



2003 Microprocessor directory

16-BIT MICROPROCESSORS (by instruction set)

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
Atmel www.atmel.com	C251 OTP/ROM/ ROMLESS	8051	40			2.7 to 5.5					
STMicroelectronics www.st.com	ST10F269	80C166	40	Up to 24/16 (custom)	16	5	120 mA	Idle: (20+F _{cpu}) mA powerdown: 15 mA	One-cycle MAC		
	ST10R272	80C166	50	Up to 24/16 (custom)	16	3.3/ 5 tolerant	140 mA	Idle: (10+0.9x _{Fcpu}) mA powerdown: 200 mA	One-cycle MAC		
Sharp Microelectronics of the Americas www.sharpsma.com	LH75400 LH75401 LH75410 LH75411	ARM	70	16/24, 8/16, 16	16, 32	3.3/ 5 tolerant	70 mA	Standby: 110 mA stop: 18 mA	Yes		
Infineon Technologies www.infineon.com/ microcontrollers	C161CS/JC/JI	C166 V1	25	24/32 or 16, external: 24/16 or 8	16, 32	5	300 mW	Idle, sleep, powerdown	16x16		
	C161K/O	C166 V1	25 (20 at 3.3V)	24/16, external: 19/16 or 8	16, 32	3.3 or 5.5	250 mW	Idle, powerdown	16x16		
	C161PI	C166 V1	25 (20 at 3.3V)	24/16, external: 23/16 or 8	16, 32	3.3 or 5.5	187 mW	Idle, powerdown	16x16		
	C164CI/CM	C166 V1	25	24/16 or 32, external: 21/16 or 8	16, 32	5	250 mW (ROM)	Idle, sleep, powerdown	16x16		
	C165	C166 V1	25 (20 at 3.3V)	24/16, external: 24/16 or 8	16, 32	3.3 or 5.5	250 mW	Idle, powerdown	16x16		
	C167CR/CS	C166 V1	33/40	24/16, external: 24/16 or 8	16, 32	5 or 3.3	600 mW	Idle, sleep, powerdown	16x16		
	XC161CJ	C166 V2	40	24/16, external: 24/16 or 8	16, 32	5 and 2.5	245 mW	Idle, sleep, powerdown	Single-cycle MAC		
	XC164CS	C166 V2	40	24/16, external: 24/16 or 8	16, 32	5 and 2.5	250 mW	Idle, sleep, powerdown	Single-cycle MAC		
	XC167CI	C166 V2	40	24/16 or 64, external: 24/16 or 8	16, 32	5 and 2.5	250 mW	Idle, sleep, powerdown	Single-cycle MAC		
Fujitsu Micro-electronics America www.fma.fujitsu.com	F2MC16F	F2MC-16	16 to 20, 32.768 kHz	24/16, external: 8 or 16	16	1.8 to 5.5	125 mW (16 MHz)	Stop, sleep, subclock, hardware standby, watch, timer			

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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)
32			40 PDIL, 44 PLCC, 44 VQFP	Three, PCA, watchdog	UART, SPI, TWI	32		0 to +70 -40 to +85		
256-kbyte Flash, 12-kbyte SRAM	Up to 16-mbyte, 8- or 16-bit wide data, multiplexed or demultiplexed	Yes	144 TQFP/PQFP	Two units with five timers	Two CAN, (a)synchronous, high-speed	Eight, 56 sources, 16 levels	16 channel, 10-bit	0 to +70 -40 to +85 -40 to +105 -40 to +125	On-chip bootstrap loader and PLL	\$20.40
1-kbyte SRAM	Up to 16-mbyte, 8- or 16-bit wide data, multiplexed or demultiplexed	Yes	100 TQFP	Two units with five timers	(A)synchronous, high-speed	Eight, 56 sources, 16 levels		0 to +70 -40 to +85		\$3.60
16-kbyte TCM SRAM, 16-kbyte SRAM	SRAM/ROM/Flash, asynchronous glueless interface, four DMA channels		144 LQFP	Three 16-bit, PWM, real-time, watchdog	CAN 2.0B, three UART, SPI, Microwire, TI's SSI, 78 PIO	Seven external	Eight channel, 10-bit, touchscreen controller	-40 to +85	Color or grayscale LCDC	\$6.41 to \$7.73
