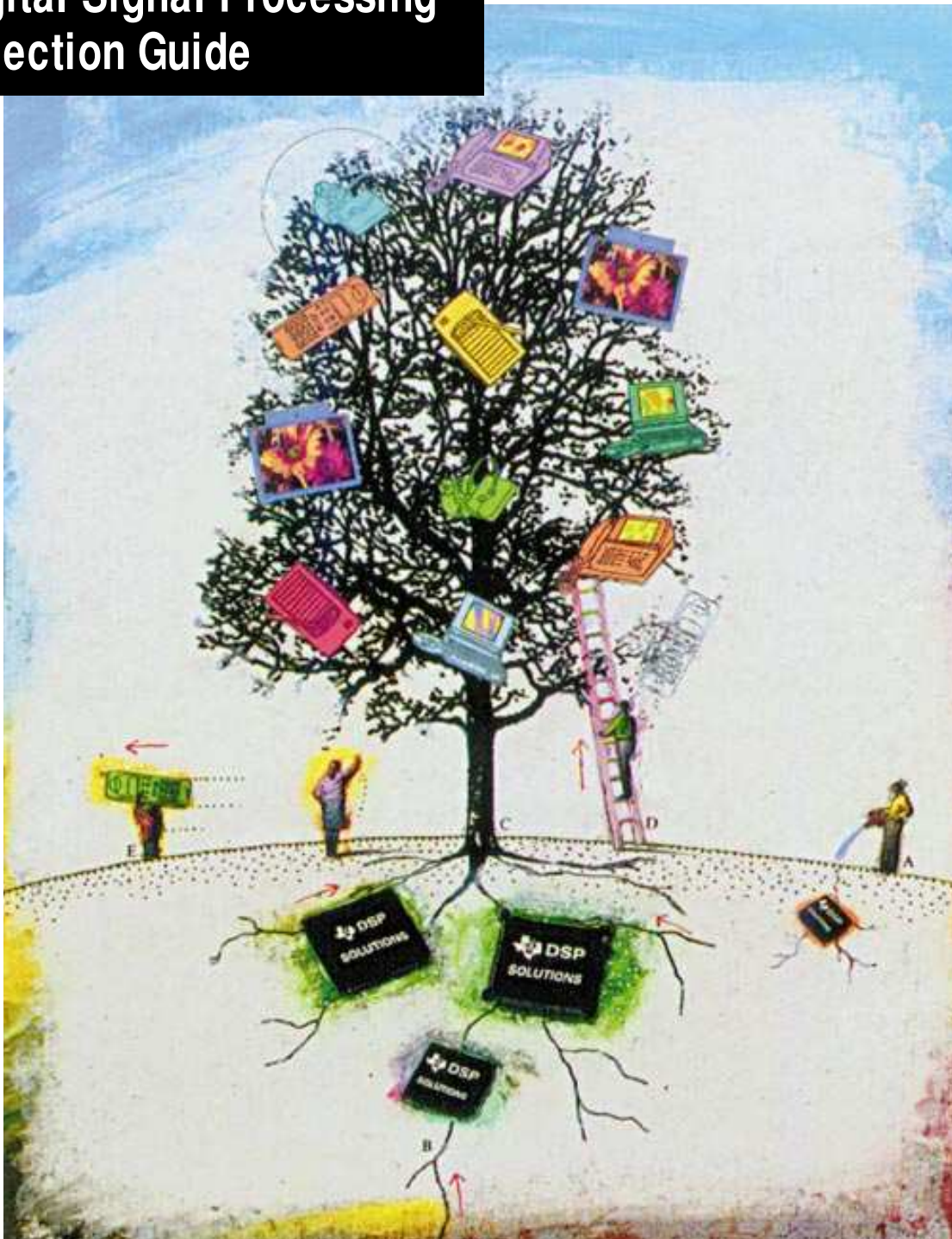


# Digital Signal Processing Selection Guide





# TM S320 Digital Signal Processor Solutions

## Solutions for today

### Sockets to look for:

- 8-/16-/32-bit Microcontrollers
- General-purpose Microprocessors
- Competitor DSPs

### Advantages of designing with DSPs over other Microprocessors:

- High-speed number crunching
- Real-time performance, simulation and emulation
- Flexibility
- Reliability
- Increased system performance
- Reduced system cost

### Advantages of TM S320 Family over the competition:

- Broad portfolio
- Market leaders in solutions
- Manufacturing strength and commitment
- Mixed Signal Support Devices
- Wide variety of packaging options
- Better support from concept to completion
- Low-cost starter kits and evaluation modules
- Cycle-accurate simulators
- Optimizing high-level language compilers
- Debuggers
- Real-time scan-based emulators
- Application software library
- Technical hotline, bulletin board service, and Internet presence (including On-Line Lab and Hotline)
- Third-party support

## General DSP Literature

(800) 477-8924

TMS320 DSP Product Overview (Flipbook)	SPRZ094C
TMS320 DSP Brochure	SPRB113
TMS320 Software Cooperative Resource Guide	SPRT111B
TMS320 Development Support Brochure	SPRT096B
TMS320 Development Support Reference Guide	SPRU011E
TMS320 Third-Party Support Guide	SPRU052C

## General Technical DSP Literature

(800) 477-8924

DSP Digital Control Applications	SPRA019
TMS320-SCSI Target Controller Application Report	SPRA025
Minimize Quantization Effects Using 320 DSP	SPRA035
Setting up TMS320 DSP Interrupts in C Applications	SPRA036

## Designer Notebook Pages (DNP)

### Notebook Pages

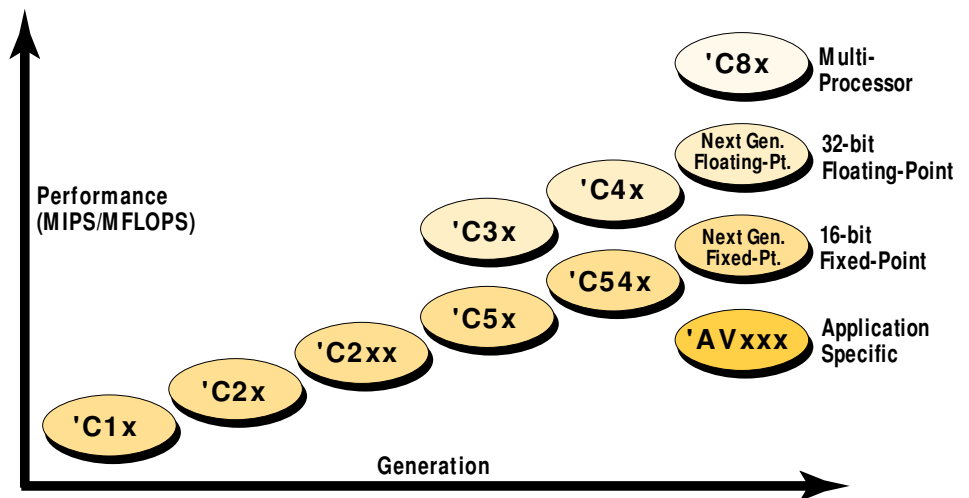
### DNP #

- Designer Notebook Volume 1  
(\* See page 23 for complete listing)
- (1-60) SPRT125\*

## Contacts

DSP Hotline	(713) 274-2320 or dsph@ti.com
Product Information Center (PIC)	(972) 644-5580
Bulletin Board Service (BBS)	(713) 274-2323 (See page 22 for access information)
Internet FTP Site	ftp.ti.com (Logon as "anonymous," password is E-mail address)
DSP Faxline	(713) 274-2324
TI DSP Web Page	http://www.ti.com/dsps
DSP On-line Lab	http://www.ti.com/sc/docs/dsps/dsplab.htm
320 Hotline On-line	http://www.ti.com/sc/docs/dsps/expsys.htm
TMS320C8x E-Mail/Hotline	'C8x-hotline@ti.com
Literature Ordering Information	(800) 477-8924
Software Upgrades/Registration	(972) 638-0333

## Digital Signal Processors – Family Roadmap



# TM S320 Digital Signal Processor Solutions

## TM S320C1x (Fixed-Point)

### Key specifications:

- On-chip RAM with ROM or OTP PROM for broad flexibility
- One of the lowest cost DSPs on the market
- Integration capability through cDSP
- Choice of five versions ('C10, 'C14, 'C15, 'C16, 'C17) for optimizing system costs

### Key applications:

- Anti-lock braking
- Musical instruments
- Energy metering
- Servo and motor control
- Digital tapeless answering machines

### Key features:

- 144-word programmable on-chip data RAM on the 'C10, 256 on other 'C1x devices
- 1.5K-word on-chip program ROM on the 'C10, 4K-word on the 'C14, 'C15 and 'C17, 8K-word on the 'C16
- Secure 4K-word on-chip program OTP
- 64K-word external data reach on the 'C16, 4K for the other 'C1x devices
- 32-bit ALU/accumulator
- 16x16-bit parallel multiplier with a 32-bit product
- Single-cycle multiply
- Up to four on-chip timers for control operations
- Up to eight-level hardware stack
- Two auxiliary registers
- Four-word input and output channels on the 'C14, 'C15 and 'C17
- 16-bit barrel shifter
- Wait states for communication with slower off-chip memories/peripherals

## TM S320C1x Product Specification Guide

Device	RAM	ROM	OTP	DAT/PRO	SER	PAR	DMA	COM	Timers	MHz	Cycle(ns)	MIPS	Packaging	\$/1ku
TMS320C10	144	1.5K	.	x/4K	.	8x16	.	.	.	20	200	5	40 PDIP, 44 PLCC	4.20 4.20
TMS320C10-25	144	1.5K	.	x/4K	.	8x16	.	.	.	25	160	6.25	40 PDIP, 44 PLCC	5.10 5.10
TMS320C14	256	4K	.	x/4K	1	7x16	.	.	4	25	160	6.25	68 PLCC	8.00
TMS320P14	256	.	4K	x/4K	1	7x16	.	.	4	25	160	6.25	68 PLCC	17.58
TMS320C15	256	4K	.	x/4K	.	8x16	.	.	.	20	200	5	40 PDIP, 44 PLCC	5.30 5.30
TMS320C15-25	256	4K	.	x/4K	.	8x16	.	.	.	25	160	6.25	40 PDIP, 44 PLCC	5.80 5.80
TMS320LC15	256	4K	.	x/4K	.	8x16	.	.	.	16	250	4	40 PDIP, 44 PLCC	5.30 5.30
TMS320P15	256	.	4K	x/4K	.	8x16	.	.	.	20	200	5	40 PDIP, 44 PLCC	13.20 13.20
TMS320P15-25	256	.	4K	x/4K	.	8x16	.	.	.	25	160	6.25	40 PDIP, 44 PLCC	16.40 16.40
TMS320C16	256	8K	.	x/64K	.	8x16	.	.	.	35	114	8.779	64 PQFP	6.32
TMS320C17	256	4K	.	.	2	6x16	.	.	1	20	200	5	40 PDIP,* 44 PLCC*	5.28 5.28
TMS320P17	256	.	4K	.	2	6x16	.	.	1	20	200	5	40 PDIP, 44 PLCC	14.52 14.52

\* 10ku minimum

## TM S320C1x Literature

(800) 477-8924

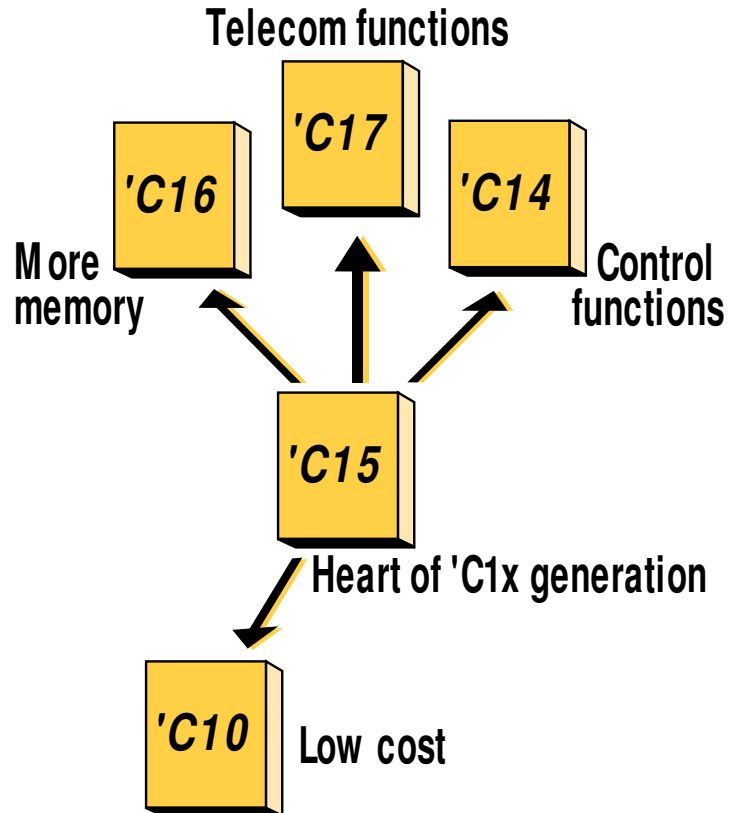
TMS320C1x User's Guide (C/E/P/LC 10/14/15/16/17)

