



# 2003 Microprocessor directory

8-BIT MICROPROCESSORS (by company)

Company name	Device name or family	Instruction set architecture	CPU frequency (MHz)	Bus interface (address/data) (bits)	Instruction width (bits)	Core / I/O operating voltages (V)	Typical power at maximum frequency	Powerdown modes and minimum power	DSP/multiplication hardware support (bits)	FPU	Caching
Analog Devices www.analog.com	ADuC812	8051	16	external: 16/8 code, 24/8 data	8	3/5	48 mW (3V)	15 mW			
	ADuC814	8051	131 kHz to 16.78	external: 16/8 code, 24/8 data	8	3/5	36 mW (3V)	33 to 45 mW			
	ADuC816 ADuC824	8051	98.3 kHz to 12.58	external: 16/8 code, 24/8 data	8	3/5	25 mW (3V)	18 to 60 mW			
	ADuC831 ADuC832	8051	131 kHz to 16.78	external: 24/8 data	8	3/5	25 to 50 mW (3V)	33 to 39 mW			
	ADuC836 ADuC834	8051	98.3 kHz to 12.58	external: 16/8 code, 24/8 data	8	3/5	25 mW (3V)	18 to 60 mW			
	ADuC841 ADuC842 ADuC843	8051	Up to 16.78	external: 24/8 data	8	3/5	25 to 50 mW (3V)	33 to 39 mW			
	ADuC844 ADuC846	8051	98 kHz to 12.58	external: 24/8 data	8	3/5	2.3 mA (3.6V)	33 to 39 mW			
	ADuC845 ADuC847	8051	98 kHz to 12.58	external: 24/8 data	8	3/5	2.3 mA (3.6V)	33 to 39 mW			
Atmel www.atmel.com	CAN Multiplexing	8051	40			2.7 to 5.5					
	MP3 Decoder	8051	20			2.7 to 3.6					
	Smart Card	8051	16, 32			3.6 to 5.5					
	AVR	AVR	1 to 24	16/8	16	1.8 to 5.5	1 to 3 mA	Less than 1 mA	8x8 (un)signed, 16x16 signed	Two-cycle 8x8 fixed-point	
	DVD AVR	AVR	1 to 40	16/8	16	3.0 to 3.6	1 to 3 mA	Less than 1 mA	8x8 (un)signed, 16x16 signed	Two-cycle 8x8 fixed-point	

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Memory	Memory controller	MMU	Package selection	Timers	Serial, Parallel I/O	Interrupts	ADC/DAC	Temperature ranges (degrees Celsius)	Additional features	Price (10,000)
8-kbyte Flash/EE, 640-byte Flash/EE, 256-byte SRAM	DMA to external data memory		52 PQFP, 56 CSP	Three 16-bit	UART, I <sup>2</sup> C, SPI, four 8-bit digital I/O ports	Nine	Eight-channel, 12-bit, 200k-sample/sec ADC; two 12-bit voltage-output DAC	-40 to +125	On-chip voltage reference and temperature sensor	\$6.85
8-kbyte Flash/EE, 640-byte Flash/EE, 256-byte SRAM			28 TSSOP	Three 16-bit, wake up, real-time	UART, I <sup>2</sup> C, SPI, 11 PIO	11	Six-channel, 12-bit, 5-usec ADC; two 12-bit DAC	-40 to +125	On-chip voltage reference and temperature sensor	\$3.73
8-kbyte Flash/EE, 640-byte Flash/EE, 256-byte SRAM			52 PQFP, 56 CSP	Three 16-bit, wake up, real-time	UART, I <sup>2</sup> C, SPI, 26 PIO	11	Dual 24/16-bit ADC with program-mable gain; 12-bit DAC	-40 to +85	On-chip excitation and transducer burn-out current sources	\$7.51 to \$8.86
62-kbyte Flash/EE, 4-kbyte Flash/EE, 2-kbyte + 256-byte SRAM			52 PQFP, 56 CSP	Three 16-bit, wake up, real-time, dual 16-bit PWM	UART, I2C, SPI, four 8-bit digital I/O ports	12	Eight-channel, 12-bit, 200k-sample/sec ADC; two 12-bit voltage-output DAC	-40 to +125	Dual data pointer, 11-bit stack pointer, on-chip PLL, upgrade for ADuC812	\$7.62
62-kbyte Flash/EE, 4-kbyte Flash/EE, 2-kbyte + 256-byte SRAM			52 PQFP, 56 CSP	Three 16-bit, wake up, real-time, dual 16-bit PWM	UART, I2C, SPI, 26 PIO	11	Dual 24/16-bit ADC with programmable gain; 12-bit DAC	-40 to +125	Dual data pointer, 11-bit stack pointer, upgrade for ADuC824/816	\$8.70 to \$10.16
62-kbyte Flash/EE, 4-kbyte Flash/EE, 2-kbyte + 256-byte SRAM			8x8-mm CSP, 52 PQFP	Three 16-bit, wake up, real-time, dual 16-bit PWM	UART, I2C, SPI, four 8-bit digital I/O ports	12	Eight-channel, 12-bit, 400k-sample/sec ADC; two 12-bit, voltage-output DAC; 20-ppm reference	-40 to +125	Single-cycle 8052 core, PLL, fast core version of ADuC831/832	\$4.45 to \$7.95
62-kbyte Flash/EE, 4-kbyte Flash/EE, 2-kbyte + 256-byte SRAM			8x8-mm CSP, 52 MQFP	Three 16-bit, wake up, real-time	UART, SPI, I2C	11	Dual 24/16-bit sigma-delta ADC with programmable gain; 12-bit DAC	-40 to +125	Single-cycle 8052 core, on-chip PLL	\$8.20 to \$12.27
62-kbyte Flash/EE, 4-kbyte Flash/EE, 2-kbyte + 256-byte SRAM			8x8-mm CSP, 52 MQFP	Three 16-bit, wake up, real-time, single and dual PWM	UART, SPI, I2C	11	10-channel, 24-bit, sigma-delta ADC with PGA; 12-bit DAC	-40 to +125	Single-cycle 8052 core, on-chip PLL	\$7.77 to \$13.76
16- to 64-kbyte			44 CABGA, 24/28 SOIC, 28/44 PLCC, 32/44 VQFP	Three, PCA, watchdog	Four-channel CAN, UART	20 or 34	10-bit	0 to +70 -40 to +85	In-system programming	
64			80 TQFP, 81 BGA	Two	UART, TWI, USB, SPI, I <sup>2</sup> S	44	10-bit	0 to +70 -40 to +85	MP3 Decoder, MMC, IDE, In-system programming	
16/32			24 SSOP, 20 TSSOP, 28/52 PLCC, 32/64 VQFP		UART, USB, SPI, PCMCIA			0 to +70 -40 to +85	ISO7816, DC/DC converter, EMV pre-certified software	
1- to 128-kbyte Flash, 64- to 4-kbyte EEPROM, 128-byte to 4-kbyte SRAM			20 SSOP, 8/20 SOIC, 32/44/64 TQFP, 8/20/28/40 DIP	Two 8-bit, two 16-bit	SPI, UART, I <sup>2</sup> C, 8-bit parallel (64-kbyte addressing)	27, eight external	Eight channel, 10 bit		JTAG debug	50 cents to \$4
12-kbyte SRAM			128/208 LQFP		UART	27, eight external	10-bit	-40 to +85	DVD/CD ATAPI interface and servo controller	From \$1

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	FPSLIC FPSLIC Secure		1 to 25	16/8	16	3.0 to 3.6	2 to 3 mW/MHz	Less than 100 mA	8x8 (un)signed, 16x16 signed	Two-cycle 8x8 fixed-point	
	In-System Programming Flash	CISC	40			2.7 to 5.5					
	LCD AVR	AVR	1 to 24	16/8	16	1.8 to 5.5	1 to 3 mA	Less than 1 mA	8x8 (un)signed, 16x16 signed	Two-cycle 8x8 fixed-point	
	MARC4		32 kHz to 4		8	1.8 to 6.5	220 µA (3V)	Sleep: 600 nA deep sleep: 300 nA			
	Mask ROM	CISC	66			2.7 to 5.5					
	MCS 51 AT 89 family	8051	12 to 40	8	16	2.7 to 6	80 mW	Idle: 2 mA, powerdown: 12 mA	8x8		
	MEGA AVR	AVR	1 to 24	16/8	16	1.8 to 5.5	1 to 3 mA	Less than 1 mA	8x8 (un)signed, 16x16 signed	Two-cycle 8x8 fixed-point	
	One Time Programmable	CISC	66			2.7 to 5.5					
	Programmable Flash	CISC	2			2.7 to 6.0					
	RF AVR	AVR	1 to 19	16/8	16	2.0 to 5.0	1 to 3 mA	Less than 1 mA	8x8 (un)signed, 16x16 signed	Two-cycle 8x8 fixed-point	
	ROMless	CISC	60			2.7 to 5.5					