10-kbyte RAM, 256-kbyte ROM, or ROMless			128 PTQFP	Nine 16-bit, real-time, watchdog, 16-channel PWM	Up to two CAN, two UART, SPI, I2C, up to one J1850, 93 PIO	Up to 59, up to 19 external	12 channel, 10-bit	-40 to +85 -40 to +125	PLL	\$12 (ROMless)
1- to 2-kbyte RAM			80 PMQFP	Three to five 16-bit, watchdog	UART, SPI, 63 PIO	10 to 13, four to seven external		0 to +70 -40 to +85		\$4.50
3-kbyte RAM			100 PTQFP, 100 PMQFP	Five 16-bit, real-time, watchdog	UART, SPI, I ² C, 76 PIO	19, eight external	Four channel, 10-bit	0 to +70 -40 to +85	PLL	\$5
2- to 4-kbyte RAM, 32- to 64-kbyte ROM or OTP			80 PMQFP, 64 PTQFP	Seven 16-bit, real-time, watchdog, 19-channel (maximum) PWM	CAN, UART, SPI, up to 59 PIO	Up to 28, up to 11 external	Up to eight channel, 12-bit	-40 to +85 -40 to +125	Motor control peripheral, PLL	\$5 to \$10
2-kbyte RAM			100 PTQFP, 100 PMQFP	Five 16-bit, watchdog	UART, SPI, 77 PIO	13, eight external		0 to +70 -40 to +85		\$7.50
Up to 11-kbyte of RAM, up to 128-kbyte of ROM, or ROMless			144 PMQFP	13 16-bit, real-time, watchdog, 36-channel (maximum) PWM	Up to two CAN, UART, SPI, up to two CAN 2.0B, 111 PIO	Up to 55, up to 33 external	16 to 24 channel, 10-bit	0 to +70 -40 to +85 (R only) -40 to +125	PLL	\$10 to \$14 (ROMless)
8-kbyte RAM, 128-kbyte Flash			144 PTQFP	Nine 16-bit, real-time, watchdog, 32-channel PWM	TwinCAN, two UART, two SPI, I2C, J1850, two CAN 2.0B, 103 PIO	Up to 74, up to 32 external	16 channel, 10-bit	-40 to +85 -40 to +125	PLL	\$13
6-kbyte RAM, 128-kbyte Flash			100 PTQFP	11 16-bit, real-time, watchdog, 19-channel PWM	TwinCAN, UART, two SPI, two CAN 2.0B, 79 PIO	Up to 75, up to 11 external	14 channel, 10-bit	-40 to +85 -40 to +125	PLL	\$12
8-kbyte RAM, 128-kbyte Flash			144 PTQFP	11 16-bit, real-time, watchdog, 19-channel PWM	TwinCAN, two UART, two SPI, two CAN 2.0B, 103 PIO	Up to 77	16 channel, 10-bit	-40 to +85 -40 to +125	PLL	\$14
32- to 384-kbyte masked ROM, 64 to 512-kbyte Flash, 640-byte to 16-kbyte RAM			48/120 QFP/LQFP/SQFP/SDIP (plastic)	16-bit, reload, PPG, PWM, 18-bit watchdog, PWC, timebase timer	SIO, triple CAN, I2C, UART, IE Bus, up to 102 PIO	eight external	Four/eight/16-channel, 8/10-bit ADC; two-channel, 8-bit DAC	0 to +70 -40 to +105	PLL, level comparator, input capture, output compare	From \$2.50

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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
	F2MC16L	F2MC-16	8 to 16, 32.768 kHz	24/16, external: 8 or 16	16	1.8 to 5.5	125 mW (16 MHz)	Stop, sleep, subclock, hardware standby, watch, timer			
	F2MC16LX	F2MC-16	8 to 24 32.768 kHz	24/16, external: 8 or 16	16	1.8 to 5.5	125 mW (16 MHz)	Stop, sleep, subclock, hardware standby, watch, timer			
Renesas Technology www.renesas.com	H8/300H Series H8/3062F	H8	25	24/16 External: 16/8	32	3.0 to 5.5	175 mW	Five	8x8, 16x16		
	H8/300H Series H8/3069F	H8	25	24/16 External: 16/8	32	4.5 to 5.5	120 mW	Five	8x8, 16x16		
	Tiny Series H8/3664	H8	16	16/16	8 to 80	2.7 to 5.5	75 mW	Six	8x8		
	Tiny Series H8/3672	H8	16	16/16	8 to 80	2.7 to 5.5	75 mW	Four	8x8		