SPRU013C

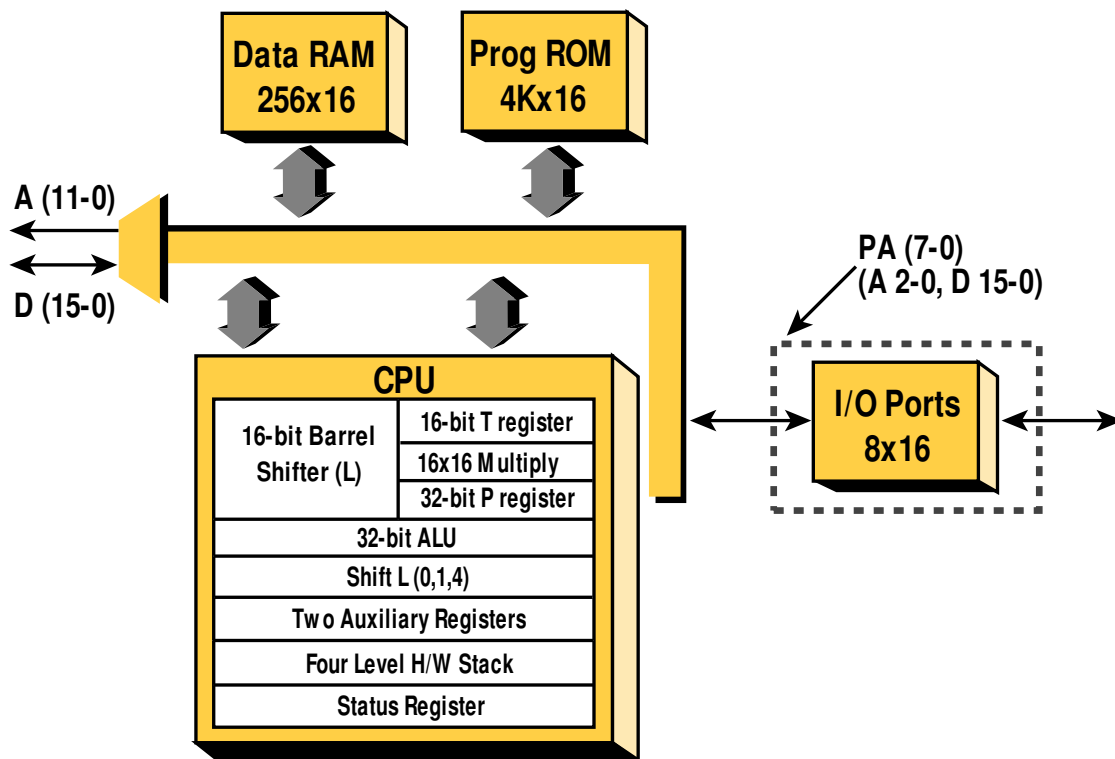
TMS320C1x Product Bulletin

SPRT115

## TM S320C1x Family



## TM S320C15 Block Diagram



The TM S320C15 is an upgraded version of the 'C10 and provides the core for subsequent 'C1x generation developments.

### TM S320C1x Development Tools

Tool	Part #	Description	Literature for Tool	Literature #	\$/U
Evaluation Module (EVM)	TMDS3260016	'C16 EVM Card for IBM PC-DOS, Win	TM S320C1x EVM Analog Int. Appl. Report TM S320C16 Source Debugger User's Guide TM S320C16 Evaluation Module Tech. Ref.	SPRA029 SPRU077 SPRU080	795
Simulator Software	TMDS3240811-02	'C10/'C15/'C17 PC/DOS Simulator	TM S320C1x Simulator User's Guide	SPRU009B	500
Code Generation Software	TMDS3242850-02	'C1x/'C2x/'C5x PC-DOS, OS/2, Asm/Lnk	Assembly Language Tools User's Guide	SPRU018D	500
Programming	TM DX3270110	P14/E14 EPROM Adaptor 68LCC->28DIP (STD & RBIT)			100
Programming	RTC/PGM 320A-06	P15/E15/E17 EPROM Adaptor 40DIP->28DIP			106
Programming	RTC/PGM 320C-06	P15/E15/P17/E17 EPROM Adaptor 44LCC->28DIP (STD & RBIT)			106
Programming	RTC/AIB320A-06	Analog I/F Board			1,400
XDS/22 Systems Emulator	TM DX3262214	'C14 XDS/22 (+ 'C14PM)			8,500
XDS/22 Systems Emulator	TMDS3262215	'C10/'C15 XDS/22 (+ 'C10/'C15 PM)			8,500
Digital Filter Design	DFDP	ASPI Digital Filter Design Package PC/DOS			1,195

# TM S320 Digital Signal Processor Solutions

## TM S320C2x (Fixed-Point)

### Key specifications:

- On-chip RAM with ROM or OTP PROM for broad flexibility
- A wide range of development tools from \$99 U.S. DSP Starter Kit to real-time emulator
- Integration capability through cDSP
- Available in two versions to optimize system costs ('C25, 'C26)

### Key applications:

- Anti-skid braking
- Servo and motor control
- Robotics/numeric control
- Telecommunications
- Sound systems, voice processing
- Digital filtering applications

### Key features:

- 544-word programmable on-chip data RAM (including 256-word program/data RAM)
- 1568-word configurable program/data RAM (TM S320C26 only)
- 4K-word on-chip program ROM (TM S320C25)
- Secure 4K-word on-chip program OTP ROM
- 128K-word total data/program memory space
- 32-bit ALU/accumulator
- 16x16-bit parallel multiplier with a 32-bit product
- Single-cycle multiply/accumulate instructions
- Repeat instructions for efficient use of program space and enhanced execution
- Block moves for data/program management
- On-chip timer for control operations
- Up to eight auxiliary registers with dedicated arithmetic unit

## TM S320C2x Product Specification Guide

Device	RAM	ROM	OTP	DAT/PRO	SER	PAR	DMA	COM	Timers	MHz	Cycle(ns)	MIPS	Packaging	\$/1ku
TM S320C25	544	4K	.	64K/64K	1	16x16	Ext	.	1	40	100	10	68 PLCC, 80 PQFP	11.20
TM S320C25-50	544	4K	.	64K/64K	1	16x16	Ext	.	1	50	80	12.5	68 PLCC	12.30
TM S320P25	544	.	4K	64K/64K	1	16x16	Ext	.	1	40	100	10	80 PQFP, 68 PLCC	29.50
TM S320C26	1.5K	256	.	64K/64K	1	16x16	Ext	.	1	40	100	10	68 PLCC	11.20

## TM S320C2x Literature

(800) 477-8924

TM S320C2x User's Guide	SPRU014C
TM S320C2x User's Guide Manual Update Sheet	SPRZ093
TM S320C2x DSP Fixed-Point Product Bulletin	SPRT116
DSP Applications Vol.2 ('C1x/'C2x)	SPRA016
TM S320P25 Data Sheet	SPRS028
Implementation of fuzzyLogic Applications	SPRA028
TI/Inform fuzzyLogic Specifications	SPRT110A
fuzzytech Product Bulletin	SPRT113

## Designer Notebook Pages (designed specific to the 'C2x)

Notebook Pages	DNP #
• Circular Buffer in Second Generation DSPs	7
• TMS320C25 Logical Shifts in Parallel With ALU Operations	11
• Creating a Delay Buffer on a TMS320C2x EVM	18
• TM S320C2x/C5x EVM AIC Initialization and Configuration	25
• Using the RBIT on the TM S320P25	29

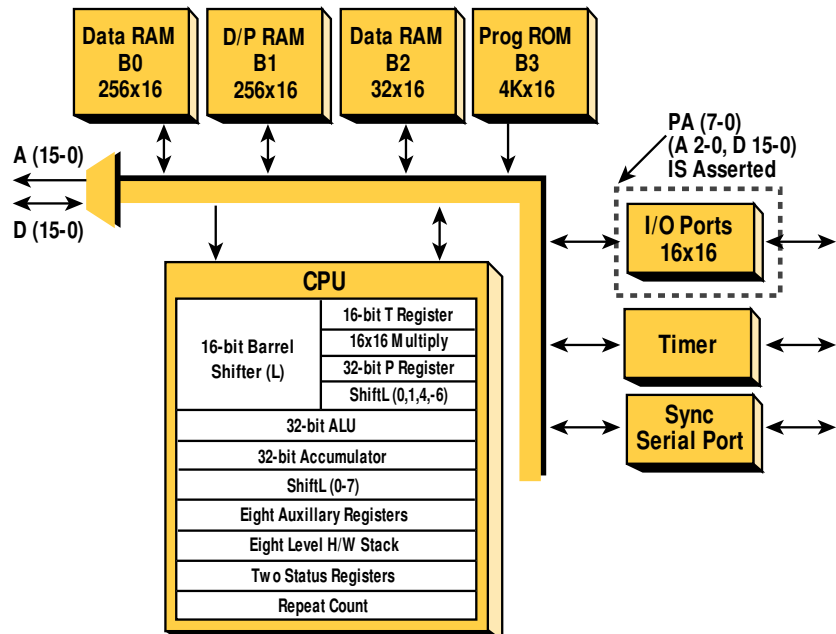
## Regional Training Center (RTC) 'C2x Training Class

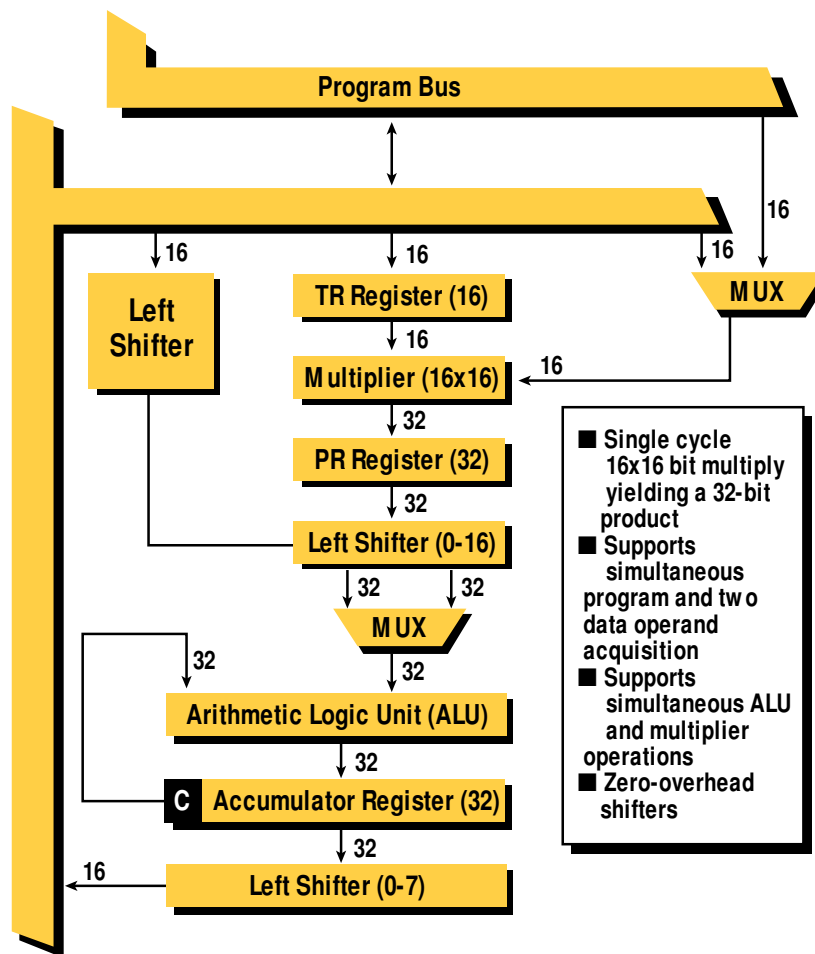
Price \$1395

### For Registration Call:

Northeast	(617) 895-9185
Western States / Canada	(408) 383-2363
Mid-America / Southeast	(972) 917-3894