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Memory	Memory controller	MMU	Package selection	Timers	Serial, Parallel I/O	Interrupts	ADC/DAC	Temperature ranges (degrees Celsius)	Additional features	Price (10,000)
20- to 32-kbyte program, 4- to 16-kbyte data memory, reconfigurable, EEPROM (Secure)			84 PLCC, 100 TQFP, 144/208 PQFP, 256 caBGA (Secure)	Two 8-bit, 16-bit	UART, I <sup>2</sup> C, 8-bit PIO	31, four external			5000- to 40,000-gate FPGA, JTAG debug	\$5 to \$85
1- to 64-kbyte			20 SOIC, 44 TQFP, 48 MLF, 64/80 VQFP, 44/52 PLCC, 20/28 SOIC, 24/16 SSOP, 20/24/40 PDIP	Three, watchdog	UART, USB 2.0, SPI	32 or 48	10-bit	0 to +70 -40 to +85	Baud-rate generator, keyboard interface	
16- to 32-kbyte Flash, 512-byte to 1-kbyte EEPROM, 1- to 2-kbyte SRAM			64 TQFP, 64 MLF, Die	Two 8-bit, 16-bit	SPI, UART, TWI, 8-bit parallel (64-kbyte addressing)	27, eight external	Eight channel, 10 bit	-40 to 85	Self-programming memory, LCD, JTAG debug	\$2.5 to \$4
2- to 4-kbyte ROM 256-nibbles RAM 512-bit EE			20/44 SSO	One or Two		Three or four, four to 10 external		-40 to +85 -40 to +105 -40 to +125	Switchable clock sources, brown out	\$1.25 to \$2.50 (60-kbyte ROM)
4- to 64-kbyte			20 SOIC, 44 TQFP, 64/80 VQFP, 44/52 PLCC, 20/28 SOIC, 24/16 SSOP, 20/24/40 PDIP	Three, PCA, watchdog	UART, SPI, USB, I <sup>2</sup> S	32 or 48	10-bit	0 to +70 -40 to +85	IDE, MMC, baud-rate generator, keyboard interface	
1- to 64-kbyte Flash, 2-kbyte EEPROM, 128 to 2048-bytes SRAM			20 SOIC, 44 TQFP, 64/80 VQFP, 44/52 PLCC, 20/28 SOIC, 24/16 SSOP, 20/24/40 PDIP	One to three 16-bit	SPI, full-duplex UART, CAN, USB	Nine, four levels	Eight channel, 10 bit	0 to +70 -40 to +85 -40 to +125	MP3, In-system-programmable Flash, three-level lock bit security, smart-card reader interface	50 cents to \$4
4- to 256-kbyte Flash, 256-byte to 4-kbyte EEPROM, 128-byte to 8-kbyte SRAM			44 PLCC, 28/40 DIP, 32/44/64 TQFP, 32/44/64 MLF, Die	Two 8-bit, two 16-bit	SPI, UART, TWI, 8-bit parallel (64-kbyte addressing)	27, eight external	Eight channel, 10 bit	-40 to 85	Self-programming memory, JTAG debug	\$1 to \$6
4- to 64-kbyte			20 SOIC, 44 TQFP, 64/80 VQFP, 44/52 PLCC, 20/28SOIC, 24/16 SSOP, 20/24/40 PDIP	Three, PCA, watchdog	UART, SPI	32 or 48	10-bit	0 to +70 -40 to +85	RC oscillator, programmable I/O	
2- to 32-kbyte			20 SOIC, 44 PLCC/TQFP, 20/44 PDIP	Two or three, watchdog	UART	15 or 32		0 to +70 -40 to +85	Analog comparator	
2-kbyte Flash, 128-byte EEPROM, 128-byte SRAM			20 TSSOP	8-bit		27, eight external		-40 to 85	PLL-based RF transmitter, 250 to 450 MHz	\$1.20
			40 PDIL, 44/64 VQFP, 44/68/52 PLCC	Three, PCA, watchdog	UART, SPI, TWI	32 or 48		0 to +70 -40 to +85		

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	SECURE AVR	AVR		16/8	16	2.7 to 5.5	1 to 3 mA	Less than 1 mA	8x8 (un)signed, 16x16 signed	Two-cycle 8x8 fixed-point	
	TCP Trusted Computing	AVR	1 to 33	16/8	16	3.0 to 3.6	1 to 3 mA	Less than 1 mA	8x8 (un)signed, 16x16 signed	Two-cycle 8x8 fixed-point	
	TINY AVR	AVR	1 to 16	16/8	16	1.8 to 5.5	1 to 3 mA	Less than 1 mA	8x8 (un)signed, 16x16 signed	Two-cycle 8x8 fixed-point	
	USB AVR	AVR	1 to 24	16/8	16	4.5 to 5.5	1 to 3 mA	Less than 1 mA	8x8 (un)signed, 16x16 signed	Two-cycle 8x8 fixed-point	
Cybernetic Micro Systems <a href="http://www.controlchips.com">www.controlchips.com</a>	P-51	8051	51	16/8 (8051) 20/8 (EISA)	8, 16	3.3/ 5 tolerant	150 mW		8x8	Single-cycle square root: 8-bit root of 16 bit number	
Cygnal Integrated Products <a href="http://www.cygnal.com">www.cygnal.com</a>	C8051F02X	8051	25	16/8	8	2.7 to 3.6/ 5 tolerant	27 mW	0.2 mA	8x8		
	C8051F04X	8051	25	16/8	8	2.7 to 3.6/ 5 tolerant	27 mW	0.2 mA	8x8		
	C8051F06X	8051	25	16/8	8	2.7 to 3.6/ 5 tolerant	34 mW	0.2 mA	8x8		
	C8051F0XX	8051	25	16/8	8	2.7 to 3.6/ 5 tolerant	34 mW	5 mA	8x8		
	C8051F12X	8051	100	16/8	8	2.7 to 3.6/ 5 tolerant	135 mW	0.2 mA	8x8, 16x16 two-cycle MAC		63-entry branch target buffer
	C8051F2XX	8051	25	16/8	8	2.7 to 3.6/ 5 tolerant	35 mW	0.1 mA	8x8		
	C8051F30X	8051	25	16/8	8	2.7 to 3.6/ 5 tolerant	16 mW	Less than 0.1 mA	8x8		
	C8051F31X	8051	25	16/8	8	2.7 to 3.6/ 5 tolerant	17 mW	Less than 0.1 mA	8x8		
	C8051F32X	8051	24	16/8	8	2.7 to 5.5	33 mW	Less than 0.1 mA	8x8		
	C8051F33X	8051	25	16/8	8	2.7 to 3.6/ 5 tolerant	17 mW	Less than 0.1 mA	8x8		