	Tiny Series H8/3687	H8	20	16/16	8 to 80	2.7 to 5.5	100 mW	Six	8x8		
	Tiny Series H8/3694	H8	20	16/16	8 to 80	2.7 to 5.5	100 mW	Six	8x8		
	Tiny Series H8/36014	H8	20	16/16	8 to 80	2.7 to 5.5	75 mW	Four	8x8		
	H8S/2100 Series H8S/2145B	H8S	10, 20	24/16	16 to 80	2.7 to 5.5	90 mW	Medium speed, sub-active, sleep, sub-sleep, watch, hardware standby, software standby, module stop	8x8, 16x16 multiply, 16/8, 32/16 divide		
	H8S/2100 Series H8S/2148B	H8S	10, 20	24/16	16 to 80	2.7 to 5.5	90 mW	Medium speed, sub-active, sleep, sub-sleep, watch, hardware standby, software standby, module stop	8x8, 16x16 multiply, 16/8, 32/16 divide		
	H8S/2200 Series H8S/2215	H8S	16	24/16	16 to 80	2.7 to 3.6	89 mW	Sleep, medium speed, hardware standby, software standby, module stop	8x8, 16x16 multiply, 16/8, 32/16 divide		

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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)
32- to 384-kbyte masked ROM, 64 to 512-kbyte Flash, 640-byte to 16-kbyte RAM			48/120 QFP/LQFP /SQFP/SDIP (plastic)	16-bit, reload, PPG, PWM, 18-bit watchdog, PWC, timebase timer	SIO, triple CAN, I2C, UART, IE Bus, up to 102 PIO	eight external	Four/eight/16-channel, 8/10-bit ADC; two-channel, 8-bit DAC	-40 to +85	LCD controller, PLL, AC/DC and stepper-motor control, sound and wave generator, level comparator, input capture, output compare	From \$2.50
32- to 384-kbyte masked ROM, 64 to 512-kbyte Flash, 640-byte to 16-kbyte RAM			48/120 QFP/LQFP/SQFP/SDIP (plastic)	16-bit, reload, PPG, PWM, 18-bit watchdog, PWC, timebase timer	SIO, triple CAN, I2C, UART, IE Bus, up to 102 PIO	eight external	Four/eight/16-channel, 8/10-bit ADC; two-channel, 8-bit DAC	-40 to +85 -40 to +105	LCD controller, PLL, AC/DC and stepper-motor control, sound and wave generator, level comparator, input capture, output compare	From \$2.50
128-kbyte Flash			100 QFP/TQFP	Four 8-bit, three 16-bit, watchdog	Two (a)synchronous	27, seven external	Eight-channel, 10-bit ADC; two-channel, 8-bit DAC	-40 to +85	Bus controller, interrupt controller, TPC, smart card interface	\$6.25
512-kbyte Flash	Four-channel M-M Two-channel M-I/O	DRAM I/F	100 QFP/TQFP	Four 8-bit, three 16-bit, watchdog	Three (a)synchronous	30, seven external	Eight-channel, 10-bit ADC; two-channel, 8-bit DAC	-40 to +85	Bus controller, TPC, refresh controller	\$10.25
32-kbyte Flash, 8 to 32-kbyte Mask ROM			42 DIP, 48 LQFP, 64 QFP/LQFP	Two 8-bit, 16-bit, watchdog, three PWM	(A)synchronous	21, 11 external	Eight channel, 10 bit	-40 to +105	Address break, on-chip debug, 32-kHz subclock	\$1.60 to \$3.90
16-, 32-kbyte Flash			48/64 LQFP	8-bit, 16-bit, watchdog, three PWM	(A)synchronous	17, seven external	Four channel, 10 bit	-40 to +85	Address break, on-chip debug	\$2.10 to \$3.25
32-, 56-kbyte Flash, 16- to 56-kbyte Mask ROM			64 QFP/LQFP	Three 8-bit, two 16-bit, watchdog, seven PWM	Two (a)synchronous, I ² C	38, 11 external	Eight channel, 10 bit	-40 to +125	Address break, on-chip debug, power on reset, low-voltage detect, 32-kHz subclock	\$2.50 to \$4.80