## TM S320C2x Block Diagram





TM S320C2x Development Tools

Tool	Part #	Description	Literature for Tool	Literature #	\$/U
Evaluation Module (EVM)	TMDS3260026	'C26 EVM Card for IBM PC-DOS, Win	TM S320C2x Source Debugger User's Guide TM S320C2x Evaluation Module Tech. Ref.	SPRU070 SPRU088	995 .
Simulator Software	TMDS3242851-02 TMDS3242551-09	'C2x PC/DOS & WIN Simulator w/ Debug 'C2x SUN SPARC Simulator w/ Debug	'C2x S/W Dev. System Tech. Ref.	SPRU072	500 3,000
Code Generation Software	TMDS3242850-02 TMDS3242855-02 TMDS3242555-08	'C1x/'C2x/'C5x PC-DOS, OS/2, Asm/Lnk 'C2x/'C5x PC-DOS, OS/2 C Cmp/Asm/Lnk 'C2x/'C5x SUN SPARC C Cmp/Asm/Lnk	Assembly Language Tools User's Guide	SPRU018D	500 1,500 3,500
Programming	TMDX3270120	E25 EPROM Adaptor 68 PLCC->28DIP (STD & RBIT)			100
Programming	RTC/AIB320A-06	Analog I/F Board			1,400
XDS/22 Systems Emulator	TMDS3262221	'C25/ XDS/22 (33 & 40 MHz only)			8,500
DSP Starter Kit (DSK)	TMDS3200026	'C26 DSP Starter Kit (DSK) 'C26, AIC, Basic Asm & Debug.	TM S320C2x DSP Starter Kit User's Guide Sample SW	SPRU093	99
Digital Filter Design	DFDP	ASPI Dig. Filter Design Package PC/DOS			1,195
Fuzzy Logic Tutorial	MCU320-EXPLORE	fuzzyTECH MCU-320 fuzzy logic			199
Fuzzy Logic Code Generator	MCU320-EDITION	fuzzyTECH MCU-320 fuzzy logic code generation tool			1,890

# TM S320 Digital Signal Processor Solutions

## TM S320C2xx (Fixed-Point)

### Key specifications:

- 20 to 40 MIPS operation
- Prices start as low as \$0.12 U.S. per MIPS
- 3V and 5V versions
- Typical active power; 1.9 mA/MIPS at 5V and 1.1 mA/MIPS at 3V
- 100-pin TQFP, 80-pin TQFP
- Source code compatible with 'C1x and 'C2x generations
- Upwardly compatible with 'C5x generation
- Integration compatibility through cDSP
- JTAG scan-based emulation

### Key applications:

- Set top boxes
- Feature phones
- Point-of-sale terminals
- Security systems
- Telecom
- Networking
- Servo and motor control
- Radar detectors
- Two-way pagers
- Digital cameras
- Modems
- CD ROMs

### Key features:

- Up to 4.5K Data/Program RAM on-chip
- 32K words of flash on-chip ('F206/'F207)
- 16 general purpose I/O pins ('F207)
- 32-bit ALU/accumulator
- 16x16-bit parallel multiplier with a 32-bit product
- Repeat instructions for efficient use of program space and enhanced execution
- 16-bit on-chip timer
- 16-bit barrel shifter
- Eight-level hardware stack
- Built-in power down mode
- Software wait-state generator

## TM S320C2xx Product Specification Guide

Device	RAM	(Words) ROM	FLASH	DAT/PRO	SER	PAR	DMA	COM	Timers	MHz	Cycle(ns)	MIPS	Packaging	\$/1ku
TM S320C203	544	Boot	.	64K/64K	2	64Kx16	Ext	.	1	40	50	20	100 TQFP	6.50
TM S320C203-57	544	Boot	.	64K/64K	2	64Kx16	Ext	.	1	57	35	28.5	100 TQFP	6.80
TM S320C203-80	544	Boot	.	64K/64K	2	64Kx16	Ext	.	1	80	25	40	100 TQFP	7.10
TM S320LC203	544	Boot	.	64K/64K	2	64Kx16	Ext	.	1	40	50	20	100 TQFP	7.15
TM S320C204	544	4K	.	64K/64K	2	64Kx16	Ext	.	1	40	50	20	100 TQFP	7.90
TM S320C204-57	544	4K	.	64K/64K	2	64Kx16	Ext	.	1	57	35	28.5	100 TQFP	8.30
TM S320C204-80	544	4K	.	64K/64K	2	64Kx16	Ext	.	1	80	25	40	100 TQFP	8.70
TM S320C205	4.5K	Boot	.	64K/64K	2	64Kx16	Ext	.	1	40	50	20	100 TQFP	9.40
TM S320C205-57	4.5K	Boot	.	64K/64K	2	64Kx16	Ext	.	1	57	35	28.5	100 TQFP	9.90
TM S320C205-80	4.5K	Boot	.	64K/64K	2	64Kx16	Ext	.	1	80	25	40	100 TQFP	10.30
TM S320C209-57	4.5K	4K	.	64K/64K	.	64Kx16	.	.	1	57	35	28.5	80 TQFP	12.90
TM S320F206	4.5K	.	32K	64K/64K	2	64Kx16	Ext	.	1	40	50	20	100 TQFP	15.20
TM S320F206-57	4.5K	.	32K	64K/64K	2	64Kx16	Ext	.	1	57	35	28.5	100 TQFP	15.90
TM S320F206-80	4.5K	.	32K	64K/64K	2	64Kx16	Ext	.	1	80	25	40	100 TQFP	16.60
TM S320LF207	4.5K	.	32K	64K/64K	3	64Kx16^	Ext	.	1	40	50	20	144 TQFP	16.60
TM S320LF207-57	4.5K	.	32K	64K/64K	3	64Kx16^	Ext	.	1	57	35	28.5	144 TQFP	17.50
TM S320LF207-80	4.5K	.	32K	64K/64K	3	64Kx16^	Ext	.	1	80	25	40	144 TQFP	18.20

^ = 'F207 also includes 16-bit addressable I/O Pins

### TM S320C2xx Literature

(800) 477-8924

TM S320C203/TM S320209 Data Sheet	SPRS025
TM S320C2xx User's Guide	SPRU127A
TM S320C2xx Product Bulletin	SPRT122A

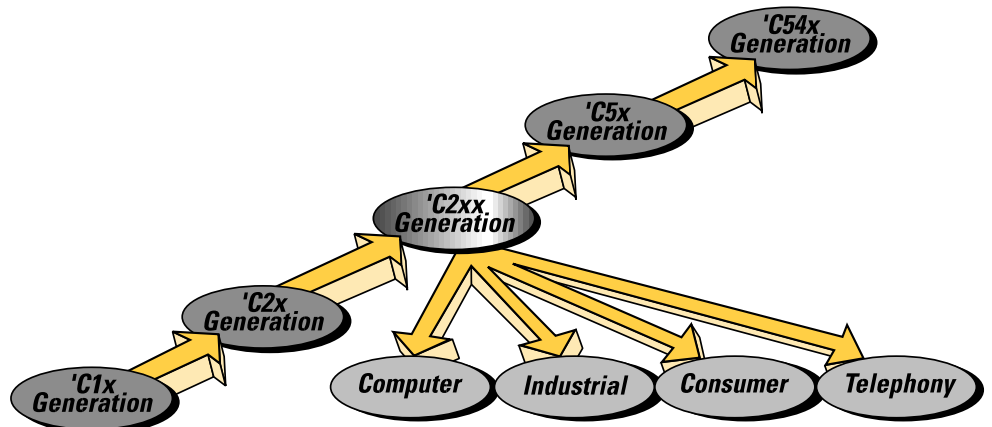
### Regional Training Center (RTC) 'C2xx Training Class

Price \$1395

### For Registration Call:

Northeast	(617) 895-9185
Western States / Canada	(408) 383-2363
Mid-America / Southeast	(972) 917-3894

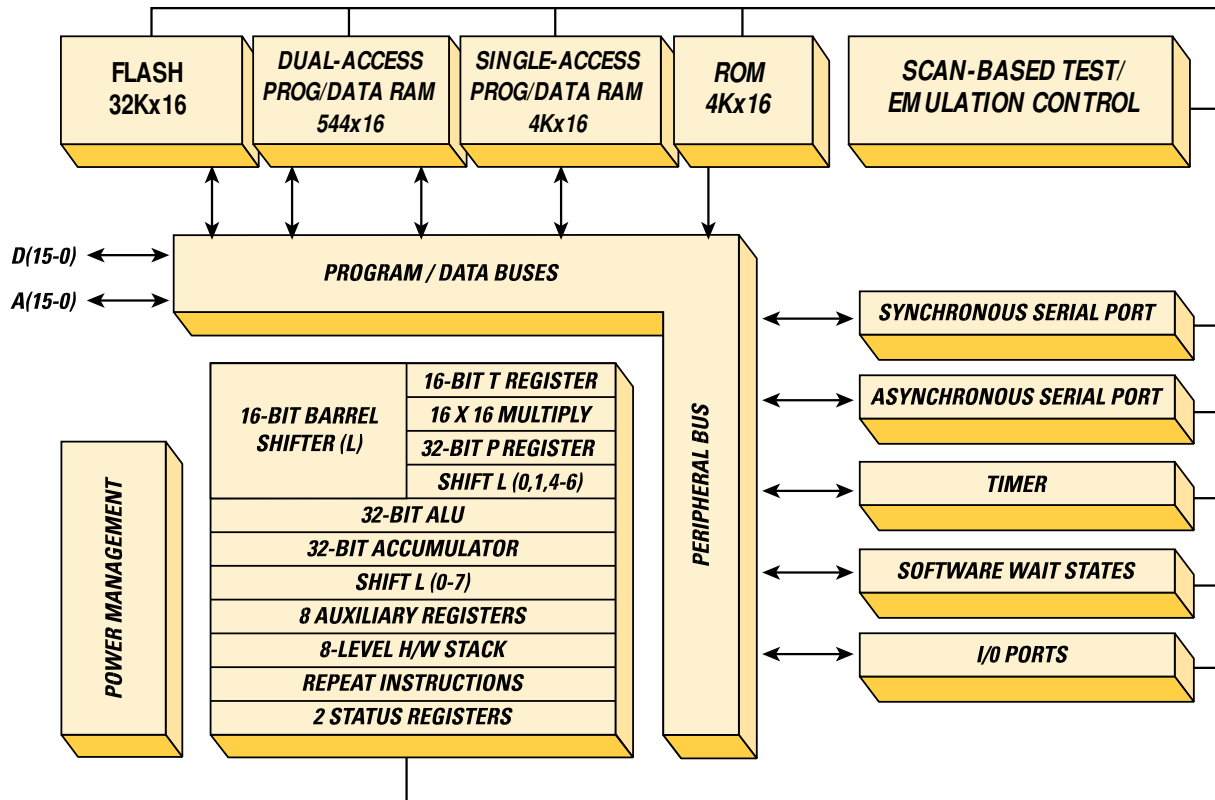
### TM S320C2xx Migration Path to Other TM S320 Generations



TM S320C2xx DSPs provide a migration path to other TM S320 fixed-point generations. They enable DSP processing for new applications in the computer, industrial, consumer and telephony segments.



## TMS320C2xx Block Diagram



TMS320C2xx DSPs offer optimized memory and peripheral configurations for a range of emerging DSP applications.

## TMS320C2xx Development Tools

Tool	Part #	Description	Literature for Tool	Literature #	\$/U
Simulator Software	TM DX324X851-02	'C2xx Simulator SW (PC)			500
	TM DX324X551-09	'C2xx Simulator SW (SPARC)			3,000
Code Generation Software	TM DS3242850-02	'C1x/'C2x/'C2xx/'C5x PC-DOS, OS/2, Asm/Lnk	Assembly Language Tools User's Guide	SPRU018D	500
	TM DS3242855-02	C Comp/Asm/Lnk (Windows, O/S 2)	'C2x/'2xx/'5x Optimizing C Comp User's Guide	SPRU024D	1,500
	TM DS3242555-08	'C2x/'C2xx/'C5x SUN SPARC C Cmp/Asm/Lnk			3,500
	CCM SP5XWIN	Code Composer - 'C2xx/'C5x	Go-DSP Brochure	SPRT126	2,000
XDS510/XDS510 WS HW	TM DS00510	XDS510 + JTAG cable (PC)			4,000
	TM DS00510WS	XDS510 + SCSI cable + JTAG cable			6,000
Debugger Software	TM DX324012XX	XDS510 C Source Debugger PC	C Source Debugger User's Guide	SPRU151	2,000
	TM DX324062XX	XDS510 C Source Debugger SPARC			4,000
EMU Porting Kit	TM DX324002XX	EMU Porting Kit PC/SPARC			6,000

# TM S320 Digital Signal Processor Solutions

## TM S320C24x (Fixed-Point)

### Key specifications:

- 20 MIPS operation
- Four power down modes
- Source code compatible with 'C1x and 'C2x generations
- Upwardly compatible with 'C5x generation
- JTAG scan-based emulation

### Key applications:

- Motor control
  - DC brushless
  - AC induction
  - Switched reluctance
- HVAC blowers and compressors
- Printers and copiers
- Automotive systems
- Power inverters
- Robotics and CNC machines
- Hard disk drives
- Tape drives

### Key features:

- Dual 10-bit A/D converters
- Three 16-bit general purpose timers
- Watchdog timer module
- Three 16-bit Compare Units with programmable Deadband Generators
- Three simple compare units
- Twelve PWM channels
- SCI
- SPI
- 28 I/O pins
- Six external interrupts