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Memory	Memory controller	MMU	Package selection	Timers	Serial, Parallel I/O	Interrupts	ADC/DAC	Temperature ranges (degrees Celsius)	Additional features	Price (10,000)
8- to 64-kbyte Flash, 32- to 256-kbyte MaskROM, 4- to 72-kbyte EEPROM, 1.5- to 6-kbyte SRAM			44 LQFP, Die, Module	Two 16-bit	TWI	27, eight external		-40 to 85	16-bit coprocessor, ISO 7816 external interface, common criteria EAL4+	From \$2
32-kbyte MaskROM, 32-kbyte EEPROM, 2-kbyte SRAM			28 TSSOP			27, eight external		-40 to 85	Fully TCG/TCPA-compliant security processor, TSS drivers	\$3
1- to 2-kbyte Flash, 64- to 128-byte EEPROM, 64-byte to 128-byte SRAM			32 TQFP, 32 MLF, 8/20 SOIC, 8/20/28 DIP, Die	Two 8-bit	8-bit parallel (64-kbyte addressing)	27, eight external	Four or 11 channel, 10-bit	-40 to 85	In-system programming	39 cents to \$1
16- to 24-kbyte MaskROM, 16- to 24-kbyte EEPROM, 512-byte to 1-kbyte SRAM			48/64/100 LQFP	8-bit, 16-bit	SPI, full-speed USB	27, eight external	12 channel, 10-bit	-40 to 85	Two- to four-hub port, three to six function endpoints	\$1.50 to \$4
4-kbyte dual-port RAM, 8-kbyte program RAM, direct host read, write access	Register to select code RAM or data RAM for direct host access	Pins/registers determine address mapping into host address space	100 SQFP	Three 16-bit	Four 8-bit parallel ports, full-duplex UART, PC-104- or 8051-compatible 8-bit host interface	Seven, via writing or reading to specific memory location		0 to +70 -55 to +125 (storage)	Breakpoint/single-step debugging, selectable IRQ and memory addressing, looks like a memory device to host	\$12
64-kbyte Flash, 4352-byte SRAM			64/100 TQFP	Four 16-bit, five-channel PCA, watchdog	SMBus, SPI, two UART, 64 PIO	22, two levels	Eight-channel, 12-bit ADC; two 12-bit DAC	-40 to +85	V <sub>ref</sub> , temperature sensor, JTAG Debug	\$6.45 to \$8.29
64-kbyte Flash, 4352-byte SRAM			64/100 TQFP	Five 16-bit, six-channel PCA, watchdog	CAN 2.0B, SMBus, SPI, two UART, 64 PIO	20, two levels	Eight-channel, 12-bit ADC; two 12-bit DAC	-40 to +85	V <sub>ref</sub> , temperature sensor, 32 CAN message objects, JTAG debug, 60 V PGamp	\$7.74 to \$9.17
64-kbyte Flash, 4352-byte SRAM			64/100 TQFP	Five 16-bit, six-channel PCA, watchdog	CAN 2.0B, SMBus, SPI, two UART, 59 PIO	22, two levels	Two 16-bit 1M-sample/sec ADC; two 12-bit DAC	-40 to +85	V <sub>ref</sub> , temperature sensor, 32 CAN message objects, JTAG debug	\$16.84 to \$18.76
32-kbyte Flash, 2304-byte SRAM			32 LQFP, 48/64 TQFP	Four 16-bit, five-channel PCA, watchdog	SMBus, SPI, UART, 32 PIO	21, two levels	Eight-channel 12 bit ADC; two 12-bit DAC	-40 to +85	V <sub>ref</sub> , temperature sensor, JTAG Debug	\$4.32 to \$5.87
128-kbyte Flash, 8448-byte SRAM			64/100 TQFP	Five 16-bit, six-channel PCA, watchdog	SMBus, SPI, two UART, 64 PIO	20, two levels	Eight-channel 12 bit ADC; two 12-bit DAC	-40 to +85	V <sub>ref</sub> , temperature sensor, JTAG debug, 2% internal oscillator with PLL	\$10.33 to \$14.48
8-kbyte Flash, 1280-byte SRAM			48 TQFP, 32 LQFP	Three 16-bit, watchdog	SPI, UART, 32 PIO	21, two levels	32 channel, 12-bit	-40 to +85	In-system JTAG debug	\$2.39 to \$3.67
8-kbyte Flash, 256-byte SRAM			11 MLP	Three 16-bit, three channel PCA, watchdog	SMBus, UART, 8 PIO	12, two levels	Eight channel, 8-bit	-40 to +85	Temp Sensor, 2% internal oscillator, in-system debug	\$0.99 to \$1.96
16-kbyte Flash, 1280-byte SRAM			32 LQFP, 28 MLP	Four 16-bit, five-channel PCA, watchdog	SMBus, SPI, UART, 29 PIO	14, two levels	21 channel, 10-bit	-40 to +85	Temp Sensor, 2% internal oscillator, in-system debug	\$3.24 to \$3.58
16-kbyte Flash, 2304-byte SRAM			32 LQFP, 28 MLP	Four 16-bit, five-channel PCA, watchdog	USB, SMBus, SPI, UART, 25 PIO	16, two levels	17 channel, 10-bit	-40 to +85	V <sub>ref</sub> , Temp Sensor, USB Function Controller, in-system debug	\$3.24 to \$3.58
8-kbyte Flash, 768-byte SRAM			20 MLP	Four 16-bit, three-channel PCA, watchdog	SMBus, SPI, UART, 17 PIO	13, two levels	13-channel, 10-bit ADC, 10-bit DAC	-40 to +85	V <sub>ref</sub> , Temp Sensor, 2% internal oscillator, in-system debug	\$2.23 to \$2.48

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Cypress MicroSystems www.cypressmicro.com	CY8C22113 CY8C24213	M8C	24	16/8	8, 16, 24	3.0 to 5.5	20 mA	Analog, digital, both	8x8 multiply 32-bit accumulate		
	CY8C24123 CY8C24223 CY8C24423	M8C	24	16/8	8, 16, 24	3.0 to 5.5	20 mA	Analog, digital, both	8x8 multiply 32-bit accumulate		
	CY8C25122 CY8C26233 CY8C26443 CY8C26643	M8C	24	16/8	8, 16, 24	3.0 to 5.25	20 mA	Analog, digital, both	8x8 multiply 32-bit accumulate		
	CY8C25122A CY8C26233A CY8C26443A CY8C26643A	M8C	24	16/8	8, 16, 24	3.3/5.0	20 mA	Analog, digital, both	MAC		
	CY8C27143 CY8C27243 CY8C27443 CY8C27543 CY8C27643	M8C	24	16/8	8, 16, 24	3.0 to 5.5	20 mA	Analog, digital, both	8x8 multiply 32-bit accumulate		
Dallas Semiconductor/Maxim www.maxim-ic.com	DS500x DS5240 DS225x	8051	16, 25	16/8 or 24/8	8	4.5 to 5.5	30 to 100 mA	Stop, idle			
	DS80C320 DS87C520 DS87C530 DS89C420	8051	18, 25, 33	16/8	8	2.7 to 5.5	10 to 100 mA	Stop, idle			
	DS80C390 DS80C400	8051	40, 75	22/8 or 24/8	8	4.5 to 5.5	35 to 75 mA	Yes	16x16 MAC		
	DS87C550 MAX765x	8051	12, 33	16/8	8	2.7 to 5.5	10 to 30 mA	Yes			
Fujitsu Micro-electronics America www.fma.fujitsu.com	F2MC - 8L	F2MC-8L	1 to 12.5	16/8	16	1.8 to 6.0	50 mW	Sleep, stop, subclock, watch, timer			
Infineon Technologies www.infineon.com/ microcontrollers	C504	C500, 8051	40	16/8	8	5	154 mW	Slow down, idle, powerdown	8x8		
	C505CA	C500, 8051	40	16/8	8	5	143 mW	Slow down, idle, powerdown	8x8		