32-kbyte Flash, 8 to 32-kbyte Mask ROM			42 DIP, 48 LQFP, 64 QFP/LQFP	Two 8-bit, 16-bit, watchdog, three PWMs	(A)synchronous, I ² C	22, 11 external	Eight channel, 10 bit	-40 to +125	Address break, on-chip debug, power on reset, low-voltage detect, 32-kHz subclock	\$1.75 to \$4.10
16-, 32-kbyte Flash, 8- to 32-kbyte Mask ROM			48/64 LQFP	8-bit, 16-bit, watchdog, three PWM	Two (a)synchronous	21, nine external	Four channel, 10 bit	-40 to +125	Address break, on-chip debug	\$1.20 to \$3.75
256-kbyte Flash, 8-kbyte RAM	Yes		100 QFP	Four 8-bit, 16-bit, two 14-bit PWM, watchdog	Three (a)synchronous, IrDA, I ² C	50, 33 external	Eight-channel, 10-bit ADC; two-channel, 8-bit DAC	-20 to +75	Low-pin-count interface, data-transfer controller	\$9
128-kbyte Flash, 4-kbyte RAM	Yes		100 QFP	Four 8-bit, 16-bit, two 14-bit PWM, two watchdog	Three (a)synchronous, IrDA, I ² C	50, 33 external	Eight-channel, 10-bit ADC; two-channel, 8-bit DAC	-40 to +85	Low-pin-count interface, data-transfer controller	\$9
256-kbyte Flash, 16-kbyte RAM	Four DMA		120 TQFP, 112 BGA	Two 8-bit, three 16-bit, watchdog	Three (a)synchronous, full speed USB 2.0	40, eight external	Six-channel, 10-bit ADC; two-channel, 8-bit DAC	-40 to +85	Data-transfer controller, PLL	\$10.80

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	H8S/2200 Series H8S/2239	H8S	16	24/16	16 to 80	2.7 to 3.6	80 mW	Medium speed, sub-active, sleep, sub-sleep, watch, hardware standby, software standby, module stop	8x8, 16x16 multiply, 16/8, 32/16 divide		
	H8S/2200 Series H8S/2268	H8S	13, 20	24/16	16 to 80	3.0 to 5.5	80 mW	Medium speed, sub-active, sleep, sub-sleep, watch, hardware standby, software standby, module stop	8x8, 16x16 multiply, 16/8, 32/16 divide		
	H8S/2300 Series H8S/2317BL	H8S	25	24/16	16 to 80	3.0 to 3.6	165 mW	Sleep, medium speed, hardware standby, software standby, module stop	8x8, 16x16 multiply, 16/8, 32/16 divide		
	H8S/2300 Series H8S/2327BL	H8S	25	24/16	16 to 80	3.0 to 3.6	181 mW	Sleep, medium speed, hardware standby, software standby, module stop	8x8, 16x16 multiply, 16/8, 32/16 divide		
	H8S/2300 Series H8S/2377	H8S	33	24/16	16 to 80	3.0 to 3.6	264 mW	Sleep, medium speed, hardware standby, software standby, module stop	8x8, 16x16 multiply, 16/8, 32/16 divide		
	H8S/2600 Series H8S/2612	H8S	20	24/16	16 to 80	4.5 to 5.5	325 mW	Sleep, medium speed, hardware standby, software standby, module stop	8x8, 16x16 multiply, MAC, 16/8, 32/16 divide		
	H8S/2600 Series H8S/2636	H8S	20	24/16	16 to 80	4.5 to 5.5	375 mW	Sleep, medium speed, hardware standby, software standby, module stop	8x8, 16x16 multiply, MAC, 16/8, 32/16 divide		
	H8S/2600 Series H8S/2674R	H8S	33	24/16	16 to 80	3.0 to 3.6	264 mW	Sleep, hardware standby, software standby, module stop, all module clock stop, clock division	8x8, 16x16 multiply, MAC, 16/8, 32/16 divide		
Motorola www.motorola.com/semiconductors	HCS12 family E series	HCS12	25	16	16	3.3 to 5.0	325 mW	Wait, stop, pseudo stop, low-voltage inhibit, auto-wakeup			