## TM S320C24x Product Specification Guide

Device	RAM	ROM	FLASH	DAT/PRO	General Purpose Timers	Watchdog Timers	Compares/Captures	PWM Channels	SPI	UART	A/D	I/O Pins	MIPS	Packaging
TM S320F240	544	.	16K	64K/64K	3	1	9/4	12	1	1	dual 10-bit	28	20	132 PQFP
TM S320C240	544	16K	.	64K/64K	3	1	9/4	12	1	1	dual 10-bit	28	20	132 PQFP

## TM S320C24x Literature

(800) 477-8924

TM S320C240/F240 Data Sheet	SPRS042
TM S320C240/F240 Product Bulletin	SPRT131
TM S320C240/F240 User's Guide (Volume 1 and 2)	SPRU0160/SPRU0161
Implementation of <i>fuzzyLogic</i> Applications	SPRA028
TI/Inform <i>fuzzyLogic</i> Specifications	SPRT110A
<i>fuzzytech</i> Product Bulletin	SPRT113

## Regional Training Center (RTC) 'C24x Training Class

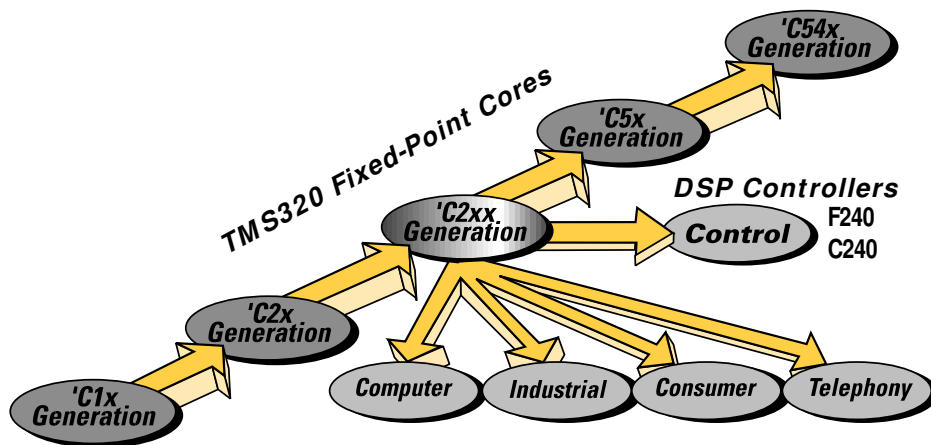
Price: TBD

Classes will be offered in mid-1997.

### For Registration Call:

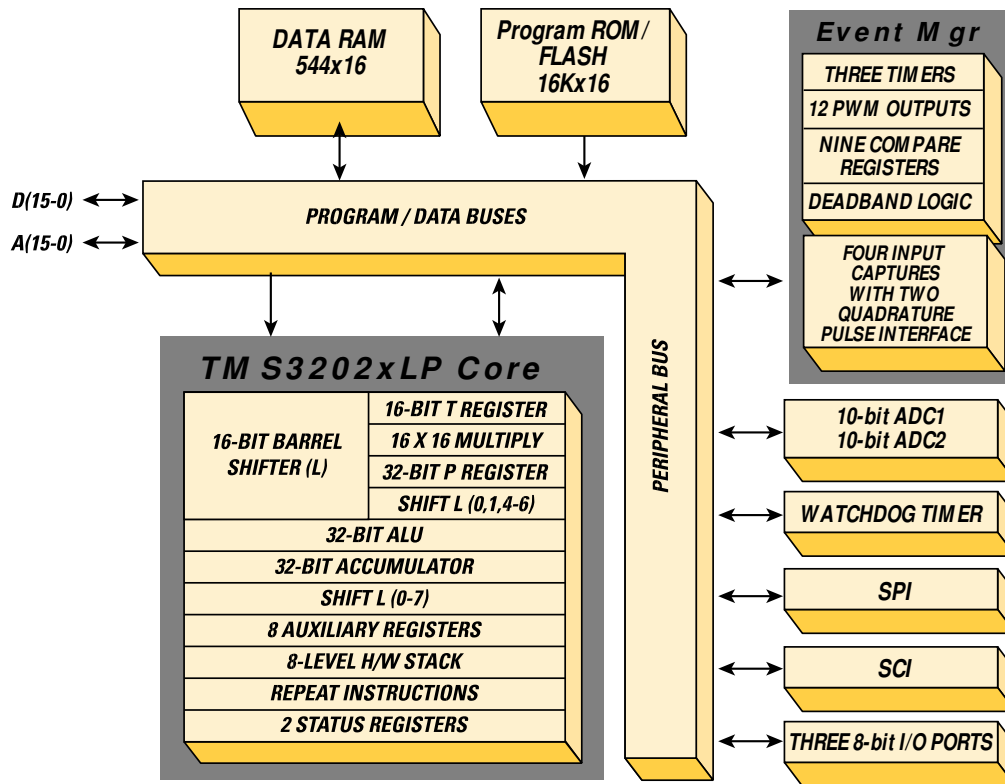
Northeast .....	(617) 895-9185
Western States / Canada .....	(408) 383-2363
Mid-America / Southeast .....	(972) 917-3894

## TM S320C2xx Migration Path to Other TM S320 Generations



Part of the 'C2xx generation, the TM S320C24x provides an optimized DSP solution for digital motion and motor control systems.

## TM S320C24x Block Diagram



TM S320C24x DSPs combine the power of TM S320C2xLP core with new optimized microcontroller peripherals — event manager, dual A/D converters, SPI, SCI and timers.

## TM S320C24x Development Tools

Tool	Part #	Description	Literature for Tool	Literature #	\$/U
Simulator Software	TM DX324X851-02	'C2xx Simulator SW (PC)			500
	TM DX324X551-09	'C2xx Simulator SW (SPARC)			3,000
Code Generation Software	TM DS3242850-02	'C1x/'C2x/'C2xx/'C5x PC-DOS, OS/2, Asm/Lnk	Assembly Language Tools User's Guide	SPRU018D	500
	TM DS3242855-02	C Comp/Asm/Lnk (Windows, O/S 2)	'C2x/'2xx/'5x Optimizing C Comp User's Guide	SPRU024D	1,500
	TM DS3242555-08	'C2x/'C2xx/'C5x SUN SPARC C Cmp/Asm/Lnk			3,500
XDS510/XDS510 WS HW	TM DS00510	XDS510 + JTAG cable (PC)			4,000
	TM DS00510WS	XDS510 + SCSI cable + JTAG cable			6,000
XDS511 Emulator Board	TM DS00511PC	Target and ROM replacement	TBD	TBD	TBD
XDS522 Emulation System	TM DX522DSP	Real-time trace and breakpoint board	TBD	TBD	TBD

# TM S320 Digital Signal Processor Solutions

## TM S320C3x (32-bit Floating-Point)

### Key specifications:

- Performance up to 60 M FLOPS
- Highly efficient C language engine
- Large address space: 16 M Words
- Fast memory management with on-chip DMA

### Key applications:

- Digital audio
- Laser printers, copiers, scanners
- Bar-code scanners
- Video conferencing
- Industrial automation and Robotics
- Voice/facsimile mail
- Servo and motor control
- Networking

### Key features:

#### High Performance:

- 33-ns instruction cycle
- 30 MIPS
- 60 M FLOPS
- 330 M OPS
- 120 M bytes/second I/O bandwidth

#### Register-based, pipelined CPU:

- Parallel multiply and arithmetic/logical operations on integer or floating-point numbers in a single chip
- Eight extended-precision registers

#### Powerful Instruction Set:

- Single-cycle instruction execution
- System control and numeric operation

#### Integrated Peripherals:

- DMA controller for concurrent I/O and CPU operation
- Timers
- Serial Port

#### Memory:

- Extensive internal busing and parallelism for rapid data-movement capability

## TM S320C3x Product Specification Guide

Device	(Words)		OTP	DAT/PRO	SER	PAR	DMA	COM	Timers	MHz	Cycle(ns)	MIPS	Packaging	\$1ku
	RAM	ROM												
TM S320C30	2K	4K	.	16M	2	16M x32	1	.	2	33	60	16.667	181 PGA	150.00
TM S320C30-40	2K	4K	.	16M	2	16M x32	1	.	2	40	50	20	181 PGA, 208 PQFP	173.00 72.60
TM X320C30-50*	2K	4K	.	16M	2	16M x32	1	.	2	50	40	25	181 PGA, 208 PQFP	199.00 83.20
TM S320C31-40	2K	#	.	16M	1	16M x32	1	.	2	40	50	20	132 PQFP	49.20
TM S320C31-50	2K	#	.	16M	1	16M x32	1	.	2	50	40	25	132 PQFP	54.10
TM S320C31-60	2K	#	.	16M	1	16M x32	1	.	2	60	33	30	132 PQFP	60.00
TM S320LC31	2K	#	.	16M	1	16M x32	1	.	2	33	60	16.667	132 PQFP	49.20
TM S320LC31-40	2K	#	.	16M	1	16M x32	1	.	2	40	50	20	132 PQFP	54.10
TM S320C32-40	512	#	.	16M	1	16M x32	2	.	2	40	50	20	144 PQFP/TQFP	26.30
TM S320C32-50	512	#	.	16M	1	16M x32	2	.	2	50	40	25	144 PQFP/TQFP	28.90
TM S320C32-60	512	#	.	16M	1	16M x32	2	.	2	60	33	30	144 PQFP/TQFP	34.70
TM X320LC32-40*	512	#	.	16M	1	16M x32	2	.	2	40	50	20	144 PQFP/TQFP	28.90

Notes from table: # = Boot Loader / ^ 16Mx8/16/32 configurable / \* These devices will be available soon.

## TM S320C3x Literature (Floating-Point)

(800) 477-8924

TM S320C3x User's Guide	SPRU031D
TM S320C3x DSP 3-D Graphics Application Report	SPRA024
TM S320C3x DSP Floating-Point Product Bulletin	SPRT117B
TM S320C3x User's Guide Addendum Manual Update Sheet	SPRZ097
TM S320C3x DSK Product Bulletin	SPRT129
TM S320C3x DSK User's Guide	SPRU163
TM S320C31 Embedded Control Technical Brief	SPRU083
TM S320C30 Data Sheet	SPRS032
TM S320C31 Data Sheet	SPRS035
TM S320C32 Data Sheet	SPRS027B
TM S320C32 Addendum to User's Guide	SPRU132B
Peripheral Control Library User's Guide	SPRU086
DSP Applications Vol. 3 (Primarily 'C3x)	SPRA017
Choosing a High-Performance Floating-Point DSP	SPRN073
Interfacing Memory to the TM S320C32 DSP	SPRA040
User's Guide Manual Update Sheet	SPRZ098
How TM S320 Tools Interact with 'C32 Enhanced Memory	SPRA048
Engine Knock Detection Using Spectral Analysis	SPRA039

## Designer Notebook Pages (designed specific to the 'C3x)

Notebook Pages	DNP #
• TM S320C3x Block Repeat	1
• Avoiding False Interrupts on the 'C3x	2
• TM S320C30 Addressing Up to 68 Gigawords	5
• Bit-reversed Addressing in C on the 'C3x	8
• Sharing Header Files in C and Assembly	9
• Interfacing the TM S320C31 to A/D and D/A Devices	14
• Fast Logarithms on a Floating-Point Device	22
• Switching From Bootloader to MP Mode With TM S320C31	23
• Hardware UART for TM S320C3x	27
• Addressing Peripherals in Data Structures in C	30
• Interrupts in C on the TM S320C3x	31
• Floating-Point C Compiler: Tips and Tricks - Part 1	33
• Guidelines for Using Decoupling Capacitors on DSP Designs	34
• Using a 'C30 Serial Port as an Asynchronous RS-232 Port	44
• Developing a Full-Duplex uART on 'C3x	58
• More on <a href="http://www.itg.ti.com/dsp/c3x/literature.html">http://www.itg.ti.com/dsp/c3x/literature.html</a>	

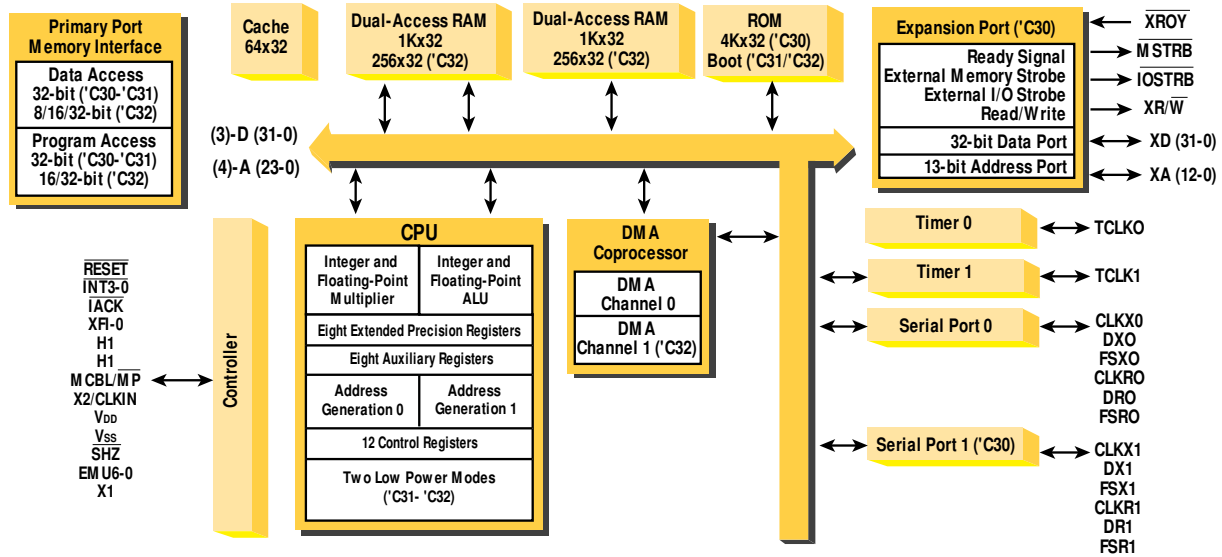
## Regional Training Center (RTC) 'C3x Training Class

Price \$1395

### For Registration Call:

Northeast	(617) 895-9185
Western States / Canada	(408) 383-2363
Mid-America / Southeast	(972) 917-3894

## TM S320C3x Block Diagram



TM S320C3x DSPs offer extensive internal busing, up to 60 MFLOPS performance and, in the case of the 'C32, a variable width external memory interface.