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2-kbyte program Flash, 256-byte SRAM			28 MLF, 8 PDIP/SOIC, 20 PDIP/SSOP	Up to four user-definable 8/16/24/32-bit, PWM	Up to two user-definable SPI/asynchronous, six to 16 PIO	11	Up to one 13-bit ADC; up to one 6/8-bit DAC	-40 to +85 -40 to +125	User definable filters, amplifier/scalers, comparators, pseudorandom sequence generator,	69 cents
4-kbyte program Flash, 256-byte SRAM			28 MLF, 8 PDIP/SOIC, 20/28 PDIP/SSOP	Up to four user-definable 8/16/24/32-bit, PWM	Up to two user-definable SPI/asynchronous, six to 24 PIO	12	Up to two 13-bit ADC; up to two 6/8-bit DAC	-40 to +85 -40 to +125	User definable filters, amplifier/scalers, comparators, pseudorandom sequence generator,	99 cents
4- to 16-kbyte program Flash, 256-byte SRAM			8 PDIP, 44 TQFP, 48 SSOP, 20/28 PDIP/SSOP/SOIC	Up to eight user-definable 8/16/24/32-bit, PWM	Up to four user-definable SPI/asynchronous, six to 44 PIO	16	Up to two 13-bit ADC; up to four 6/8-bit DAC	-40 to +85	User definable filters, amplifier/scalers, comparators, pseudorandom sequence generator,	\$1.69
4-, 8- or 16-kbyte program Flash, 256-byte SRAM			8 PDIP, 48 QFP, 20/28/48 PDIP/SSOP/SOIC	Up to eight user-definable 8/16/24/32-bit, PWM	Up to four user-definable SPI/asynchronous, six to 44 PIO	16	Up to two eight-channel DAC		User definable filters, amplifier/scalers, comparators	\$1.60 to \$4.50
16-kbyte program Flash, 256-byte SRAM			8 PDIP, 20 SSOP, 44 TQFP, 48 SSOP, 48 MLF, 28 PDIP/SSOP	Up to eight user-definable 8/16/24/32-bit, PWM	Up to four user-definable SPI/asynchronous, six to 44 PIO	18	Up to two 13-bit ADC; up to four 6/8-bit DAC	-40 to +85 -40 to +105	User definable filters, amplifier/scalers, comparators, pseudorandom sequence generator,	\$1.99
ROMless versions, up to 5-kbyte nonvolatile SRAM, 32-, 64-, or 128-kbyte SRAM		MMU (DS5240only)	80/100 QFP, 40/72 SIMM	Two or three 16-bit, watchdog	One or two full-duplex UART	Six or 15		0 to +70 -40 to +85	In-system-programmable, nonvolatile memory-control circuitry	\$7 to \$50
8- or 16-kbyte EPROM, 16-, 32-, or 64-kbyte Flash, 256-byte, 1-, or 4-kbyte RAM			PDIP, PLCC, TQFP	Three 16-bit, real-time, watchdog	Two full-duplex UART	10 to 14		0 to +70 -40 to +85	In-system-programmable, EMI reduction, dual DPTR, nonvolatile SRAM	\$4 to \$25
256-bytes RAM, 4-kbyte SRAM, 512-bytes RAM for CAN		MMU	64 QFP, 68 PLCC, 100 LQFP	Three or four 16-bit, watchdog	Two full-duplex UART, CAN, 10/100 Ethernet MAC	16		0 to +70 -40 to +85	One-wire	\$8 to \$10
256-byte RAM, 1-kbyte SRAM, 8-kbyte EPROM, 16-kbyte Flash			64 TQFP, 68 PLCC, 80 PQFP, 68 Windowed CLCC	Three 16-bit, four-channel 8-bit PWM, watchdog	Two full-duplex UART	11 or 16	Eight-channel, 10-bit or 12-bit ADC; PWM DAC	0 to +70 -40 to +85	Dual DPTR, EMI reduction	\$7.60 to \$12
128-byte to 18-kbyte RAM, 4- to 60-kbyte ROM, 16- to 60-kbyte Flash			28/48/64/80/100 QFP/QFP/SOP/SDIP/DIP (plastic)	8/16-bit, 21-bit time-base, 8-bit PWM, PPG, PWC, watchdog	SIO, I2C, USB, SMBus, UART, up to 85 PIO	Up to 16 external	Eight-channel (maximum), 8/10-bit ADC; DAC	-40 to +85	Buzzer output, remote-control carrier generator, DTMF generator, LCD driver, VFD, stepper-motor control	From \$1.20
16- to 32-kbyte ROM/OTP or ROMless, 512 bytes RAM			44 PMQFP	Five 16-bit, seven-channel (maximum) PWM	UART, 32 PIO	Six, six external	Eight channel, 10-bit	0 to +70 -40 to +85 -40 to +125	Motor-control peripheral	\$3.50 (ROMless)
16- to 32-kbyte ROM/OTP or ROMless, 1.2-kbyte RAM			44 PMQFP	Three 16-bit, four-channel PWM	CAN 2.0B, UART, 34 PIO	Six, six external	Eight channel, 10-bit	0 to +70 -40 to +85 -40 to +125		\$4.50 (ROMless)

# 2003 Microprocessor directory

8-BIT MICROPROCESSORS (by company)

Company name	Device name or family	Instruction set architecture	CPU frequency (MHz)	Bus interface (address/data) (bits)	Instruction width (bits)	Core / I/O operating voltages (V)	Typical power at maximum frequency	Powerdown modes and minimum power	DSP/multiplication hardware support (bits)	FPU	Caching
	C505L	C500, 8051	20	16/8	8	5	143 mW	Slow down, idle, powerdown	8x8		
	C508	C500, 8051	40	16/8	8	5	113 mW	Slow down, idle, powerdown	8x8		
	C515C	C500, 8051	20	16/8	8	5	94 mW	Slow down, idle, powerdown	8x8		
	C868	C500, 8051	40	16/8	8	3.3	52mW	Slow down, idle, powerdown	8x8		
Intel <a href="http://www.intel.com">www.intel.com</a>	MCS251 8XC251Sx 8XC251Tx	MCS51	16, 24	24/8	8, 16	4.5 to 5.5 +/- 10%	85 mA	Idle, powerdown	16x8		
	MCS51 8XCxx 8XC51Fx 8XC51Rx 83C51KB	MCS51	12, 16, 24, 33	8	8	4.5 to 5.5 +/- 10%	24 mA	Idle, powerdown	8x8		
Microchip Technology <a href="http://www.microchip.com">www.microchip.com</a>	PIC12	PICmicro	20	14/8	12, 14	2 to 5.5	10 mW	low power sleep, individual peripheral on/off control			
	PIC16	PICmicro	20	14/8	12, 14	2 to 6	50 mW	low power sleep, individual peripheral on/off control			
	PIC18	PICmicro	40	16/8	16	2 to 5.5	50 mW	low power sleep, individual peripheral on/off control	8x8		
	rfPIC	PICmicro	20	14/8	12, 14	2.5 to 5.5	10 mW	low power sleep, individual peripheral on/off control			
Motorola <a href="http://www.motorola.com/semiconductors">www.motorola.com/semiconductors</a>	68HC08 family (HCS08) series GT, GB	HC08	20	8	8	1.8 to 3.6	9.6 mW	Powerdown: 20 nA, wait, stop, zero-component auto wake-up			
	68HC08 family EY series	HC08	8	8	8	3.0 to 5.0	99 mW	Wait, stop, low-voltage inhibit, auto-wakeup			

# 2003 Microprocessor directory

(by company) 8-BIT MICROPROCESSORS

Memory	Memory controller	MMU	Package selection	Timers	Serial, Parallel I/O	Interrupts	ADC/DAC	Temperature ranges (degrees Celsius)	Additional features	Price (10,000)
16- to 32-kbyte ROM/OTP or ROMless, 512-byte RAM			80 PMQFP	Three 16-bit	UART, 46 PIO	Six, six external	Eight channel, 10-bit	0 to +70 -40 to +85	128-segment LCD controller	\$5 (OTP)
16- to 32-kbyte ROM/OTP or ROMless, 1.2-kbyte RAM			64 PMQFP	Five 16-bit, 11-channel (maximum) PWM	UART, 40 PIO (eight-input only)	Nine, 10 external	Eight channel, 10-bit	0 to +70 -40 to +85	Motor-control peripheral, PLL	\$3.50 (ROMless)
64-kbyte ROM/OTP or ROMless, 3.2-kbyte RAM			80 PMQFP	Three 16-bit, four-channel PWM	CAN 2.0B, UART, SPI, 49 PIO, eight-input only	Seven, 10 external	Eight channel, 10-bit	0 to +70 -40 to +85		\$5 (ROMless)
8-kbyte ROM/OTM, 512 byte RAM			38 PTSSOP, 28 PDSO	Five 16-bit, seven-channel (maximum) PWM	UART, SPI/I <sup>2</sup> C (for booting), 13 PIO (five-input only)	Nine, four external	Four channel, 8-bit	-40 to +85 -40 to +125	Brownout, motor-control peripheral, PLL	Up to \$2
8- or 16-kbyte OTP, ROM, 512- or 1024-byte RAM			44 PLCC, 40 PDIP	Three 16-bit, PCA, watchdog	One or two UART	Eight, four levels			40-byte register file	\$4.84 to \$6.87
8-, 16-, or 32-kbyte EPROM, OTP, ROM, 256- or 512-byte RAM			44 PLCC, 44 PDIP, 44 MQFP	Three 16-bit, PCA, watchdog	Full-duplex UART	Eight, two levels				\$1.61 to \$5.48
768- to 3584-byte ROM/OTP/Flash 25- to 128-byte SRAM, 16- to 128-byte EEPROM			8 PDIP, 8 SOIC, 8 CERDIP, 8 DFN	8/16-bit real-time/counter (8-bit programmable prescaler)	UART, I <sup>2</sup> C	Four to 12	Up to four channel, 8/10-bit	-40 to +125	In-circuit serial programming, low-voltage detect, brownout reset, internal oscillator, analog comparator	80 cents to \$2
768-byte to 14-kbyte ROM/OTP/Flash 68- to 368-byte SRAM, 64- to 256-byte EEPROM			14/44 DIP/SOIC/SSOP/PLCC/TQFP/MQFP/CERDIP/QFN	Multiple 8-/16-bit, PWM, capture/compare	USART, I <sup>2</sup> C, SPI, LIN, MI2C, USB, 13 to 33 GPIO,	Four to 12	Four- to eight-channel 8/12-bit ADC; 8-bit DAC	-40 to +125	Op amp, in-circuit serial programming, low-voltage detect, brownout reset, internal oscillator, analog comparator, voltage reference	\$1.10 to \$5.50
4- to 128-kbyte OTP/Flash, 256-byte to 4-kbyte SRAM, 128 byte to 1-kbyte EEPROM			18/84 DIP/SOIC/PLCC/TQFP/SDIP/QFN	Two 10-bit PWM, three 8-/16-bit watchdog, start-up, power-up	Up to two UART, three-wire SPI, I2C, MI2C, CAN 2.0B, 23 to 68 GPIO	Up to 22 external, two UART on address bit	10-bit, support during sleep	-40 to +125	In-circuit serial programming, low-voltage detect, brownout reset	\$1.60 to \$6.50
768- to 3584-byte OTP/Flash, 25- to 128-byte SRAM, 16- to 128-byte EEPROM			18/20 CERDIP/SSOP/SOIC	8-bit, 16-bit, watchdog		Four to 12	Four 10-bit ADC	-40 to +125	RF transmitter, 310 to 440 MHz, 85 to 930 MHz, in-circuit serial programming, low-voltage detect, brownout reset, 25-mA source/sink per I/O	\$1.94 to \$2.09
32- to 60-kbyte Flash, 2- to 4-kbyte RAM			44/64 QFP, 42 SDIP	Eight 16-bit, PWM	Two SCI, SPI, I2C, up to 56 GPIO	IRQ, KBI (up to eight pins)	Eight channel, 10 bit	-40 to +85	debug module with two comparators and nine trigger modes, single-pin interface, background debug, hardware breakpoint	\$3.85 to \$5.25
16-kbyte Flash, 512-byte RAM			32 LQFP	Two 16-bit, PWM	24 GPIO, ESCI, SPI	IRQ, KBI (five pins)	Eight channel, 10 bit	-40 to +85 -40 to +105 -40 to +125	Higher current source capability on nine-port lines for LED drive, low-voltage inhibit with software-selectable trip points for 5V operation	\$3.57 to \$3.95