	HCS12 family D series	HCS12	25	16	16	5	275 mW	Wait, stop, pseudo stop, low-voltage inhibit, auto-wakeup			

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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)
384-kbyte Flash, 32-kbyte RAM	Yes		100 QFP	Four 8-bit, six 16-bit, two watchdog	Four (a)synchronous, I ² C	65, nine external	Eight-channel, 10-bit ADC; two-channel, 8-bit DAC	-40 to +85	Data-transfer controller, smart-card interface	\$11.75
256-kbyte Flash, 16-kbyte RAM			100 QFP	Four 8-bit, six 16-bit, watchdog	Three (a)synchronous, I ² C	48, 14 external	10-channel, 10-bit ADC; two-channel, 8-bit DAC	-40 to +85	40x4 LCD, data-transfer controller	\$11.75
128-kbyte Flash, 8-kbyte RAM	Yes		100 TQFP	Four 8-bit, six 16-bit, watchdog	Three (a)synchronous	43, nine external	Eight-channel, 10-bit ADC; two-channel, 8-bit DAC	-40 to +85	Data-transfer controller, smart-card I/F, on-chip debug	\$4.99
128-kbyte Flash, 8-kbyte RAM	Four DMA		128 QFP	Four 8-bit, six 16-bit, watchdog	Three (a)synchronous	52, nine external	Eight-channel, 10-bit ADC; two-channel, 8-bit DAC	-40 to +85	Data-transfer controller, smart-card interface, on-chip debug	\$5.99
384-kbyte Flash, 24-kbyte RAM	SDRAM		144 LQFP	Four 8-bit, six 16-bit, watchdog	Five (a)synchronous, IrDA	62, 17 external	16-channel, 10-bit ADC; six-channel, 8-bit DAC	-40 to +85	Data-transfer controller, smart-card interface, PLL	\$15.35
128-kbyte Flash, 4-kbyte RAM	Yes		80 QFP	Six 16-bit, watchdog	Three (a)synchronous, HCAN	49, seven external	12 channel, 10-bit	-40 to +125	Data-transfer controller, motor-management timer, PC-break controller	\$12
128-kbyte Flash, 4-kbyte RAM	SDRAM		128 QFP	Six 16-bit, two watchdog	Three (a)synchronous	50, seven external	12-channel, 10-bit ADC; two-channel 8-bit DAC	-40 to +85	HCAN, data-transfer controller, 8-bit PPG, motor-control PWM, PLL, smart-card I/F	\$14.40
32-kbyte RAM, ROM-less	SDRAM		144 LQFP	Two 8-bit, six 16-bit, watchdog	Three (a)synchronous	57, 17 external	12-channel, 10-bit ADC; four-channel, 8-bit DAC	-40 to +85	Data-transfer controller, 16-bit PPG, SDRAM I/F, PLL, IrDA	\$7.80
64- to 256-kbyte Flash, 8-kbyte RAM			112 LQFP, 80 QFP	Three or four 16-bit, six 8-bit, three 16-bit PWM	Up to 90 GPIO, up to three SCI, SPI, I ² C	IRQ, XIRQ, 20 sources with wakeup	16-channel, 10-bit ADC; two 8-bit DAC	-40 to +85 -40 to 125	Background debug, single-pin interface, on-chip hardware breakpoints; six-channel PMF	\$6.27 to \$8.30
64- to 256-kbyte Flash, 4- to 12-kbyte RAM, 1- to 4-kbyte EEPROM			112 LQFP, 80 QFP	Eight 16-bit, up to eight 8-bit, four 16-bit PWM	Up to two SCI, up to three SPI, I ² C, up to 91 GPIO, up to five CAN	IRQ, XIRQ, 20 sources with wakeup	Up to two eight-channel, 10-bit ADC	-40 to +85 -40 to +105 -40 to +125	Background debug, single-pin interface, on-chip hardware breakpoints; digital BDLC (Byte Data Link)	\$7.83 to \$14.08

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	HCS12 family A series	HCS12	25	16	16	5	325 mW	Wait, stop, pseudo stop, low-voltage inhibit, auto-wakeup			
