

Microcontroller

The instruction set processor implemented as an integrated circuit that functions to control the embedded system.

Parts or Features of Microcontrollers

Instruction set (programmable)

RAM (registers)

ROM, PROM, EPROM (Instruction storage)

ROM: Read-only memory

PROM: Programmable ROM (Program set at factory)

OTP: One-time programmable

EPROM: Erasable programmable ROM

I/O Ports (Serial, Parallel, I²C ...)

Clock generator

Reset function

Watchdog timer (resets the controller after a problem occurs)

Timers

A/D converters

D/A converters

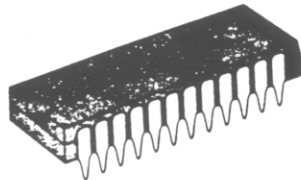
Examples:

8031	40 pins, 128 bytes RAM, I/O	\$3.25
80C31	CMOS (low power), 40 pins, 128 bytes RAM, I/O	\$5.49
DS80C320	High speed (25 MHz) version of 80C31	\$12.95
8049	8-bit microcontroller (one of the oldest!)	\$0.95
8052AHBASIC	Microcontroller with internal Basic	\$24.95
MC68HC11A1P	Microcontroller with internal A/D	\$10.95
Z80H	40 pins, 8 MHz speed	\$2.95

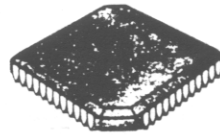
Other microcontroller terminology:

Package Type

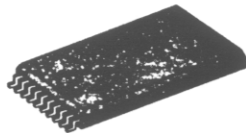
Various Types of Chip Packages



Dual Inline Package (DIP)



Plastic Leaded Chip Carrier (PLCC)



Thin Small Outline Package (TSOP)



Plastic Quad Flat Pack (PQFP)

Data path size

8 bit (Example 8051)

16 bit (Intel MCS-96)

32 bit (Intel i960)

Instruction Sets

RISC: Reduced instruction set computer

CISC: Complex instruction set computer

80C31	111 Instructions	12 MHz	1 MIPS
68HC11	62 Instructions	8 MHz	2 MIPS
TMP87C800N/F	129 Instructions	8 MHz	2 MIPS
PIC16C57	33 Instructions	20 MHz	5 MIPS
Z86C06	47 Instructions	12 MHz	6 MIPS

Microcontroller	RAM	ROM/ EPROM	Clock	MIPS	Instructions	EPROM	I/O Pins	Timer	Serial Ports	Watchdog Timer	PWM	A/D	Interrupt	Price
37700	2K	32K	25Mhz	6	103	No	68	8	Yes	Yes	Y	Y	3	9.50
68HC05	1.2K	16K	8Mhz	1	62	No	32*	2	Yes	Yes	Y	Y	Yes	2.75
68HC11	1.2K	32K	16Mhz	2	62	512	38	2	Yes	Yes	N*	Y	3	7.94
68HC16	2K	48K	4Mhz	8		Yes	99	4	Yes	Yes	Y	Y	7	14.34
78356	2K	32K	32Mhz	5		No	54	5	Yes		N	Y	Yes	14.00
8051	128	4K	12Mhz	1	46	No	32	2	Yes	No	N	N	2	3.50
80C166	2K	32K	40Mhz	10	76	Yes	81	5	Yes	Yes	4	Y	38	26.00
AT89C2051	128	2K	24Mhz	2		Yes	15	2	Yes	No	N	Y	2	2.00
COP820CJ	64	1K	10Mhz	1	55	No	23	3	Yes	Yes	2	N	3	2.50
COP888EG	256	8K	10Mhz	1	55	No	39	3	Yes	Yes	3	N	2	5.80
DS80C320	1.2K	4K	33Mhz	10	46	No	32	2	Yes	Yes	N	N	6	
H8	2K	62K	25Mhz	5	63	Yes	58	8	Yes	Yes	2	Y	9	11.25
MCS 96	1K	32K	20Mhz	5		No	56	2	Yes	Yes	Y	Y	Yes	13.85
PIC16C54	32	512	20MHz	5	33	No	12	1	No	Yes	N	N	No	2.34
PIC16C55	32	1K	20MHz	5	33	No	20	1	No	Yes	N	N	No	3.20
PIC16C57	80	2K	20MHz	5	33	No	20	1	No	Yes	N	N	No	3.75
PIC16C64	128	2K	20MHz	5	35	No	33	3	Yes	Yes	1	N	8	5.00
PIC16C74	192	4K	20Mhz	5	35	No	33	3	Yes	Yes	2	8	12	6.25
PIC16C84	36	No	10Mhz	2.5	35	1K	13	1	No	Yes	No	No	4	4.65
PIC12C508	25	512	4Mhz	1	33	No	5	1	No	Yes	No	No	No	1.88
PIC12C509	41	1K	4Mhz	1	33	No	5	1	No	Yes	No	No	No	2.05
ST6211	64	2K	8Mhz	0.3	28	No	12	1	No	Yes	No	No	Yes	1.50
ST6293	128	4K	8Mhz	0.3	28	128	20	3	Yes	Yes	No	Yes	Yes	2.70
ST9026	256	16K	24Mhz	2	87	No	40	1	Yes	Yes		No	Yes	6.90
TLCS90	1K	32K	16Mhz	4	163	Yes	54	5	Yes	Yes	Yes	Yes	4	9.55
TMPN3120	1K	10K	10Mhz	2	74	512	11	2	Yes	3	1	No	No	10.00
TMS370	1K	32K	20Mhz	5	73	512	55	2	Yes	Yes	Yes	Yes	3	8.85
Z8	256	20K	20Mhz	10	46	No	56	2	Yes	Yes	No	No	4	6.70
Z86E33	237	4KB	12Mhz	6		No	24	2	No	Yes	No	No	Yes	
SX18AC	136	2K	50Mhz	50	43	Yes	12	Vir	Virtual	Yes	Vir	Vir	Yes	3.00
SX28AC	136	2K	50Mhz	50	43	Yes	20	Vir	Virtual	Yes	Vir	Vir	Yes	3.50