# 2003 Microprocessor directory

8-BIT MICROPROCESSORS (by company)

Company name	Device name or family	Instruction set architecture	CPU frequency (MHz)	Bus interface (address/data) (bits)	Instruction width (bits)	Core / I/O operating voltages (V)	Typical power at maximum frequency	Powerdown modes and minimum power	DSP/multiplication hardware support (bits)	FPU	Caching
	68HC08 family JB, JG, JT	HC08	3.0 to 5.5	8	8	2.0 to 5.0	36.75 mW	Wait, stop, low-voltage inhibit, auto-wakeup			
	68HC08 family JK, JL series	HC08	8	8	8	3.0 to 5.0	50 mW	Wait, stop, low-voltage inhibit, auto-wakeup			
	68HC08 family QT/QY series	HC08	8	8	8	3.0 to 5.0	22.5 mW	Wait, stop, low-voltage inhibit, auto-wakeup			
National Semiconductor <a href="http://www.national.com">www.national.com</a>	COP8 family		10 to 20	8/1	8	2.5 to 5.5 (OTP, Flash) 2.5 to 7 (ROM)	75 mW (ROM)	Active idle: 21 mW sleep: 48 mW			
NEC Electronics America <a href="http://www.necelam.com">www.necelam.com</a>	K0	NEC K	1 to 12	8/16	8	1.8 to 5.5	5 to 10 mA (5V)	Halt, stop	8x8 multiply, 16x8 divide		
	K0S	NEC K	1 to 10	None	8	1.8 to 5.5	0.25 to 2.5 mA (5V)	Halt, stop	8x8		
	Kx1	NEC K	2 to 10	8/16	8	2.7 to 5.5	5 to 10 mA (5V)	Halt, stop	16x16 multiply, 32x16 divide		
Philips Semiconductors <a href="http://www.philips.semiconductors.com/microcontrollers">www.philips.semiconductors.com/microcontrollers</a>	P89C51Rx2	8051	33	16/8	8	3 to 6		Idle, powerdown			
	P89LPC90x	8051	12	0/8	8	2 to 4		Idle, powerdown			
	P89LPC91x	8051	12	0/8	8	2 to 4		Idle, powerdown			
	P89LPC92x	8051	12	0/8	8	2 to 4		Idle, powerdown			
	P89LPC93x	8051	12	0/8	8	2 to 4		Idle, powerdown			
	P8xLPC76x	8051	20	0/8	8	3 to 6		Idle, powerdown			
Rabbit Semiconductor <a href="http://www.rabbitsemiconductor.com">www.rabbitsemiconductor.com</a>	Rabbit 2000	Z80/Z180	30	20/8	8, 16	2.5 to 5.5	120 mA (5V)	Sleepy: 60 mA (2.5V)	16x16		
	Rabbit 3000	Z80/Z180	54	20/8	8, 16	1.8 to 3.6	108 mA (3.3V)	Sleepy: 23 mA ultra sleepy: 2 mA (1.8V)	16x16		

# 2003 Microprocessor directory

(by company) 8-BIT MICROPROCESSORS

Memory	Memory controller	MMU	Package selection	Timers	Serial, Parallel I/O	Interrupts	ADC/DAC	Temperature ranges (degrees Celsius)	Additional features	Price (10,000)
5.5- to 8-kbyte ROM, 8- to 16-kbyte Flash, 128- to 384-byte RAM			20 (P)DIP, 44 QFP, 32 LQFP, 20 to 28 SOIC	Single or dual 16-bit	13 to 37 GPIO, USB, USB 2.0, PS/2, SCI	IRQ, KBI (up to eight pins)	Eight channel, 10-bit	0 to +70	Low-voltage inhibit, up to six LED pins	\$1.89 to \$4.25
4-kbyte ROM, 1.5- to 8-kbyte Flash, 128- to 256-byte RAM			20 to 28 SOIC, 20 to 28 DIP, 20 to 28 PDIP, 32 to 48 LQFP	Single or dual 16-bit, PWM	14 to 26 GPIO, SCI	IRQ, KBI (up to eight pins)	12 to 14 channel, 8-bit	-40 to +85 -40 to +125	RC oscillator option, addressable external memory, low voltage inhibit, up to 10 LED pins, LVR with selectable trip points	\$1.20 to \$2.95
1.5- to 4-kbyte Flash, 128-byte RAM			8 DIP/DFN, 16 PDIP, 16 TSSOP, 8 to 16 SOIC	Two 16-bit, PWM	Five to 13 GPIO	IRQ, KBI (up to six pins)	Four channel, 8-bit	-40 to +85	Trimmable internal oscillator; selectable trip point LVI (low-voltage inhibit)	From 70 cents
1- to 32-kbyte ROM, OTP, Flash			16 to 68	Three 16-bit, PWM, idle	CAN, UART, SPI, I <sup>2</sup> C	Up to 15 maskable	16 channel, 10-bit	-40 to +125	Dynamic allocated non-volatile memory on Flash devices	75 cents to \$6.50
8- to 60-kbyte, ROM, Flash, OTP			QFP, SSOP, SDIP	8-bit, 16-bit, watchdog, real-time, PWM	UART, I <sup>2</sup> C, three-wire, two-wire	NMI, 20 maskable	Eight channel, 8/10-bit	-40 to +85	Four LCD configurations	\$2.50 to \$7
2- to 48-kbyte ROM, Flash			SSOP, LQFP	8-bit, 16-bit, watchdog, real-time, PWM	UART, I <sup>2</sup> C, three-wire	NMI, 15 maskable	Four to eight 8/10-bit	-40 to +85	Eight LCD configurations	\$1.50 to \$5
8- to 60-kbyte, ROM, Flash			SSOP, QFP	8-bit, 16-bit, watchdog, real-time, PWM	UART, LIN	NMI, 28 maskable	Eight channel, 10-bit	-40 to +85	Failsafe clock, external device reset, POC, LVI	\$2.50 to \$5.50
RAM: 512- to 1024-byte RAM, 65- to 8192- byte EPROM, 65- to 8192-byte Flash/EEPROM			TSSOP, LQFP, PLCC	Four, watchdog	UART, 32 GPIO	Two external, four levels		0 to +70	40- and 44-pin, 12-clock default, six-clock option, IAP/ISP	\$1.50 to \$3.95
128-kbyte RAM, 1-kbyte Flash/EEPROM			SO, DIP	Three, watchdog	UART, six GPIO	Three external, four levels		-40 to +85	8-pin, byte erasable Flash	63 cents to 80 cents
128-kbyte RAM, 1-kbyte Flash/EEPROM			TSSOP	Three, watchdog	UART, 12 GPIO	Three external, four levels		-40 to +85	14-pin, byte erasable Flash	79 cents to 85 cents
256-kbyte RAM, 2- to 8-kbyte Flash/EEPROM			TSSOP, DIP	Three, watchdog	UART, 18 GPIO	Three external, four levels		-40 to +85	76x pin-compatible, 20-pin, byte erasable Flash	\$1.05 to \$1.26
256- to 768-kbyte RAM, 2- to 8-kbyte Flash/EEPROM			HVQFN, TSSOP, PLCC	Three, watchdog	I <sup>2</sup> C, UART, 26 GPIO	Three external, four levels	8-bit	-40 to +85	28-pin, byte erasable Flash	\$1.21 to \$1.79
128-kbyte RAM, 1- to 4-kbyte Flash/EEPROM			SO, TSSOP, DIP	Two, watchdog	I <sup>2</sup> C, UART, 18 GPIO	Three external, four levels	8-bit	0 to +70	14, 16, and 20 pins, two analog comparators	79 cents to \$1.86
External Flash, ROM, SRAM	Three chip selects, two out/write enables, up to six devices	Yes	100 PQFP	Five 8-bit, 10-bit with two match registers, real-time, watchdog	Four asynchronous, two synchronous with SPI, 40 PIO	Four external			Slave port, bootstrap mode, spread spectrum circuitry for low-EMI	\$7.50
External Flash, ROM, SRAM	Three chip selects, two out/write enables, up to six devices	Yes	128 LQFP, 128 TFBGA	10 8-bit, 10-bit with two match registers, real-time, PWM, watchdog	Six asynchronous, IrDA, four synchronous or SPI, two with HDLC/SDLC, 56 PIO	Four to eight external			Slave port, bootstrap mode, quadrature decoder, pulse capture, auxiliary I/O bus, spread spectrum circuitry for low-EMI	\$8.75