Renesas Technology www.renesas.com	M16C/10	M16C	16		16	2.7 to 5.5	300 mW		16x16		
	M16C/1N	M16C	16	20/16	16	4.2 to 5.5	500 mW	Stop: 1.0 mA	16x16		
	M16C/24	M16C	16	20/16	16	3.0 to 3.6	300 mW		16x16		
	M16C/26	M16C	20		16	2.7 to 5.5	16 mA	Stop: 0.7 mA wait: 1.8 mA	16x16		
	M16C/62P	M16C	24	20/16	16	2.7 to 5.5	300 mW	Stop: 0.8 mA wait: 2.0 mA	16x16		
	M16C/6N	M16C	20	20/16	16	4.2 to 5.5	700 mW	Stop: 0.8 mA wait: 3.0 mA	16x16		
	M16C/80	M16C	20	20/16	16	2.7 to 5.5	500 mW	Stop: 1.0 mA	16x16		
	M32C/83	M16C	32	20/16	16	3 to 5.5	500 mW	Stop: 0.4 mA wait: 470 mA	16x16		
Microchip Technology www.microchip.com	dsPIC	Modified Harvard	120	No external	24	2.5 to 5.5		low power sleep, individual peripheral on/off control	Single-cycle 16x16 MAC, barrel shifter, two 40-bit accumulators, 32/16 and 16/16 divide		
Texas Instruments www.ti.com/msp430	MSP430 C1101	MSP	Up to 8	16/16	16	1.8 to 3.6	250 mA/MIP	standby: 0.8 mA off: 0.1 mA			
	MSP430 C1111	MSP	Up to 8	16/16	16	1.8 to 3.6	250 mA/MIP	standby: 0.8 mA off: 0.1 mA			
	MSP430 C1121	MSP	Up to 8	16/16	16	1.8 to 3.6	250 mA/MIP	standby: 0.8 mA off: 0.1 mA			
	MSP430 C1331	MSP	Up to 8	16/16	16	1.8 to 3.6	250 mA/MIP	standby: 0.8 mA off: 0.1 mA			
	MSP430 C1351	MSP	Up to 8	16/16	16	1.8 to 3.6	250 mA/MIP	standby: 0.8 mA off: 0.1 mA			
	MSP430 CW423	MSP	Up to 8	16/16	16	1.8 to 3.6	250 mA/MIP	standby: 0.8 mA off: 0.1 mA			
	MSP430 CW425	MSP	Up to 8	16/16	16	1.8 to 3.6	250 mA/MIP	standby: 0.8 mA off: 0.1 mA			

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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)
64- to 256-kbyte Flash, 4- to 12-kbyte RAM, 1- to 4-kbyte EEPROM			112 LQFP, 80 QFP	Eight 16-bit, up to eight 8-bit, four 16-bit PWM	Up to two SCI, up to two SPI, I2C, up to 91 GPIO	IRQ, XIRQ, 20 sources with wakeup	Up to two eight-channel, 10-bit ADC	-40 to +85	Background debug, single-pin interface, on-chip hardware breakpoints	\$6.75 to \$11.80
24-kbyte Flash, 1 kbyte RAM			32/48 LQFP	Four 8-bit, 16-bit, real-time, watchdog	Two (a)synchronous	Seven external	14-channel, 10-bit ADC; 8-bit DAC	-40 to +85	22 or 34/8 GPIO/high-current, internal ring oscillator	\$3 to \$4
64-kbyte Flash, 3 kbyte RAM			48 LQFP	Four 8-bit, 16-bit, real-time, watchdog	Two (a)synchronous, CAN, 37 GPIO (eight high current)	Eight external	14-channel, 10-bit ADC; 8-bit DAC	-40 to +85	Internal ring oscillator	
128-kbyte Flash, 10-kbyte RAM	Four DMA		100 LQFP	Five 16-bit, watchdog	Four (a)synchronous, four I2C, USB, 82 GPIO (eight high-current)	Three external	Eight channel, 10 bit	-20 to +85	3.25-kbyte of USB FIFO, nine end points, SSI	\$9
24- to 64-kbyte Flash, 4-kbyte Virtual EEPROM, 1- or 2-kbyte RAM	Two DMA		48 LQFP	Eight 16-bit, real-time, watchdog	Three (a)synchronous, I2C, 38 GPIO	Seven external	Eight channel, 10 bit	-40 to +85	Virtual EEPROM, BOD, three-phase, internal ring oscillator	\$4 to \$5