Table 13-1. A sample of the microcontrollers available on the market today.

Microcontroller Application Development

Programmer: Burns the microcontroller code/program into the EPROM memory.

The code/program is generated using either assembly language or C language generally. Basic is also sometimes used.

Compiler: Converts the C code or assembly code to machine language code for the microcontroller.

Simulator: Software program that runs the microcontroller code. Permits the interrogation of registers, etc.

Emulator: Functions as a software replacement of the microcontroller in an embedded system. Allows full testing of the microcontroller code.

Note for the PIC 16C77 we have a compiler and programmer in the EB 2221 lab.

Detailed Examination of the PIC 16C77 Microcontroller

The full specification sheet for the 16C77 is available at the web site of Microchip Technology Inc. (www.microchip.com)

The full specification sheet is 288 pages long. One copy is available in the EB 2221 lab for those interested.

The PIC 16C77 is a 8-bit CMOS microcontroller with A/D converter.

- 8k x 14 EPROM size for program memory

- 368 bytes x 8 data memory (RAM)

- Three (8 bit) ports (B, C, and D)

- One (6 bit) port (A)

- One (3 bit) port (E)

- DC to 20 MHz

- 8 bit, 8 channel A/D converter

- 35 instructions in the instruction set

- 12 interrupts

- Serial Communication

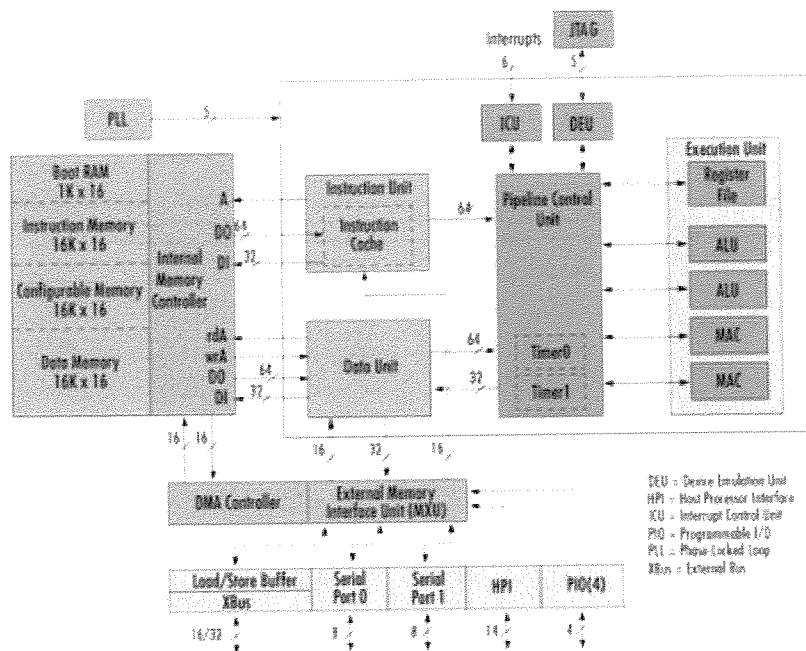
 - USART- Universal Synchronous Asynchronous Receiver/Transmitter