## TM S320C3x Development Tools

Tool	Part #	Description	Literature for Tool	Literature #	\$/U
Evaluation Module (EVM)	TM DS3260030	'C30 EVM Card for IBM PC-DOS, Win Appl. Library Asm/Lnk & HLL Debug	TM S320C3x Source Debugger User's Guide TM S320C3x Evaluation Module Tech. Ref. TM S320C30 EVM Application Notes	SPRU053B SPRU069 SPRA021	995
Simulator Software	TM DS3243851-02 TM DS3243551-09	'C3x PC/DOS & WIN Simulator w/ Debug 'C3x SUN SPARC Simulator w/ Debug	TM S320C3x Simulator Getting Started Getting Started Guide for the TM S320 Code Gen. Tools	SPRU123 SPRU119	500 3,000
Code Generation Software	TM DS3243850-02 TM DS3243855-02 TM DS3243555-08 CCM SP34XWIN TAR-CCM-PC TAR-CMS-PC TAR-CCM-SP TAR-CMS-SP	'C3x/'C4x PC-DOS, OS/2, Asm/Lnk 'C3x/'C4x PC-DOS, OS/2 C Cmp/Asm/Lnk 'C3x/'C4x SUN SPARC C Cmp/Asm/Lnk Code Composer - 'C3x/'C4x 'C3x/'C4x C/C++ Comp for PC 'C3x/'C4x C/C++ Comp for PC w/sim 'C3x/'C4x C/C++ Comp for SPARC 'C3x/'C4x C/C++ Comp SPARC w/sim	TM S320C3x Peripheral Control Library UG TM DS324 F/P DSP: Optimizing C Comp UG Floating-Point Assy. Lang. Tools User's Guide Go-DSP Brochure	SPRU086 SPRU034F SPRU035B SPRT126	500 1,500 3,500 2,000 2,995 3,995 6,495 8,495
XDS510/XDS510 WS HW	TM DS00510M TM DS00510WSM	XDS510 Board and MPSD cable XDS510WS Controller Box & MPSD cable			4,000 6,000
DSP Starter Kit (DSK)	TM DS3200031	'C31 DSP Starter Kit (DSK)	TM S320C3x DSK User's Guide	SPRU163A	99
Debugger Software	TM DS3240130 TM DS3240630 TAR-DBG-EVM-PC TAR-DBG-XDS-PC TAR-DBG-XDS-SP	'C3x XDS510 C Source Debugger PC 'C3x XDS510 C Source Debugger SPARC 'C3x Debug PC/DOS & MS Win 'C3x/'C4x Debug for PC/DOS, Win 'C3x/'C4x Debug for SPARC	'C3x C Source Debugger User's Guide	SPRU053B	2,000 4,000 795 795 1,795
Conversion Cable	TM DS3080004	'C3x 3V/5V PC/SPARC Emulation cable			1,000
Porting Kit	TM DX3240030	EMU Porting Kit PC/SPARC			6,000
Digital Filter Design	DFDP	ASPI Dig. Filter Design Package PC/DOS			1,195
Fuzzy Logic Tutorial	MCU320-EXPLORE	fuzzyTECH MCU-320 fuzzy logic tutorial			199
Fuzzy Logic Code Generator	MCU320-EDITION	fuzzyTECH MCU-320 fuzzy logic code generation tool			1,890
Math Library	320FLO-PC-C30 320FLO-SUN-C30	Floating-Point Library for PC/DOS Floating-Point Library for SPARC	FLO-TAR 64-bit Floating-Point Data Sheet C++ Compiler Data Sheet	SPRT108 SPRT109A	695 895

# TM S320 Digital Signal Processor Solutions

## TM S320C4x (32-bit Floating-Point)

### Key specifications:

- 60 MFLOPS performance
- Increased computational power
- Increased communications power
- Multi-processing capability
- Scalability
- Fault tolerance

### Key applications:

- High-speed communications
- Virtual Reality, simulators
- Radar/sonar/image processing
- 3-D Graphics
- Robotics/numeric control
- Speech recognition
- Telecom infrastructure

### Key features:

*Six communication ports for high-speed interprocessor communication:*

- 24 M bytes/s asynchronous transfer at each port for maximum data throughput
- Direct (glueless) processor-to-processor communication for ease of use

*Six-channel DMA coprocessor for concurrent I/O and CPU operation:*

- Concurrent data transfers and CPU operation for sustained CPU performance

*High performance DSP CPU capable of 330 M OPS and up to 384 M bytes/s:*

- 11 operations per cycle throughput
- 33- and 40-ns instruction cycle times

*Two identical external data and address buses supporting shared memory systems and high data rate, single cycle transfers:*

- High port data-transfer rate of 120 M bytes/s ('C40-60)

## TM S320C4x Product Specification Guide

Device	RAM	(Words)		DAT/PRO*	SER	PAR	DMA	COM	Timers	MHz	Cycle(ns)	MIPS	Packaging	\$1Ku
		ROM	OTP											
TM S320C40-50	2K	#	.	4G	.	4Gx32	6(12)%	6	2	50	40	25	325 PGA	178.00
TM S320C40-60	2K	#	.	4G	.	4Gx32	6(12)%	6	2	60	33	30	325 PGA	196.00
TM S320C44-50	2K	#	.	32M	.	32Mx32	6(12)%	4	2	50	40	25	304 PQFP 388 BGA	129.60
TM S320C44-60	2K	#	.	32M	.	32Mx32	6(12)%	4	2	60	33	30	304 PQFP 388 BGA	143.00

Notes from table: # = Boot Loader / %12 DMA channels in split mode.

## TM S320C4x Literature (Floating-Point)

(800) 477-8924

TM S320C4x User's Guide	SPRU063B
TM S320C4x General Purpose Applications	SPRU159
TM S320C4x Product Bulletin	SPRT118B
TM S320C4x Parallel Processing Applications	SPRA031
TM S320C4x Technical Brief	SPRU076
TM S320C4x Parallel Runtime Support Library	SPRU084A
TM S320C40 Data Sheet	SPRS026
TM S320C40 Power Dissipation Application Report	SPRA032
TM S320C40PPDS Technical Reference	SPRU075A
Choosing a High-Performance Floating-Point DSP	SPRN073
TM S320C44 Data Sheet Addendum	SPRU177
TM S320C44 Data Sheet ('C44-40, 50, 60)	SPRS031B

Check <http://www.litg.ti.com/dsp/c4x/literature.html> for complete reference to 'C4x literature.

## Designer Notebook Pages (designed specific to the 'C4x)

Notebook Pages	DNP #
• TM S320C40 Boot Loader Selection	12
• TM S320C40 DMA Memory Transfer Timing	16
• Designing With TM S320C40 Communication Ports: Part 1	17
• A Simple Way to Terminate Unused 'C40 Communication Ports	20
• Fast Logarithms on a Floating-Point Device	22
• A Novel Way of Using TM S320C40 Cache	26
• TM S320C40 Emulator Tips	32
• Floating-Point C Compiler: Tips and Tricks, Part 1	33
• Mastering the 'C4x DMA (Direct Memory Access)	38
• Bootloading a 'C4x Network - Part 1: Direct Connect	51

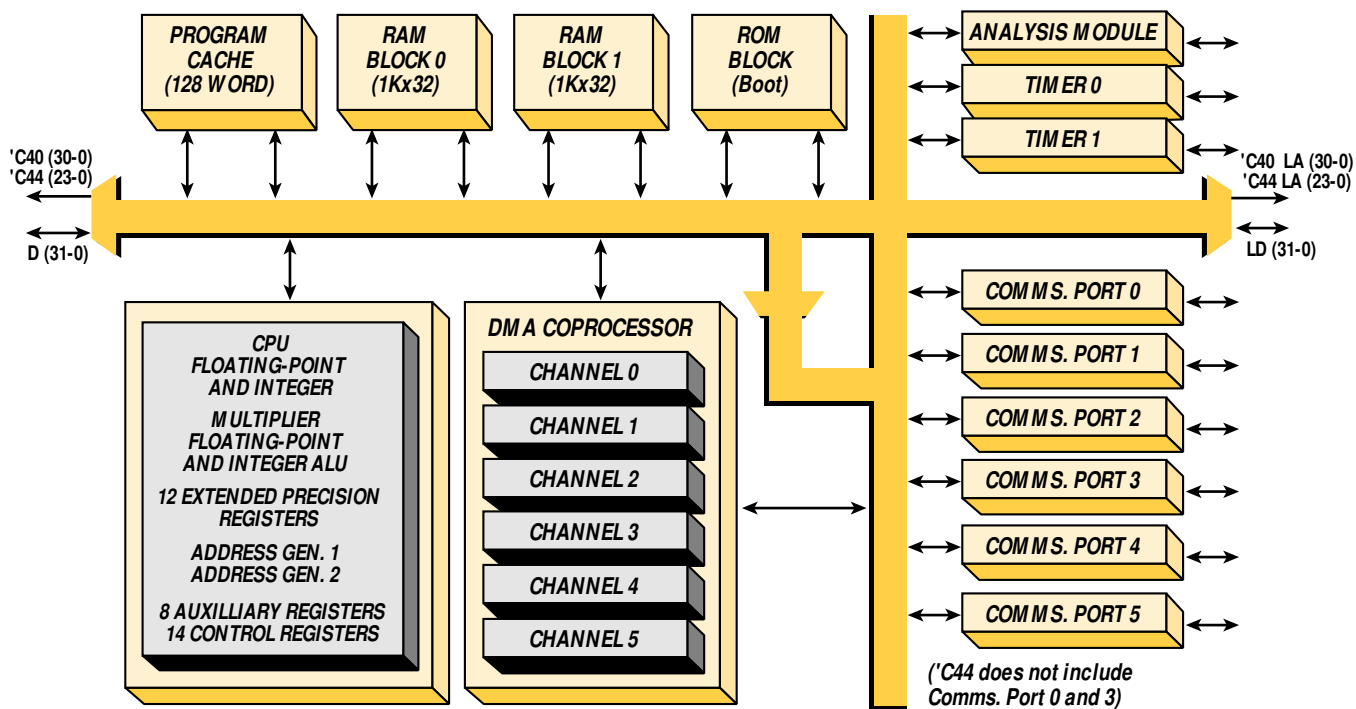
## Regional Training Center (RTC) 'C4x Training Class

Price \$1395

### For Registration Call:

Northeast	(617) 895-9185
Western States / Canada	(408) 383-2363
Mid-America / Southeast	(972) 917-3894

