- Data converter support tool
- Simulators for programming without hardware
- Optimized DSP algorithm libraries

Multi-user & CCS Policies

DSKs are supplied with a version of CCS which is locked to that type of DSK and is not upgradeable. This may be sufficient for a single project, but for academia where the software may be used for several years and access to the simulator is required, we have a special policy. Academic purchasers of our hardware can apply for a full copy of CCS free-of-charge along with a Multi-User Authorisation for multiple users. This enables a full lab to use the latest CCS and to have simulator access.

For more information, or to make a request, please contact the ECSC: http://www.ti.com/europe/csc

Mathworks tools

Target For C6000 / C2000

http://www.mathworks.com/products/tic6000/
http://www.mathworks.com/products/tic2000/

Target for TI C6000/C2000 integrates MATLAB and Simulink with C6000/C2000 processors. Together, these products let you develop and validate signal processing algorithms from concept through code by performing automatic code generation, prototyping, and embedded system deployment on TI C6000 processors.

Link for CCS

http://www.mathworks.co.uk/products/ccslink/

Link for CCS connects MATLAB and Simulink with CCS. Link for CCS lets you debug and verify embedded code running on TI DSPs using MATLAB scripts and Simulink models. You can use a test bench created in MATLAB and Simulink as a test harness to verify both hand-written and automatically generated embedded code.

Product Support

Europe, Middle East and Africa

European Customer Support Center
FREE CALL 00800 ASK TEXAS
00800 275 83927
International
+49 8161 80 2121
Texas Instruments

Russian Support
+7 (495) 981 07 01

http://www.ti.com/europe/csc

List of DSKs and Prices:

CODE COMPOSER STUDIO PACKAGES	PART NUMBER	Uni. Price ($)	Applications
CCS v3.3 for C2000, C5000 and C6000	TMDSCCSALL-1	900	All
EVALUATION/DEVELOPMENT BOARDS	**PART NUMBER**	**Uni. Price ($)**	**Applications**
DM6437 EVM DaVinci DVDP	TMDXVDP6437	495	Video
DM642 EVM (requires emulator)	TMDSEVM642-0E	1,695	Video
C6455 EVM	TMDXEVM6455-0E	1,795	Research
DSP STARTER KITS (DSKs)	**PART NUMBER**	**Uni. Price ($)**	**Applications**
DSK eZdsp LF2407	TMDSEZD2407	345	Control
DSK eZdsp F2812 (non socketed)	TMDSEZD2812-0E	335	Control
DSK eZdsp F2812 (socketed)	TMDSEZS2812-0E	445	Control
DSK eZdsp F2808 (socketed)	TMDSEZS2808-0E	445	Control
DSK eZdsp F28335 (socketed)	TMDSEZ28335	495	Control
DSK C5509	TMDSDSK5509-0E	495	Low-Power
DSK C5510	TMDSDSK5510-0E	316	Low-Power
DSK C6416 (1GHz)	TMDSDSK6416-TE	445	Imaging
DSK C6713 (floating point)	TMDSDSK6713-0E	355	Audio
DSK C6455 (1GHz)	TMDXDSK6455-0E	595	Research
EMULATORS	**PART NUMBER**	**Uni. Price ($)**	**Applications**
XDS560, PCI-bus Emulator	TMDSEMU560	1,995	-
XDS510PP+, Parallel port Emulator	TMDSEMUPP-0E	999	-
XDS510USB, USB Emulator	TMDSEMUUSB	1,350	-

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