64- to 384-kbyte Flash, 4-kbyte Virtual EEPROM, 4- to 31-kbyte RAM	Two DMA		100 QFP, 100/128 LQFP	11 16-bit, real-time, watchdog	Five (a)synchronous, three I2C, 87 or 113 GPIO	Eight external	26-channel, 10-bit ADC; two-channel, 8-bit DAC	-40 to +85	Virtual EEPROM, PLL, CRC, three-phase, internal ring oscillator	\$6 to \$13
128- to 256-kbyte Flash, 5- to 10-kbyte RAM	Two DMA		100 QFP	11 16-bit, watchdog	Four (a)synchronous, three I2C, up to two CAN, 87 GPIO	Nine external	26-channel, 10-bit ADC; two-channel, 8-bit DAC	-40 to +85	CRC, three-phase, internal ring oscillator	\$12 to \$16
128- to 256-kbyte Flash, 10- to 20-kbyte RAM	Four DMA		100 QFP, 100/144 LQFP	11 16-bit, real-time, watchdog	I2C, five (a)synchronous, 87 or 123 GPIO	Eight external	10-channel, 10-bit ADC; two-channel, 8-bit DAC	-40 to +85	DRAMC, high-speed interrupt, XYZ, CRC, three-phase	\$15 to \$18
512-kbyte Flash, 31-kbyte RAM	Four DMA		100 QFP, 144 LQFP	11 16-bit, watchdog	Eight (a)synchronous, five I ² C, CAN, 88 or 124 GPIO	Eight external	16 or 24 10-channel 10-bit ADC; two-channel, 8-bit DAC	-40 to +85	DRAMC, XYZ, three-phase, HDLC, RTP, internal ring oscillator	\$15 to \$17
12-kbyte-144-kbyte Flash, 512 to 8192-byte RAM, 0- to 4-kbyte EEPROM			18/80 PDIP/SPDIP/SOIC/TQFP	Five 16-bit, can pair for 32-bit, watchdog	Up to two UART, CAN 2.0B, SPI, up to one I2C, codec interface, PWM, up to 54 GPIO	Up to 45 sources, seven levels	Two or four channel, 10-bit (500k samples/sec), up to 16 channel, 12-bit (100k samples/sec), 16 deep result buffer	-40 to +125	Software stack, quadrature encoder	\$3.70 to \$12.90
1-kbyte Flash, 128-byte RAM			20 TSSOP, 20 TVSOP, 24 QFN	16-bit watchdog, 16-bit PWM	14 PIO	All peripherals and I/O	slope	-40 to 85		60 cents
2-kbyte Flash, 128-byte RAM			20 TSSOP, 20 TVSOP, 24 QFN	16-bit watchdog, 16-bit PWM	14 PIO	All peripherals and I/O	slope	-40 to 85		\$1.10
4-kbyte Flash, 256-byte RAM			20 TSSOP, 20 TVSOP, 24 QFN	16-bit watchdog, 16-bit PWM	14 PIO	All peripherals and I/O	slope	-40 to 85		\$1.34
8-kbyte Flash, 256-byte RAM			64 QFP	16-bit watchdog, 16-bit PWM	USART, 48 PIO	All peripherals and I/O	slope	-40 to 85		\$1.95
16-kbyte Flash, 512-byte RAM			64 QFP	16-bit watchdog, 16-bit PWM	USART, 48 PIO	All peripherals and I/O	slope	-40 to 85		\$2.25
8-kbyte Flash, 256-byte RAM			64 QFP	Two 8-bit, 16-bit watchdog, two 16-bit PWM	48 PIO	All peripherals and I/O	Scan I/F	-40 to 85		
16-kbyte Flash, 512-byte RAM			64 QFP	Two 8-bit, 16-bit watchdog, two 16-bit PWM	48 PIO	All peripherals and I/O	Scan I/F	-40 to 85		

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16-BIT MICROPROCESSORS (by instruction set)

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
	MSP430 CW427	MSP	Up to 8	16/16	16	1.8 to 3.6	250 mA/MIP	standby: 0.8 mA off: 0.1 mA			
	MSP430 F1101A	MSP	Up to 8	16/16	16	1.8 to 3.6	250 mA/MIP	standby: 0.8 mA off: 0.1 mA			
	MSP430 F1121A	MSP	Up to 8	16/16	16	1.8 to 3.6	250 mA/MIP	standby: 0.8 mA off: 0.1 mA			
	MSP430 F1122	MSP	Up to 8	16/16	16	1.8 to 3.6	250 mA/MIP	standby: 0.8 mA off: 0.1 mA			