# 2003 Microprocessor directory

## 8-BIT MICROPROCESSORS (by company)

Company name	Device name or family	Instruction set architecture	CPU frequency (MHz)	Bus interface (address/data) (bits)	Instruction width (bits)	Core / I/O operating voltages (V)	Typical power at maximum frequency	Powerdown modes and minimum power	DSP/multiplication hardware support (bits)	FPU	Caching
Renesas Technology www.renesas.com	740 Series M37542	Accumulator	32 kHz to 8	16/8	8	2.2 to 5.5	40 mW	Standby: 20 mW sleep: 0.1 mW	Software multiply/divide		
	740 Series M37544	Accumulator	32 kHz to 8	16/8	8	4.0 to 5.5	40 mW	Standby: 20 mW sleep: 0.1 mW	Software multiply/divide		
	H8/38004	H8	5	16/8	16, 32	1.8 to 3.6	35 mW	Eight	8x8		
	H8/38024	H8	8	16/8	16, 32	1.8 to 5.5	35 mW	Eight	8x8		
Silicon Storage Technology www.sst.com	FlashFlex51	MCS 51	12, 33, 40	16/8	8	2.7 to 5.5	15 mA	Idle, standby, powerdown	8x8		
STMicroelectronics www.st.com	ST62xx family	ST6	Up to 8		8	3.0 to 6.0	3.3 mA (5V)	Wait: 350 mA stop: 0.1 mA			
	ST72(F)260 ST72(F)262 ST72(F)264	ST7	Up to 8		8	2.4 to 5.5	7.2 mA (5V)	Halt, active-halt, wait, slow	Hardware multiply		
	ST72(F)321	ST7	Up to 8		8	3.8 to 5.5	6.5 mA (5V)	Halt: 10 mA (less than 85°C), halt: 50 mA (less than 125°C)	Hardware multiply		
	ST72(F)324	ST7	Up to 8		8	3.8 to 5.5	7.4 mA (5V)	Halt, active-halt, wait, slow	Hardware multiply		
	ST72(F)521	ST7	Up to 8		8	3.8 to 5.5	6.2 mA (5V)		Hardware multiply		
	ST72(F)65	ST7	3, 6, 8		8	2.4 to 5.5	14 mA (5V)	Wait, halt	Hardware multiply		
	ST7261 ST72(F)62 ST72(F)63B	ST7	1, 2, 4, 8		8	3.0 to 5.5	12 mA (5V)	Slow, wait, halt	Hardware multiply		
	ST7FLiteSx ST7FLite0x ST7FLite1x ST7FLite2x	ST7	Up to 8		8	2.4 to 5.5	4 mA (5V)	Halt: 10 mA, autowake-up, active-halt, wait, slow	Hardware multiply		
Texas Instruments www.ti.com/msc	MSC120x	MSC	Up to 33	16/8	8	2.7 to 5.25	40 mW	Stop: less than 1 mA, idle, slow	8x8 32-bit accumulator		
	MSC121x	MSC	Up to 33	16/8	8	2.7 to 5.25	48 mW	Stop less than 1 mA, idle	8x8 32-bit accumulator		

# 2003 Microprocessor directory

(by company) 8-BIT MICROPROCESSORS

Memory	Memory controller	MMU	Package selection	Timers	Serial, Parallel I/O	Interrupts	ADC/DAC	Temperature ranges (degrees Celsius)	Additional features	Price (10,000)
36-kbyte Flash, 1 kbyte SRAM			36 SSOP, 32 LQFP, 32 SDIP	Two 8-bit, two 16-bit	Two UART or SIO, 29 GPIO	18 sources, six external	Eight channel, 10-bit	-40 to +125		\$1.25 to \$3.50
8-kbyte OTP, mask, 256-byte SRAM			32 LQFP, 32 SDIP	Two 8-bit, 16-bit	UART or SIO, 25 GPIO	12 sources, five external	Six channel, 8-bit	-20 to +85		\$1.15 to \$1.75
32-kbyte Flash, 16- to 32-kbyte mask ROM			64 QFP/TQFP	Two 16-bit, 8-bit, two PWM, watchdog	(A)synchronous	11 external	Four channel, 10-bit	-40 to +85	25x4 LCD controller, on-chip debug, 32-kHz subclock	\$1.50 to \$4
32-kbyte Flash, 8 to 32-kbyte mask ROM			80 QFP/TQFP	Three 8-bit, two 16-bit, two PWM, watchdog	(A)synchronous	13, nine external	Eight channel, 10-bit	-40 to +85	25x4 LCD controller, on-chip debug, 32-kHz subclock	\$1.70 to \$4.65
20-, 36-, 40-, 72-kbyte Flash, 256-byte to 1-kbyte RAM			40 PDIP, 44 PLCC, 44 TQFP	Three 16-bit, PCA, watchdog	Full duplex UART, enhanced version, SPI	Six to eight, two to four levels		0 to +70 -40 to +85	In-application programming, BOD, second DPTR	\$1.30 to \$3
1- to 8-kbyte OTP, ROM, up to 128 bytes of EEPROM, up to 320 bytes of SRAM	Internal memory only		DIP, SDIP, SO, SSOP, QFP (16 to 100)	8-bit, 16-bit, 8-bit autoreload, watchdog	UART, SPI	Six levels	21 channel (maximum), 8-bit	0 to +70 -40 to +85 -40 to +105 -40 to +125	Low-voltage detector	80 cents to \$3
4- or 8-kbyte ROM or Flash, 256-byte RAM	Internal memory only		28 SO, 32 SDIP, 36 BGA (6x6 mm)	Two 16-bit, PWM, watchdog	SPI, I <sup>2</sup> C, SCI	10, 22 external (nested support)	Six channel, 10-bit	0 to +70 -10 to +85 -40 to +85	PLL, in-application Flash programming	\$1.13 to \$174
32- to 60-kbyte ROM or high density Flash, 1- to 2-kbyte RAM	Internal memory only		44/64 TQFP, 42/56 SDIP	Two 16-bit, PWM, 8-bit auto-reload, watchdog	SPI, I <sup>2</sup> C, SCI	10, 15 external (nested support)	16 channel, 10-bit	0 to +70 -40 to +85 -40 to +105 -40 to +125	In-application Flash programming	\$2.18 to \$3.84
8- to 32-kbyte ROM or Flash, 384- byte to 1-kbyte RAM	Internal memory only		32/44 TQFP, 32/42 SDIP	Two 16-bit, PWM, watchdog	SPI, SCI	10, nine external (nested support)	12 channel, 10-bit	0 to +70 -40 to +85 -40 to +105 -40 to +125	Enhanced reset, in-application Flash programming	\$1.60 to \$2.39
32- to 60-kbyte Flash or ROM, 1- to 2-kbyte RAM	Internal memory only		64/80 TQFP	Two 16-bit, PWM, 8-bit auto-reload, watchdog	SPI, SCI, I <sup>2</sup> C, CAN	14, 15 external, TLI (nested support)	16 channel, 10-bit	0 to +70 -40 to +85 -40 to +105 -40 to +125	In-application Flash programming	\$3.48 to \$4.21
16- or 32-kbyte, 1- to 5-kbyte SRAM	Internal memory only		64 TQFP	16-bit with compare, 6-bit PWM, 4-bit rate multiplier, watchdog	I <sup>2</sup> C, USB full speed, 47 PIO	16 external	Two channel, 8-bit	0 to +70	In-application programming	\$4.05 to \$5.22
4- to 16-kbyte Flash, EEPROM, OTP and ROM, 256- to 768-byte SRAM	Internal memory only		PDIP, SO, TQFP, CSDIP	16-bit, 8-bit auto reload, 8-bit timebase unit, PWM, watchdog	SCI, SPI, I <sup>2</sup> C, USB low speed, 11 to 31 PIO	12 external	Eight channel, 8/10-bit	0 to +70	In-application programming	\$1.38 to \$2.97
1k- to 8-kbyte Flash, up to 256-byte EEPROM, 128- to 384-byte SRAM	Internal memory only		16/20 SO, 16/20 DIP	8-bit, 12-bit auto-reload, up to four PWM, real-time, watchdog	SPI	10, four external	Five or seven channel, 8/10-bit with op-amp	0 to +70 -10 to +85 -40 to +85	1% RC internal oscillator, PLL, DALI communication interface, in-application programming	70 cents to \$1.45
4- to 8-kbyte code/data Flash, 128-byte SRAM			48TQFP	Two 16-bit, four system	Basic SPI, I <sup>2</sup> C, UART, 16 PIO	20 sources	24-bit ADC, 8-bit DAC	-40 to 85	Internal Oscillator, PLL, precision V <sub>ref</sub> and temperature sensor, PGA=128	\$5
4- to 32-kbyte code/data Flash, 1.2-kbyte SRAM			64TQFP	Two 16-bit, four system	Multimaster SPI and I <sup>2</sup> C, dual QUART, 34 PIO	21 sources	24-bit ADC, Quad 16-bit DAC	-40 to 85	Precision V <sub>ref</sub> and temperature sensor, PGA=128	\$8 to \$14