## TM S320C4x Block Diagram



## TM S320C4x Development Tools

Tool	Part #	Description	Literature for Tool	Literature #	\$/U
Simulator Software	TMDS3244851-02	'C4x PC/DOS & WIN Simulator w/ Debug			500
	TMDS3244551-09	'C4x SUN SPARC Simulator w/ Debug			3,000
Code Generation Software	TMDS3243850-02	'C3x/'C4x PC-DOS, OS/2, Asm/Lnk	Floating-Point Assy. Lang. Tool User's Guide	SPRU035B	500
	TMDS3243855-02	'C3x/'C4x PC-DOS, OS/2 C Cmp/Asm/Lnk	TMDS324 Floating-Point DSP: Optimizing C Comp User's Guide	SPRU034F	1,500
	TMDS3243555-08	'C3x/'C4x SUN SPARC C Cmp/Asm/Lnk	TM S320C4x Parallel Routine Support	SPRU084A	3,500
	CCM SP34XWIN	'C3x/'C4x Code Composer	Go-DSP Brochure	SPRT126	2,000
	TAR-CCM-PC	'C3x/'C4x C/C++ Comp for PC			2,995
	TAR-CMS-PC	'C3x/'C4x C/C++ Comp for PC w/sim			3,995
	TAR-CCM-SP	'C3x/'C4x C/C++ Comp for SPARC			6,495
TAR-CMS-SP	'C3x/'C4x C/C++ Comp SPARC w/sim			8,495	
XDS510/XDS510 WS HW	TMDS00510	XDS510 Board and JTAG cable ('C4x/'C5x/'C8x)			4,000
	TMDS00510WS	XDS510WS Controller Box & JTAG cable			6,000
Debugger Software	TMDS3240140	'C4x XDS510 C Source Debugger PC	'C4x C Source Debugger User's Guide	SPRU054	2,000
	TMDS3240640	'C4x XDS510 C Source Debugger SPARC	Parallel Debug MGR Addendum	SPRU094	4,000
	TAR-DBG-XDS-PC	'C3x/'C4x Debug for PC/DOS, Win			795
	TAR-DBG-XDS-SP	'C3x/'C4x Debug for SPARC			1,795
Conversion Cable	TMDS3080002	'C5x/'C4x 3V/5V PC/SPARC EMU cable			1,000
Porting Kit	TM DX3240040	EMU Porting Kit PC/SPARC			6,000
Digital Filter Design	DFDP	ASPI Dig. Filter Design Package PC/DOS			1,195
Math Library	320FLO-PC-C40	Floating-Point Library for PC/DOS	FLO-TAR 64-bit Floating-Point Data Sheet	SPRT108	695
	320FLO-SUN-C40	Floating-Point Library for SPARC	C++ Compiler Data Sheet	SPRT109A	895
Parallel Development	TM DX3261040	Parallel Processing Development Board			10,000

# TM S320 Digital Signal Processor Solutions

## TM S320C5x (Fixed-Point)

### Key specifications:

- 50 MIPS performance
- Prices start as low as \$0.30 U.S. per MIP
- 3V and 5V versions
- 100-pin TQFP/PQFP, 128-pin TQFP, 132-pin PQFP and 144-pin TQFP options
- Integrated RAM and ROM configurations
- JTAG scan-based emulation
- Fully compatible with TMS320C1x, 'C2x and 'C2xx

### Key applications:

- Cellular/cordless telephone
- High-speed modems
- Personal communications
- Sound systems, voice processing
- Laser printers, copiers
- Other telecommunications applications
- Multimedia
- Hard disk drives

### Key features:

- 'C5x DSPs can perform an instruction in as little as 20-ns
- 50 MIPS performance
- Active power consumption is as low as 1.15 mA/MIPS
- Choose from an array of integrated RAM and ROM configurations
- Performs on-chip emulation, eliminating the propagation delay associated with older emulation technology
- Source code compatibility with 'C1x, 'C2x and 'C2xx
- Provides a high-speed bit manipulation without modifying the ALU status bits or registers
- Provides a glueless, external interface allowing the use of slower off-chip memory and I/O devices reducing system costs
- The 12 most fundamental CPU registers are duplicated to provide zero-overhead context saves

## TM S320C5x Product Specification Guide

Device	RAM	(Words)		DAT/PRO	SER	PAR	DMA	COM	Timers	MHz	Cycle(ns)	MIPS	Packaging	\$1ku
		ROM	OTP											
TM S320C50-57&* 10K	10K	Boot	.	64K/64K	2	64Kx16	Ext	.	1	57	35	28.57	132 PQFP	26.30
TM S320C50-80* 10K	10K	Boot	.	64K/64K	2	64Kx16	Ext	.	1	80	25	40	132 PQFP	30.30
TM S320C51-57&* 2K	2K	8K	.	64K/64K	2	64Kx16	Ext	.	1	57	35	28.57	132 PQFP, 100 TQFP	20.00 20.00
TM S320C51-80* 2K	2K	8K	.	64K/64K	2	64Kx16	Ext	.	1	80	25	40	132 PQFP, 100 TQFP	23.20 23.20
TM S320C51-100* 2K	2K	8K	.	64K/64K	2	64Kx16	Ext	.	1	100	20	50	132 PQFP, 100 TQFP	27.40 27.40
TM S320C52-57&* 1K	1K	4K	.	64K/64K	1	64Kx16	Ext	.	1	57	35	28.57	100 PQFP, 100 TQFP	15.10 15.10
TM S320C52-80 1K	1K	4K	.	64K/64K	1	64Kx16	Ext	.	1	80	25	40	100 PQFP, 100 TQFP	17.30 17.30
TM X320C52-100* 1K	1K	4K	.	64K/64K	1	64Kx16	Ext	.	1	100	20	50	100 PQFP, 100TQFP	20.70 20.70
TM S320C53-57 4K	16K	.	.	64K/64K	2	64Kx16	Ext	.	1	57	35	28.57	132 PQFP	25.00
TM S320C53-80 4K	16K	.	.	64K/64K	2	64Kx16	Ext	.	1	80	25	40	132 PQFP	28.40
TM S320C53S57&* 4K	16K	.	.	64K/64K	2	64Kx16	Ext	.	1	57	35	28.57	100 TQFP	25.00
TM S320C53S80 4K	16K	.	.	64K/64K	2	64Kx16	Ext	.	1	80	25	40	100 TQFP	28.40
TM S320LBC56-57 7K	32K	.	.	64K/64K	2!	64Kx16	Ext	.	1	57	35	28.57	100 TQFP	45.30
TM S320LBC56-80 7K	32K	.	.	64K/64K	2!	64Kx16	Ext	.	1	80	25	40	100 TQFP	54.70
TM S320LBC57-57 7K	32K	.	.	64K/64K	2!	64Kx16	Ext	HPI	1	57	35	28.57	128 TQFP,	49.80
TM S320LBC57-80 7K	32K	.	.	64K/64K	2!	64Kx16	Ext	HPI	1	80	25	40	128 TQFP,	59.80
TM S320BC57S-57 7K	Boot	.	.	64K/64K	2!	64Kx16	Ext	HPI	1	57	35	28	144 TQFP	26.30
TM S320BC57S-80 7K	Boot	.	.	64K/64K	2!	64Kx16	Ext	HPI	1	80	25	40	144 TQFP	30.30

Notes from table: & = Extended temperature version available / \* 3.3V version available / ! Buffered Serial Port / Bootloader available

## TM S320C5x Literature

(800) 477-8924

TM S320C5x User's Guide	SPRU056B
TM S320C5x Fixed-Point DSP Product Bulletin	SPRT119A
TM S320C5x Power Dissipation Application Report	SPRA030
TM S320C5x DSP Seminar Workbook	SPRW017
TM S320C5x Data Sheet	SPRS030
Telecommunications Applications With 'C5x	SPRA033
TM S320WP010 Product Bulletin	SPRT124
TM S320WP010 Data Sheet	SPRS040
TC320IS54B Product Bulletin	SPRT114
TC320IS54B Chipset User's Guide (Preliminary)	SPRU128A
TM S320C5x On-Chip Oscillator With External Resonator	SPRA054

## Designer Notebook Pages (designed specific to the 'C5x)

Notebook Pages	DNP #
• Optimizing Control Algorithms on TM S320C5x	4
• TM S320C5x EVM Provides for Auto Processing	6
• Efficient Coding on the TM S320C5x	15
• Dual Access Into Single-Access RAM on a TM S320C5x Device	19
• TM S320C5x Interrupts	21
• TM S320C5x Interrupts Response Time	24
• TM S320C2x/C5x EVM AIC Initialization and Configuration	25
• TM S320C5x Interrupts and the Pipeline	35
• Bootload of C Code for the TM S320C5x	39
• Supporting External DMA Activity to Internal RAM for TM S320C5x Devices with the PZ Package	41
• Binary Search Algorithm on the TM S320C5x	42
• Random Number Generation on a TM S320C5x	43
• Fast TM S320C5x External Memory I/F	45
• TM S320C5x Memory Paging	46
• TM S320C5x Clock Modes	47
• TM S320C5x Wait States	48
• Clocking Options on the TM S320C5x	49
• TM S320C5x DSK Analog I/O	50
• Accessing TM S320C5x Memory Mapped Registers in CC5XREGS.H	54
• C Routines for Setting Up the AIC on the TM S320C5x EVM	55
• Initializing the TM S320C5x DSK Board	57
• Designing Macros for the TM S320C5x	59



## TM S320C5x Development Tools

Tool	Part #	Description	Literature for Tool	Literature #	\$/U
Evaluation Module (EVM)	TM DS3260050	'C50 EVM Card for IBM PC-DOS, Win	TM S320C5x Source Debugger User's Guide TM S320C5x Evaluation Module Tech. Reference	SPRU055B SPRU087	995
Simulator Software	TM DS3245851-02 TM DS3245551-09	'C5x PC/DOS & WIN Simulator w/ Debug 'C5x SUN SPARC Simulator w/ Debug			500 3,000
Code Generation Software	TM DS3242850-02 TM DS3242855-02 TM DS3242555-08 CCM SP5XWIN	'C1x/'C2x/'C5x PC-DOS, OS/2, Asm/Lnk 'C2x/'C5x PC-DOS, OS/2 C Cmp/Asm/Lnk 'C2x/'C5x SUN SPARC C Cmp/Asm/Lnk 'C2xx/'C5x Code Composer	'C1x/'C2x/'C5x Assembly Lang. Tools User's Guide 'C2x/'C2xx/'C5x Optimizing C Comp User's Guide TM S320C4x Parallel Routine Support Go-DSP Brochure	SPRU018D SPRU024D SPRU084A SPRT126	500 1,500 3,500 2,000
XDS510/XDS510 WS HW	TM DS00510 TM DS00510WS	XDS510 Board and JTAG cable (C4x/5x) XDS510WS Controller Box & JTAG cable			4,000 6,000
Debugger Software	TM DS3240150 TM DS3240650	'C4x XDS510 C Source Debugger PC 'C4x XDS510 C Source Debugger SPARC	'C5x C Source Debugger User's Guide Parallel Debug MGR Addendum	SPRU055B SPRU094	2,000 4,000
Conversion Cable	TM DS3080002	'C5x/'C4x 3V/5V PC/SPARC EMU cable			1,000
DSP Starter Kit (DSK)	TM DS3200051	'C50 DSP Starter Kit (DSK) 'C50, AIC, Basic Asm & Debug. Sample SW	TM S320C5x DSP Starter Kit User's Guide TM S320C5x DSK Product Bulletin	SPRU101 SPRV032	99
Digital Filter Design	DFDP	ASPI Dig. Filter Design Package PC/DOS			1,195
Fuzzy Logic Tutorial	MCU320-EXPLORE	fuzzyTECH MCU-320 fuzzy logic tutorial			199
Fuzzy Logic Code Generator	MCU320-EDITION	fuzzyTECH MCU-320 fuzzy logic code generation tool			1,890

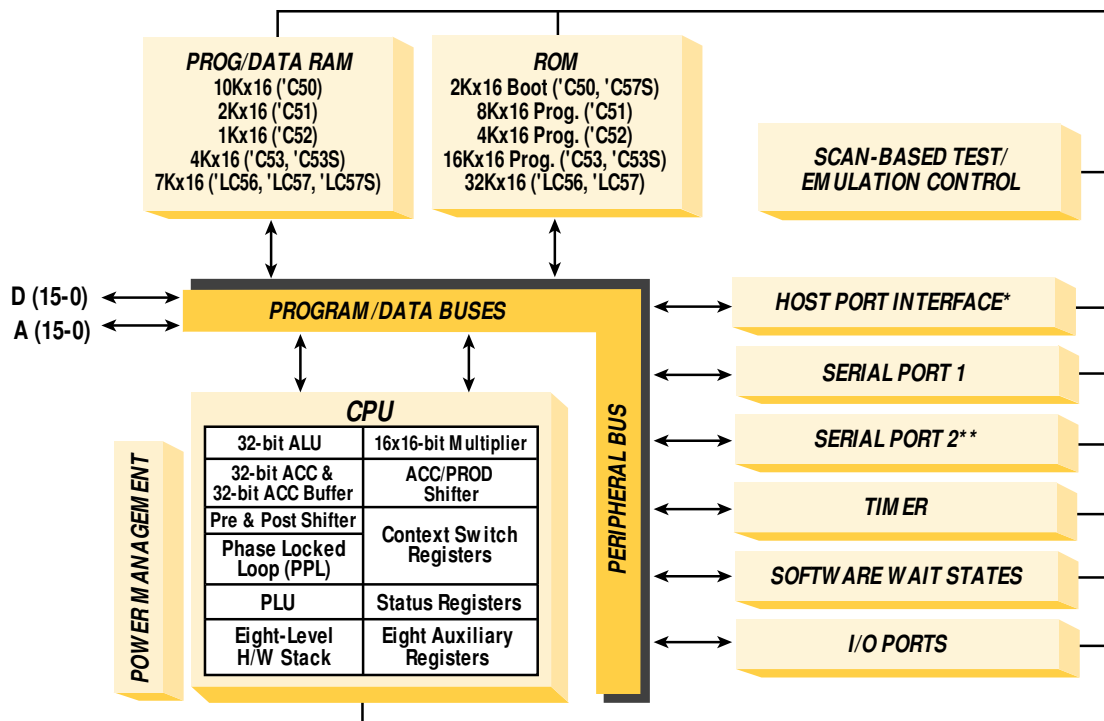
## Regional Training Center ( RTC ) 'C5x Training Class