 - Synchronous Serial Port

 - SPI- Serial Peripheral Interface

 - I²C- Inter-Integrated Circuit

- Three timers



Enlarge

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Support

- Support

Global support page with links to product-related tech support resources and contacts.

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Product Literature

- LSI403WLP Digital Signal Processor Product Brief [PDF, 221KB, May 2005]

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Related Technologies

- Enhanced Versatile Disc (EVD)

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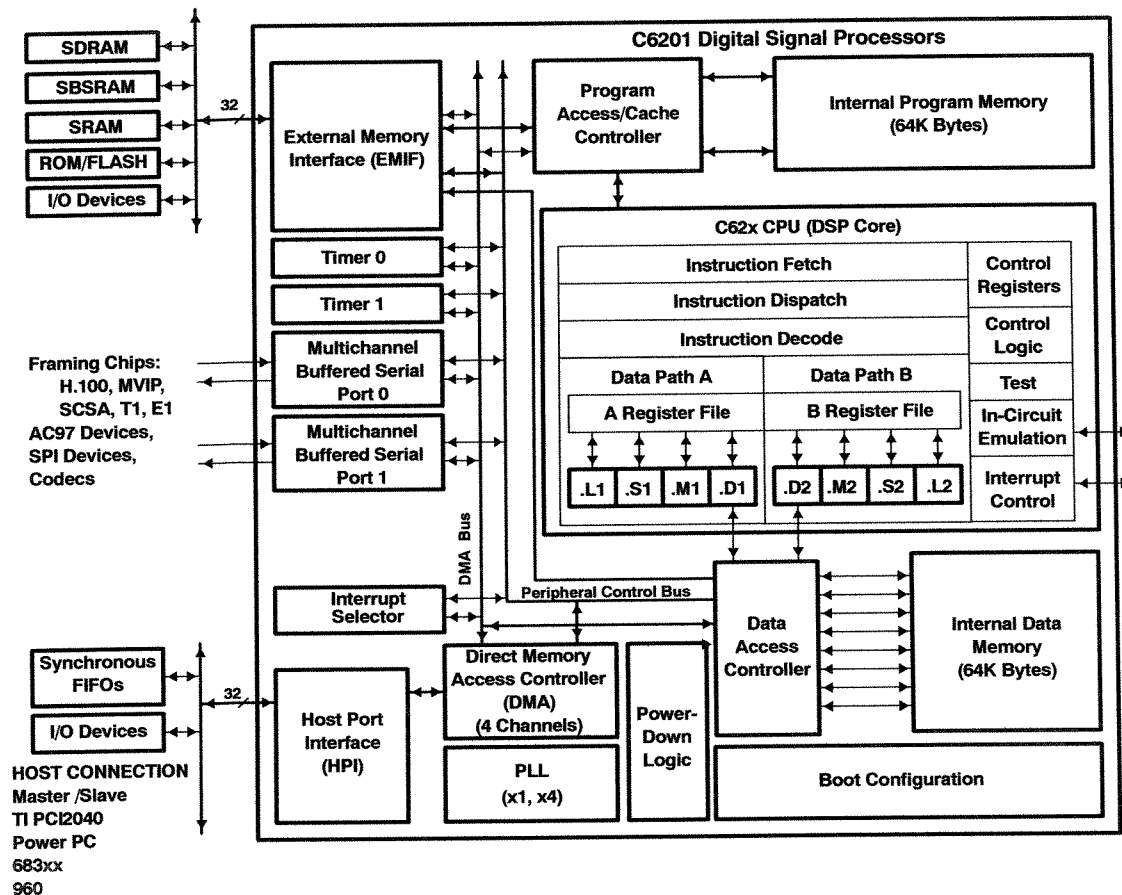
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TMS320C6201 FIXED-POINT DIGITAL SIGNAL PROCESSOR

SPRS051H - JANUARY 1997 - REVISED MARCH 2004

functional and CPU (DSP core) block diagram



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