# 2003 Microprocessor directory

8-BIT MICROPROCESSORS (by company)

Company name	Device name or family	Instruction set architecture	CPU frequency (MHz)	Bus interface (address/data) (bits)	Instruction width (bits)	Core / I/O operating voltages (V)	Typical power at maximum frequency	Powerdown modes and minimum power	DSP/multiplication hardware support (bits)	FPU	Caching
Toshiba America Electronic Components www.toshiba.com	870 family	TLCS	32 kHz to 8	16/8	8 to 32	1.8 to 6.0	8 mA	Idle: 4 mA slow: 30 mA sleep: 15 mA stop: 0.5 mA	Yes		
	870/C family	TLCS	32 kHz to 16	16/8	8 to 40	1.8 to 5.5	7.5 mA	Idle: 5.5 mA slow: 14 mA sleep: 6 mA stop: 0.5 mA	Yes		
	870/X family	TLCS	32 kHz to 16	20/8	8 to 48	2.7 to 5.5	20 mA	Idle: 10 mA stop: 0.5 mA	Yes		
Triscend www.triscend.com	E5 Customizable	8051	Up to 40	32/8	8	3.3/ 5 tolerant	1.8 W	Powerdown: less than 50 mA, function disable	8x8		
Ubicom www.ubicom.com	IP2012	MASI	120	Software I/O	16	2.5/2.5 or 3.3, 5 tolerant	175 mW	Sleep: 500 mW, runtime clock control, function disable	One-cycle 8x8 signed/unsigned		None, single-cycle program/data memory on-chip
	IP2022	MASI	120 to 160	Software I/O	16	2.5/2.5 or 3.3, 5 tolerant	175 mW	Sleep: 500 mW, runtime clock control, function disable	One-cycle 8x8 signed/unsigned		None, single-cycle program/data memory on-chip
XEMICS SA www.xemics.com	XE88LC01A Sensing Machine	CoolRISC	2	16/8	22	2.4 to 5.5	0.3 mA/MHz, power supply independent	Sleep, hibernate function disable	8x8 single-cycle multiplication		Three-instruction pipeline
	XE88LC02 Sensing Machine	CoolRISC	2.5 MTP 7 ROM	16/8	22	2.4 to 5.5 (MTP), 1.2 to 5.5 (ROM)	0.3 mA/MHz, power supply independent	Sleep, hibernate function disable	8x8 single-cycle multiplication		Three-instruction pipeline
	XE88LC05A Sensing Machine	CoolRISC	2	16/8	22	2.4 to 5.5	0.3 mA/MHz, power supply independent	Sleep, hibernate function disable	8x8 single-cycle multiplication		Three-instruction pipeline
	XE88LC06A Radio Machine	CoolRISC	2.5 MTP 7 ROM	16/8	22	2.4 to 5.5 (MTP), 1.2 to 5.5 (ROM)	0.3 mA/MHz, power supply independent	Sleep, hibernate function disable	8x8 single-cycle multiplication		Three-instruction pipeline
ZiLOG www.zilog.com	eZ80190	Z80/Z180	50	24/8	24	3.3/ 5 tolerant	50 mA		16x16+40 MAC		
	eZ80F91	Z80/Z180	50	24/8	8	3.0 to 3.6/ 5 tolerant	50 mA	Sleep, halt			
	eZ80F92	Z80/Z180	20	24/8	8	3.0 to 3.6/ 5 tolerant	30 mA	Sleep, halt			
	eZ80F93	Z80/Z180	20	24/8	8	3.0 to 3.6/ 5 tolerant	30 mA	Sleep, halt			

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(by company) 8-BIT MICROPROCESSORS

Memory	Memory controller	MMU	Package selection	Timers	Serial, Parallel I/O	Interrupts	ADC/DAC	Temperature ranges (degrees Celsius)	Additional features	Price (10,000)
4- to 60-kbyte ROM, up to 2-kbyte SRAM, up to 16-kbyte EEPROM program, up to 512 bytes EEPROM data			SDIP, QFP, LQFP, SSOP, SOP	Up to four 8-bit, up to two 16-bit, up to 18-bit timers, watchdog	Up to one UART, up to three synchronous SIO, up to two I2C, up to one high-speed SIO	15	16-channel (maximum) 8/10-bit ADC; up to six AD comparator inputs; up to eight DAC		LED, LCD, VFT drivers, dual clock, clock gear, on-screen-display, remote-control pulse detector	\$1.50 to \$7
4- to 60-kbyte ROM, up to 2-kbyte of SRAM			SDIP, QFP, LQFP, SSOP, SOP	Up to four 8-bit, up to two 16-bit, 18-bit (maximum) timers, watchdog	Up to two UART, synchronous SIO, up to three I2C, up to one CAN, up to eight PWM	15	16-channel (maximum), 10-bit ADC; eight channel (maximum), 8-bit ADC; up to one 8-bit DAC		LED, LCD, VFT drivers, dual clock, clock gear, brushless motor control	\$1.25 to \$7
16- to 96-kbyte ROM, up to 3-kbyte of SRAM	Yes		SDIP, QFP, LQFP, SOP	Up to four 8-bit, up to three 16-bit timers, watchdog	Up to one UART, up to two synchronous SIO, up to two I2C, up to 10 PWM	63	16-channel (maximum), 10-bit ADC; 12-channel (maximum), 8-bit ADC		LED, LCD, VFT drivers, dual clock, clock gear, brushless motor control	\$2.50 to \$8
Up to 64-kbyte of RAM+O2	External 8-bit such as Flash and SRAM, serial Flash, two DMA		128 LQFP, 208 PQFP	Three 16-bit, 32-bit watchdog, can add timers	UART, can add (UART, SPI, I <sup>2</sup> C, HDLC), 56 to 228 PIO	12, can add more			Up to 30,000 on-chip programmable logic gates, up to 120 user-definable I/O pins	\$4.80 to \$18.75
64-kbyte Flash (program or data), 16-kbyte + 4-kbyte SRAM	Implement via GPIO only (part of software I/O)		80 PQFP	Two 16-bit, 8-bit pre-scale, real-time, watchdog	Serdes unit for Ethernet, USB, GPSI, SPI, UART, 48 GPIO	15	Eight channel, 10-bit	-40 to +85	Software I/O	\$7.75
64-kbyte Flash (program or data), 16-kbyte + 4-kbyte SRAM	SRAM		80 PQFP, 80 uBGA	Two 16-bit, 8-bit pre-scale, real-time, watchdog	Two Serdes units for Ethernet, USB, GPSI, SPI, UART, 52 GPIO	15	Eight channel, 10-bit	-40 to +85 (120 MHz) 0 to +55 (160 MHz)	Software I/O	\$8.50 to \$9.90
22-kbyte MTP, 512-byte SRAM			44 LQFP, 48 VQFN	Four 8-bit, up-down, PWM, real-time, Xtal, 22-bit prescaler	115-kbps UART, 24 GPIO	Up to 24, 16 events	13-channel, 16+10-bit zooming ADC	-40 to +85 MTP -40 to +125 ROM	Prescaler with 1- and 128-Hz interrupt	\$4.69
22-kbyte MTP, 1024-byte SRAM			80/100 LQFP	Four 8-bit, up-down, PWM, real-time, Xtal, 22-bit prescaler	115-kbps UART, SPI, 60 GPIO	Up to 24, 16 events	13-channel, 16+10-bit zooming ADC, four low-power comparators	-40 to +85 MTP -40 to +125 ROM	120-segment LCD driver, prescaler with 1- and 128-Hz interrupt	
22-kbyte MTP, 512-byte SRAM			64 LQFP	Four 8-bit, up-down, PWM, real-time, Xtal, 22-bit prescaler	115-kbps UART, 24 GPIO	Up to 24, 16 events	13-channel 16+10-bit zooming ADC, 8- and 16-bit DAC	-40 to +85 MTP -40 to +125 ROM	Prescaler with 1- and 128-Hz interrupt	\$ 5.63
22-kbyte MTP, 512-byte SRAM			32 TQFP	Four 8-bit, up-down, PWM, real-time, Xtal, 22-bit prescaler	115-kbps UART, 24 GPIO, 156-kbps Bitjockey (Radio UART)	Up to 24, 16 events	Four low-power comparators	-40 to +85 MTP -40 to +125 ROM	Prescaler with 1- and 128-Hz interrupt	\$2.94
8-kbyte SRAM	Two DMA, external Flash		100 LQFP	Six PRT, watchdog	Two UART, SPI, 24 PIO, I <sup>2</sup> C	44		-40 to +105	SSL, Ethernet/PPP drivers	\$5.99 to \$6.59
256-kbyte Flash, 8-kbyte SRAM, 8-kbyte EMAC Buffer			144 LQFP	Four PRT, PWM, real-time, watchdog	Two 9-bit UART, 32-bit GPIO, I <sup>2</sup> C, SPI, Ethernet MAC	46		-40 to +105	IrDA, Ethernet/PPP drivers, TCP/IP stack, RTOS	\$12.78 to \$14.06
128-kbyte Flash, 8-kbyte SRAM			100 LQFP	Six PRT, watchdog	Two 9-bit UART, 24-bit GPIO, I <sup>2</sup> C, SPI	36		-40 to +105	IrDA, Ethernet/PPP drivers, TCP/IP stack, RTOS	\$7.54 to \$8.30
64-kbyte Flash, 4 kbyte SRAM			100 LQFP	Six PRT, watchdog	Two 9-bit UART, 24-bit GPIO, I <sup>2</sup> C, SPI	36		-40 to +105	IrDA, Ethernet/PPP drivers, TCP/IP stack, RTOS	\$7.01 to \$7.72