Price \$1495

### For Registration Call:

Northeast ..... (617) 895-9185  
 Western States / Canada ..... (408) 383-2363  
 Mid-America / Southeast ..... (972) 917-3894

## TM S320C5x Block Diagram



\* Available on the 'LC57 and 'C57S \*\* One serial port on 'C52; buffered serial port on 'LC56, 'LC57 and 'C57S

# TM S320 Digital Signal Processor Solutions

## TM S320C54x (Fixed-Point)

### Key specifications:

- Performance up to 66 MIPS
- Integrated Viterbi operation
- Three power-down modes
- Integrated RAM and ROM configurations
- Auto-buffered serial port
- Host-port interface
- Ultra-thin packaging (100-, 128- and 144-pin TQFPs)

### Key applications:

- Digital Cellular Communications
- Personal Communications Systems (PCS)
- Pagers
- Personal Digital Assistants
- Digital Cordless Communications
- Wireless Data

### Key features:

- Integrated Viterbi accelerator
- Operates at 3.3 and 5V
- 40-bit adder and two 40-bit accumulators to support parallel instructions
- 40-bit ALU with a dual 16-bit configuration capability for dual one-cycle operations
- 17x17 multiplier allowing 16-bit signed or unsigned multiplication
- Four internal buses and dual address generators enable multiple operand operations and reduce memory bottleneck
- Single-cycle normalization and exponential encoding
- Eight auxiliary registers and a software stack enable the industry's most advanced fixed-point DSP C compiler
- Power-down modes for battery-powered applications

## TM S320C54x Product Specification Guide

Device *	RAM	(Words) ROM	OTP	DAT/PRO	SER	PAR	COM	Timers	MHz	Cycles(ns)	MIPS	Packaging	\$/1ku
TM S320C541#-40	5K	28K	.	64K/64K	2	64Kx16	.	1	80	25	40	100 TQFP	36.80
TM S320C542#-40	10K	2K	.	64K/64K	2!+	64Kx16	HPI	1	80	25	40	128, 144 TQFP	41.10
TM S320LC541#-40	5K	28K	.	64K/64K	2	64Kx16	.	1	80	25	40	100 TQFP	36.80
TM S320LC541#-50	5K	28K	.	64K/64K	2	64Kx16	.	1	100	20	50	100 TQFP	41.10
TM S320LC542#-40	10K	2K	.	64K/64K	2!+	64Kx16	HPI	1	80	25	40	128, 144 TQFP	41.10
TM S320LC542#-50	10K	2K	.	64K/64K	2!+	64Kx16	HPI	1	100	20	50	128, 144 TQFP	45.30
TM S320LC543#-40	10K	2K	.	64K/64K	2!+	64Kx16	.	1	80	25	40	100 TQFP	38.90
TM S320LC543#-50	10K	2K	.	64K/64K	2!+	64Kx16	.	1	100	20	50	100 TQFP	43.20
TM S320LC545#-40	6K	48K	.	64K/64K	2!	64Kx16	HPI	1	80	25	40	128 TQFP	43.20
TM S320LC545#-50	6K	48K	.	64K/64K	2!	64Kx16	HPI	1	100	20	50	128 TQFP	47.40
TM S320LC546#-40	6K	48K	.	64K/64K	2!	64Kx16	.	1	80	25	40	100 TQFP	41.10
TM S320LC546#-50	6K	48K	.	64K/64K	2!	64Kx16	.	1	100	20	50	100 TQFP	45.30
TM S320LC548#-50	32K	2K	.	4M/64K	3!+	64Kx16	HPI	1	100	20	50	144 TQFP	56.60
TM S320LC548#-66	32K	2K	.	4M/64K	3!+	64Kx16	HPI	1	133	15	66	144 TQFP	68.00

Notes from table: \* Devices available soon, check before ordering / Bootloader available on all devices / ! Buffered Serial Port ('C548 have 2), + 1TDM Serial Port / # = 1 for PLL option 1, = 2 PLL for option 2 (see User's Guide for details) LC = 3.3V

## TM S320C54x Literature

(800) 477-8924

TM S320C54x Product Bulletin	SPRT121C
TM S320C54x User's Guide	SPRU131B
TM S320C54x Serial Ports User's Guide Addendum	SPRU156
TM S320C54x C Source Debugger User's Guide	SPRU099A
TM S320C54x Assembly Language Tools User's Guide	SPRU102A
TM S320C54x Datasheet	SPRS039

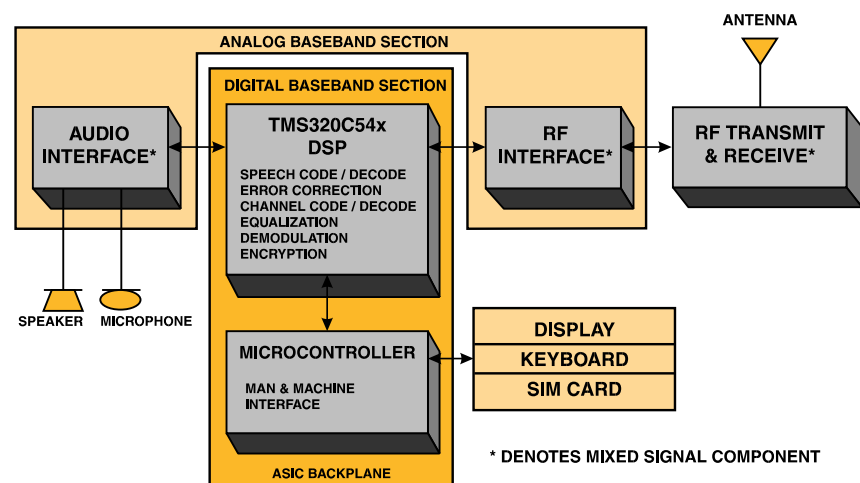
## Regional Training Center (RTC) C54x Training Class

Price \$1395

Class length is 3.5 days. For Registration Call:

Northeast	(617) 895-9185
Western States / Canada	(408) 383-2363
Mid-America / Southeast	(972) 917-3894

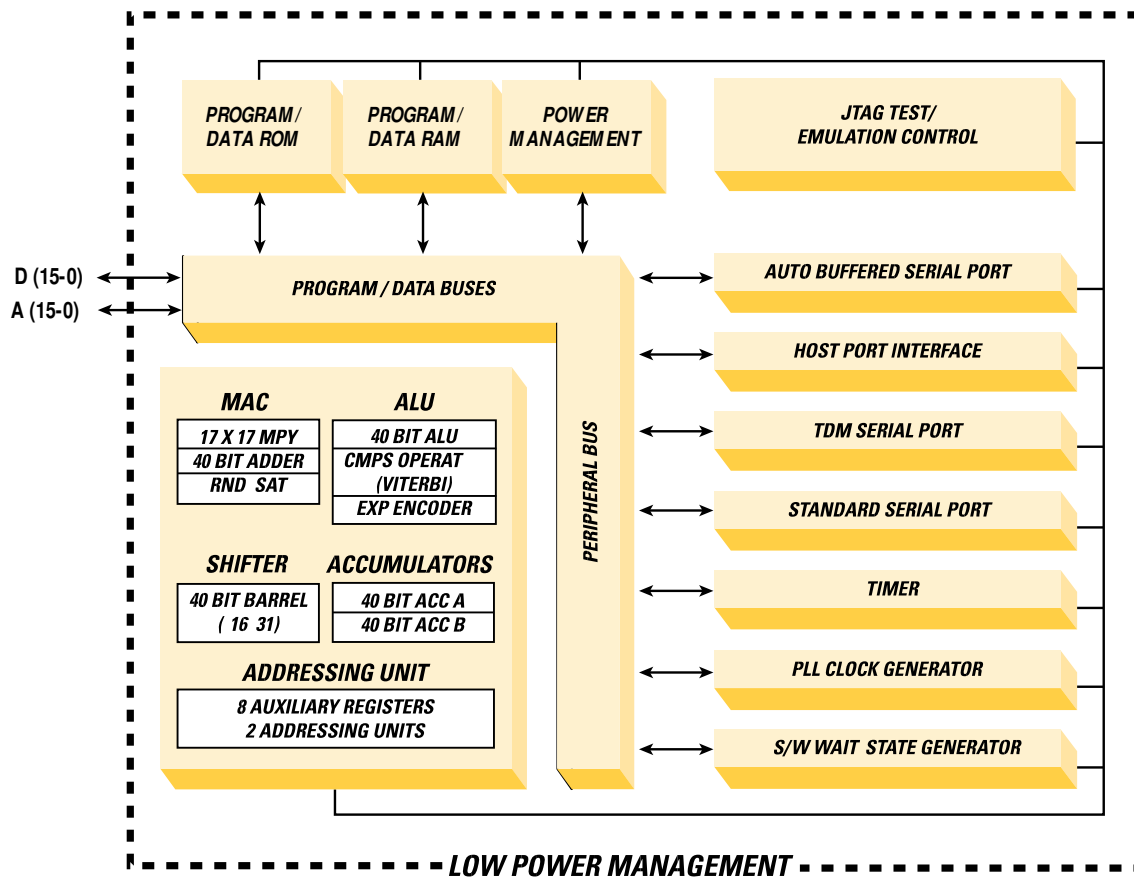
## Digital Cellular Phone Solution



## TM S320C54x Development Tools

Tool	Part #	Description	Literature for Tool	Literature #	\$/U
Evaluation Module (EVM)	TM DX3260051	'C54x EVM Card for IBM PC-DOS, Win	TM S320C54x EVM Tech. Reference	SPRU135	995
Simulator Software	TM DS324L851-02 TM DS324L551-09	'C54x PC/DOS & WIN Simulator 'C54x SUN SPARC Simulator			500 3,000
C Compiler/Asm/Linker	TM DS324L850-02 TM DS324L855-02 TM DS324L555-08 CCM SP54XWIN	'C54x Asm/Lnk for PC 'C54x C Cmp/Asm/Lnk for PC-DOS,OS/2 'C54x SUN SPARC C Cmp/Asm/Lnk 'C54x Code Composer	TM S320C54x Opt. C Compiler User's Guide TM S320C54x Assy. Lang. Tools User's Guide Go-DSP Brochure	SPRU103A SPRU102A SPRT126	500 1,500 3,500 2,000
XDS510/XDS510 WS HW	TM DS00510 TM DS00510WS	XDS510 Board and JTAG cable (C54x) XDS510WS Controller Box & JTAG cable			4,000 6,000
Debugger Software	TM DS32401L0 TM DS32406L0	'C54x XDS510 C Source Debugger PC 'C54x XDS510 C Source Debugger SPARC	TM S320C54x C Source Debugger User's Guide	SPRU099A	2,000 4,000
Conversion Cable	TM DS3080002	3V/5V JTAG cable (510 and 510WS)			1,000

## TM S320C54x Block Diagram



TM S320C54x DSPs are optimized to meet the performance, cost and low-power needs of wireless communications systems.

# TM S320 Digital Signal Processor Solutions

## TM S320C8x

### Key specifications:

#### 'C8x Architecture

- Fully programmable MIMD Architecture
- 32-bit data/64-bit instruction advanced DSP
- 32-bit RISC Master Processor
- Transfer Controller
- 400-M byte/sec 4-Gbyte address space
- 20/25-ns cycle time

#### TM S320C80

- Video Controller
- Four parallel processing DSPs
- 50 Kbytes of on-chip RAM
- 2 BOPS performance
- 305-pin PGA, 352 BGA (planned)

#### TM S320C82

- Two parallel processing DSPs
- 44 Kbytes of on-chip RAM
- 1.5 BOPS performance
- 352 BGA (planned)

### Key applications:

- Video Conferencing
- Video Phones
- High-Speed Telecommunications
- Image and Video Processing
- Multimedia Workstations
- 2-D and 3-D Graphics Accelerators
- Virtual Reality
- Security
- Radar and Sonar Systems

### Key features:

- Intelligent On-chip Transfer Controller and On-board Memory (SRAM)
- Multiple 32-bit Parallel Processing, Advanced DSP
- 32-bit ALU, can be divided into two 16-bit ALUs or four 8-bit ALUs for parallel processing on lower precision data
- Direct interface to DRAM, SRAM and VRAM
- 8-, 16-, 32-, 64-bit dynamic external bus interface

## TM S320C8x Product Specification Guide

Device	Shared RAM	32-bit DSPs	32-bit RISC	Video Controller	Transfer Controller	Cycle (ns)	Address Space (Byte)	MHz	Packaging	\$/1ku
TM S320C80	50K	4	1	2	1	20, 25	4G	40, 50	305 PGA, 352 BGA	353.60 442.00
TM S320C82	44K	2	1	0	1	20	4G	50	352 BGA	180* (1pc.)

Notes from table: Boot Loader and Industrial Temperature versions are available / \* 'C82 pricing for TMX, samples available 3Q96.