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8-BIT MICROPROCESSORS (by company)

Company name	Device name or family	Instruction set architecture	CPU frequency (MHz)	Bus interface (address/data) (bits)	Instruction width (bits)	Core / I/O operating voltages (V)	Typical power at maximum frequency	Powerdown modes and minimum power	DSP/multiplication hardware support (bits)	FPU	Caching
	eZ80L92	Z80/Z180	20, 50	24/8	24	3.3/5 tolerant	40 mA	Sleep, halt			
	eZ80L92 Ethernet Module	Z80/Z180	48	24/8	24	3.3/5 tolerant	125 mA	Sleep, halt			
	Z8	Z80/Z180	16	16/8	16	2.0 to 5.5	20 mA	Stop: 10 mA	16x16 multiply 32x16 divide		
	Z8F042x Z8 Encore!	Z80/Z180	20	16/8	16	2.7 to 3.6/5 tolerant	10 mA	Sleep, halt	16x16 multiply 32x16 divide		
	Z8F082x Z8 Encore!	Z80/Z180	20	16/8	16	2.7 to 3.6/5 tolerant	10 mA	Sleep, halt	16x16 multiply 32x16 divide		
	Z8F160x Z8 Encore!	Z80/Z180	20	16/8	16	3.0 to 3.6/5 tolerant	15 mA	Sleep, halt	16x16 multiply 32x16 divide		
	Z8F240x Z8 Encore!	Z80/Z180	20	16/8	16	3.0 to 3.6/5 tolerant	15 mA	Sleep, halt	16x16 multiply 32x16 divide		
	Z8F320x Z8 Encore!	Z80/Z180	20	16/8	16	3.0 to 3.6/5 tolerant	15 mA	Sleep, halt	16x16 multiply 32x16 divide		
	Z8F480x Z8 Encore!	Z80/Z180	20	16/8	16	3.0 to 3.6/5 tolerant	15 mA	Sleep, halt	16x16 multiply 32x16 divide		
	Z8F640x Z8 Encore!	Z80/Z180	20	16/8	16	3.0 to 3.6/5 tolerant	15 mA	Sleep, halt	16x16 multiply 32x16 divide		

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(by company) 8-BIT MICROPROCESSORS

Memory	Memory controller	MMU	Package selection	Timers	Serial, Parallel I/O	Interrupts	ADC/DAC	Temperature ranges (degrees Celsius)	Additional features	Price (10,000)
	External Flash		100 LQFP	Six PRT, real-time, watchdog	Two UART, SPI, 24 PIO, I <sup>2</sup> C	36		-40 to +105	IrDA, TCP/IP stack, RTOS	\$4.39 to \$5.56
1-Mbyte Flash, 512-kbyte RAM	External Flash		Two 50-pin system-expansion interfaces	Six PRT, watchdog	Two UART, SPI, 24 PIO, I <sup>2</sup> C	36		0 to +70	IrDA, TCP/IP stack, RTOS, RJ45	\$52.80 (5000)
OTP, EPROM, 236-byte SRAM			18/28/40 DIP, 18/28 SOIC, 20 SSOP, 44 PLCC/QFP	Two or three 8-bit with 6-bit prescaler, watchdog	UART, 32 GPIO	Six	Eight-channel, 8-bit ADC	-40 to +105	In-circuit programming, POR, brownout reset	68 cents to \$8.25
4-kbyte Flash or ROM, 1-kbyte SRAM			20, 28	Two 16-bit, PWM	9-bit UART with RS485, IrDA encoder/decoder	24	Five-channel (maximum), 10-bit ADC (sigma/delta)	-40 to +105	One-pin in-circuit programming, on-chip debug, voltage brown out, power-on reset	\$1.83
8-kbyte Flash or ROM, 1-kbyte SRAM			20, 28	Two 16-bit, PWM	9-bit UART with RS485, IrDA encoder/decoder	24	Five-channel (maximum), 10-bit ADC (sigma/delta)	-40 to +105	One-pin in-circuit programming, on-chip debug, voltage brown out, power-on reset	\$2.26
16-kbyte Flash or ROM, 2-kbyte SRAM	Three-channel DMA		40, 44, 64, and 68	Four 16-bit, PWM	Two 9-bit UART with RS485, IrDA encoder/decoder	24	12-channel (maximum), 10-bit ADC (sigma/delta)	-40 to +105	One-pin in-circuit programming, on-chip debug, voltage brown out, power-on reset	\$2.84
24-kbyte Flash or ROM, 2-kbyte SRAM	Three-channel DMA		40, 44, 64, and 68	Four 16-bit, PWM	Two 9-bit UART with RS485, IrDA encoder/decoder	24	12-channel (maximum), 10-bit ADC (sigma/delta)	-40 to +105	One-pin in-circuit programming, on-chip debug, voltage brown out, power-on reset	\$3.28
32-kbyte Flash or ROM, 2-kbyte SRAM	Three-channel DMA		40, 44, 64, and 68	Four 16-bit, PWM	Two 9-bit UART with RS485, IrDA encoder/decoder	24	12-channel (maximum), 10-bit ADC (sigma/delta)	-40 to +105	One-pin in-circuit programming, on-chip debug, voltage brown out, power-on reset	\$3.49
48-kbyte Flash or ROM, 4-kbyte SRAM	Three-channel DMA		40, 44, 64, 68, and 80	Four 16-bit, PWM	Two 9-bit UART with RS485, IrDA encoder/decoder	24	12-channel (maximum), 10-bit ADC (sigma/delta)	-40 to +105	One-pin in-circuit programming, on-chip debug, voltage brown out, power-on reset	\$3.93
64-kbyte Flash or ROM, 4-kbyte SRAM	Three-channel DMA		40, 44, 64, 68, and 80	Four 16-bit, PWM	Two 9-bit UART with RS485, IrDA encoder/decoder	24	12-channel (maximum), 10-bit ADC (sigma/delta)	-40 to +105	One-pin in-circuit programming, on-chip debug, voltage brown out, power-on reset	\$4.37