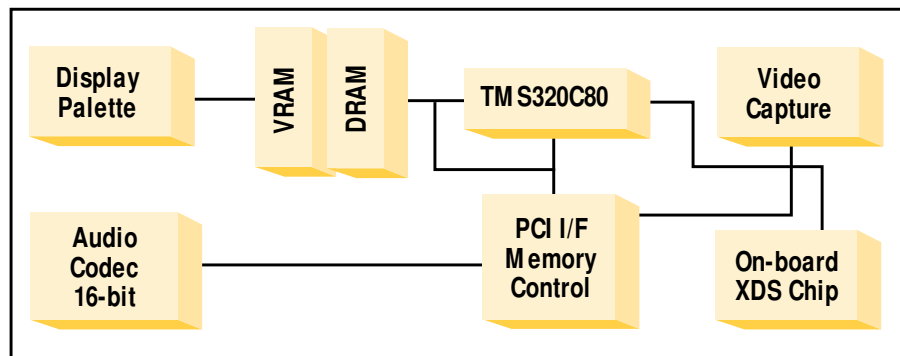
## TM S320C8x Literature

(800) 477-8924

System Level Synopsis	SPRU113B
TM S320C80 Product Bulletin/Brochure	SPRT112B
TM S320C80 Data Sheet	SPRS023
TM S320C80 DSP PC Based Tools Product Bulletin	SPRT123
TM S320C80 User's Guide (* CD ROM)	SPRC001B
Transfer Controller User's Guide	SPRU105A
C Source Debugger User's Guide	SPRU107A
Code Generation Tools	SPRU108A
Master Processor User's Guide	SPRU109A
Parallel Processor User's Guide	SPRU110A
Video Controller User's Guide	SPRU111A
Multitasking Executive User's Guide	SPRU112A
TM S320C82 to TM S320C80 Compatibility User's Guide	SPRU154
TM S320C80 H.320 Software Library White Pages	SPRY002

\* IMPORTANT: CD ROM is more readily available than paper documentation.

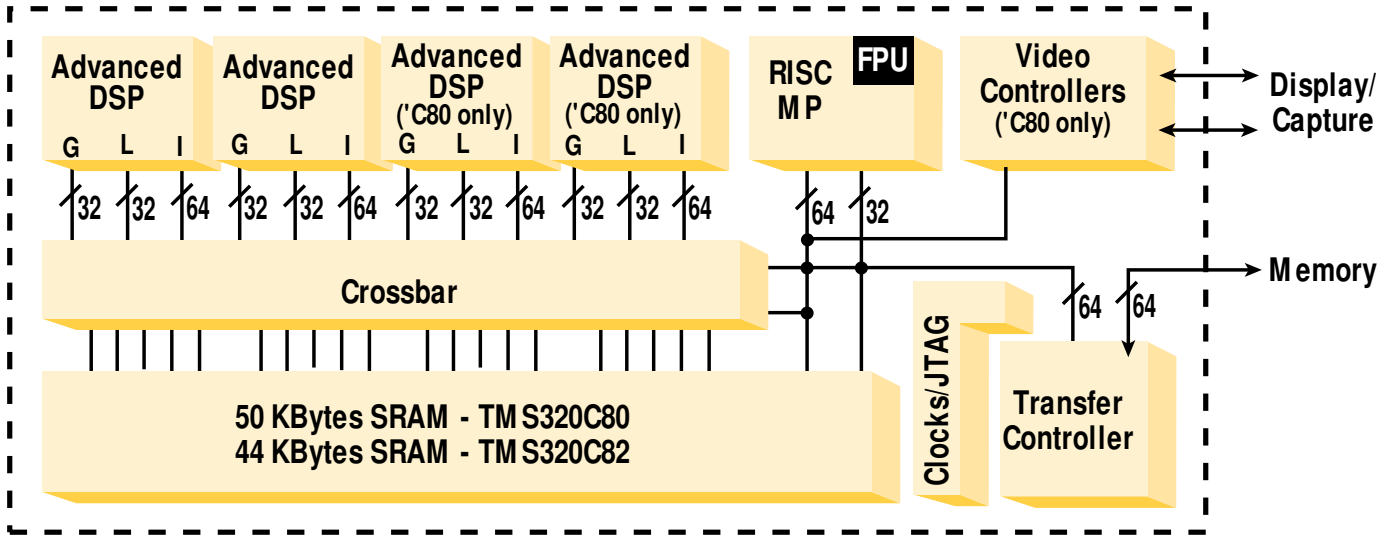
## TM S320C8x Software Development Board



The SDB's bus master interface facilitates high-speed data transfer.

Simplify your design process with TI's TM S320C8x DSP development tools.

## TM S320C8x Architecture



## Designer Notebook Pages (designed specific to the 'C8x)

### Notebook Pages

- Register Bit Fields and Memory in the HLL Debugger
- Multitasking Executive

### DNP #

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## Regional Training Center (RTC) 'C8x Training Class

A four day training course is now available. It is similar in style and format to the other TMS320 RTC courses. For more information call (800) 336-5236 ext. 3904 or call (972) 917-3894.

## TM S320C8x Development Tools

Tool	Part #	Description	Literature for Tool	Literature #	\$/U
Debugger Software	TMDX3240680	'C8x XDS510WS C Source Debugger (SPARC)	C Source Debugger User's Guide	SPRU107A	4,000
	TMDX3240180	'C8x XDS510 C Source Debugger (PC)			
Code Generation Software	TMDX3248555-67	'C8x Code Generation Tool (SPARC)	Code Generation Tools	SPRU108A	10,000
	TMDX3248855-07	'C8x Code Generation Tool (PC)			
SW Development Board	TMDX3260080	'C8x Software Development Board	TMS320C8x DSP PC Tools Product Bulletin	SPRT123	6,000
XDS510/XDS510 WS HW	TMDS00510	XDS Board and JTAG Cable (PC)			4,000
	TMDS00510WS	XDS510WS Controller Box and JTAG Cable (SPARC)			6,000

# TM S320 Digital Signal Processor Solutions

## TM S320AVxxx (DCP)

### TM S320AV110 key features:

- Single-chip ISO-MPEG audio decoder
- Decodes mono, dual, stereo and joint stereo modes
- Supports all MPEG sampling and data rates
- Accepts compressed and audio at up to 15-M bits/sec burst rate
- Small footprint 120-pin plastic quad flat package

### TM S320AV120 key features:

- Does not require a host microprocessor for initialization or operation
- Accepts SCR and audio PTS and provides automatic synchronization
- Provides status information at beginning of every frame
- Low-cost 44-pin PLCC package

### TM S320AV220 key features:

- Direct interface with 'AV120 MPEG audio decoder and 'AV420 NTSC encoder
- Integrated system decoder, micro-coded ROM and audio input buffer
- Automates audio and video synchronization – no external logic needed
- Supports NTSC and PAL video output timing formats and SIF and CCIR 601 resolution

### TM S320AV411 key features:

- Single-chip digital NTSC/PAL encoder
- Input: RGB, 4:2:2 YCbCr in 8- or 16-bit multiplexed format
- Output: RGB, Y/C (S-video) or composite video
- 16-color overlay with color lookup table

### TM S320AV420 key features:

- Single-chip digital NTSC encoder
- Vertical line interpolation for MPEG-1 video
- Input: RGB, YUV 4:4:4 or 4:2:2
- Output S-video (Y and C)
- On-chip synchronization signal generator circuitry

## Digital Compression Product Specification Guide

Device	Function	Input Format	Output Format	Controller Interface	Off-chip Memory	Packaging	\$/1ku
TMS320AV110	MPEG Audio Decoder	MPEG Audio Stream or MPEG System Stream	16- or 18-bit serial PCM	8-bit	Optional 1M DRAM	120-pin PQFP	13.75
TMS320AV120	MPEG Audio Decoder	MPEG Audio Stream	16- or 18-bit serial PCM	None	None	44-pin PLCC	10.00
TMS320AV220	Video CD MPEG Decoder	MPEG System Stream	704x240 @ 60Hz 704x288 @ 50 Hz	8-bit	4M DRAM	160-pin PQFP	29.00
TMS320AV411	Digital NTSC/PAL Encoder	RGB, 4:2:2 YCbCr in 8- or 16-bit multiplexed format	RGB, S-Video (Y and C) composite video	None	None	100-pin PQFP	Call
TMS320AV420	Digital NTSC Encoder	RGB, YUV 4:4:4 or YUV 4:2:2	S-Video (Y and C)	None	None	80-pin PQFP	7.50

## TM S320AVxxx Literature

(800) 477-8924

TMS320AV110 Application Notes	SCSA005
TMS320AV110 Product Bulletin	SCSB001
Large DCP Presentation Folder	SCSB004
TMS320AV110 Data Sheet	SCSS013C
TMS320AV120 Data Sheet	SCSS014A
TMS320AV420 Data Sheet	SCSS015A
TMS320AV220 Data Sheet	SCSS016A
Video CD Chipset Product Bulletin	SCST002A
TMS320AV120 Product Bulletin	SCST003
TMS320AV410/411 Data Sheet	SCSS020

## Video CD Chipset – Support to Simplify Your Designs

### An Optimized Chipset that's also versatile



■ Provides a cost-effective, dedicated implementation of the MPEG Audio algorithm (Layers 1 and 2).

■ Architecture mathematically modeled to minimize silicon and maximize audio quality. CD quality is maintained with no additional quantization noise added.

■ Can also be used as a stand-alone MPEG Audio Decoder, eliminating the need for a host processor.

■ Derived from TI's highly successful TMS320AV110 MPEG Audio Decoder and optimized to reduce cost for Video CD applications.



■ Based on C-Cube's CL450 Video Decoder with integrated features specifically for Video CD.

■ Integrates MPEG-1 system decoder, audio buffer and on-chip microcode.

■ Synchronizes audio and video outputs without an external host.

■ Integrates Video CD control functions (fast forward, reverse and freeze frame).

■ Provides a seamless interface to Sony and Sanyo CD-ROM decoders.



■ Converts RGB (red-green-blue) or YUV (luminance chrominance) bit-streams output from the 'AV220 to an analog NTSC signal for TV.

■ Vertically interpolates scan lines to create a smooth picture by reducing the noise and flicker that is associated with line-doubled implementations of MPEG-1 Video.

■ Generates synchronization timing signals for the 'AV220 Video Decoder.

■ Supports overlays, providing the ability to superimpose both text and graphics on the video display.

## Complete listing of Designer Notebook Pages

Notebook Pages	DNP #
• Designer Notebook Volume 1	1-60/SPRT125
• TMS320C3x Block Repeat	1
• Avoiding False Interrupts on the 'C3x	2
• Bit-reversed Addressing Without Data Alignment	3
• Optimizing Control Algorithms on 'C5x	4
• TMS320C30 Addressing up to 68 Gigawords	5
• TMS320C5x EVM Provides for Auto Processing	6
• Circular Buffer in Second Generation DSPs	7
• Bit-reversed Addressing in C on the 'C3x	8
• Sharing Header Files in C and Assembly	9
• Initializing the Fixed-Point EVM's AIC	10
• TMS320C25 Logical Shifts in Parallel With ALU Operations	11
• TMS320C40 Boot Loader Selection	12
• Reducing System Power Requirements	13
• Interfacing the TMS320C31 to A/D and D/A Devices	14
• Efficient Coding on the TMS320C5x	15
• TMS320C40 DMA Memory Transfer Timing	16
• Designing With TMS320C40 Communication Ports: Part 1	17
• Creating a Delay Buffer on a TMS320C2x EVM	18
• Dual Access Into Single-Access RAM on a 'C5x Device	19
• A Simple Way to Terminate Unused 'C40 Communication Ports	20
• TMS320C5x Interrupts	21
• Fast Logarithms on a Floating-Point Device	22
• Switching From Bootloader to MP Mode With TMS320C31	23
• TMS320C5x Interrupts Response Time	24
• TMS320C2x/C5x EVM AIC Initialization and Configuration	25
• A Novel Way of Using TMS320C40 Cache	26
• Hardware UART for TMS320C3x	27
• Using VRAMS and DSPs for System Performance	28
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• Addressing Peripherals as Data Structures in C	30
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• TMS320C5x DSK Analog I/O	50
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• Extending Fixed-Point Math Dynamic Range with Minimum Cycles	53
• Accessing 'C5x Memory Mapped Registers in CC5XREGS.H	54
• C Routines for Setting Up the AIC on the 'C5x EVM	55
• How Can Comb Filters Be Used to Synthesize Musical Instruments on a TMS320 DSP	56
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• Developing a Full-Duplex uART on 'C3x	58
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• Accessing Status and Control Fields and I/O Ports in the TMS320Cxx HLL Debugger	60
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• Sharing Memory Interface with a TMS320C5x DSP	63
• Accessing TMS320C54x Memory-Mapped Registers in C	64
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• Interfacing TMS320C2x, 'C2xx or 'C5x DSP to an 8-bit A/D Converter	66
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