	MSP430 F1132	MSP	Up to 8	16/16	16	1.8 to 3.6	250 mA/MIP	standby: 0.8 mA off: 0.1 mA			
	MSP430 F122	MSP	Up to 8	16/16	16	1.8 to 3.6	250 mA/MIP	standby: 0.8 mA off: 0.1 mA			
	MSP430 F1222	MSP	Up to 8	16/16	16	1.8 to 3.6	250 mA/MIP	standby: 0.8 mA off: 0.1 mA			
	MSP430 F123	MSP	Up to 8	16/16	16	1.8 to 3.6	250 mA/MIP	standby: 0.8 mA off: 0.1 mA			
	MSP430 F1232	MSP	Up to 8	16/16	16	1.8 to 3.6	250 mA/MIP	standby: 0.8 mA off: 0.1 mA			
	MSP430 F133	MSP	Up to 8	16/16	16	1.8 to 3.6	250 mA/MIP	standby: 0.8 mA off: 0.1 mA			
	MSP430 F135	MSP	Up to 8	16/16	16	1.8 to 3.6	250 mA/MIP	standby: 0.8 mA off: 0.1 mA			
	MSP430 F147	MSP	Up to 8	16/16	16	1.8 to 3.6	250 mA/MIP	standby: 0.8 mA off: 0.1 mA	One-cycle MPY, MPYS, MAC, MACS		
	MSP430 F1471	MSP	Up to 8	16/16	16	1.8 to 3.6	250 mA/MIP	standby: 0.8 mA off: 0.1 mA	One-cycle MPY, MPYS, MAC, MACS		
	MSP430 F148	MSP	Up to 8	16/16	16	1.8 to 3.6	250 mA/MIP	standby: 0.8 mA off: 0.1 mA	One-cycle MPY, MPYS, MAC, MACS		
	MSP430 F1481	MSP	Up to 8	16/16	16	1.8 to 3.6	250 mA/MIP	standby: 0.8 mA off: 0.1 mA	One-cycle MPY, MPYS, MAC, MACS		
	MSP430 F149	MSP	Up to 8	16/16	16	1.8 to 3.6	250 mA/MIP	standby: 0.8 mA off: 0.1 mA	One-cycle MPY, MPYS, MAC, MACS		
	MSP430 F1491	MSP	Up to 8	16/16	16	1.8 to 3.6	250 mA/MIP	standby: 0.8 mA off: 0.1 mA	One-cycle MPY, MPYS, MAC, MACS		
	MSP430 F155	MSP	Up to 8	16/16	16	1.8 to 3.6	250 mA/MIP	standby: 0.8 mA off: 0.1 mA			
	MSP430 F156	MSP	Up to 8	16/16	16	1.8 to 3.6	250 mA/MIP	standby: 0.8 mA off: 0.1 mA			
	MSP430 F157	MSP	Up to 8	16/16	16	1.8 to 3.6	250 mA/MIP	standby: 0.8 mA off: 0.1 mA			
	MSP430 F1610	MSP	Up to 8	16/16	16	1.8 to 3.6	250 mA/MIP	standby: 0.8 mA off: 0.1 mA	One-cycle MPY, MPYS, MAC, MACS		

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(by instruction set) 16-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)
32-kbyte Flash, 1024-byte RAM			64 QFP	Two 8-bit, 16-bit watchdog, two 16-bit PWM	48 PIO	All peripherals and I/O	Scan I/F	-40 to 85		
1-kbyte Flash, 128-byte RAM			20 TSSOP, 20 TVSOP, 24 QFN	16-bit watchdog, 16-bit PWM	14 PIO	All peripherals and I/O	slope	-40 to 85		99 cents
4-kbyte Flash, 256-byte RAM			20 TSSOP, 20 TVSOP, 24 QFN	16-bit watchdog, 16-bit PWM	14 PIO	All peripherals and I/O	slope	-40 to 85		\$1.74
4-kbyte Flash, 256-byte RAM			20 TSSOP, 20 TVSOP, 24 QFN	16-bit watchdog, 16-bit PWM	14 PIO	All peripherals and I/O	Five channel, 10-bit	-40 to 85		\$2.24
8-kbyte Flash, 256-byte RAM			20 TSSOP, 20 TVSOP, 24 QFN	16-bit watchdog, 16-bit PWM	14 PIO	All peripherals and I/O	Five channel, 10-bit	-40 to 85		\$2.48
4-kbyte Flash, 256-byte RAM			28 SOP, 28 TSSOP	16-bit watchdog, 16-bit PWM	USART, 22 PIO	All peripherals and I/O	slope	-40 to 85		\$2.39
4-kbyte Flash, 256-byte RAM			28 SOP, 28 TSSOP	16-bit watchdog, 16-bit PWM	USART, 22 PIO	All peripherals and I/O	Eight channel, 10-bit	-40 to 85		\$2.62
8-kbyte Flash, 256-byte RAM			28 SOP, 28 TSSOP	16-bit watchdog, 16-bit PWM	USART, 22 PIO	All peripherals and I/O	slope	-40 to 85		\$2.51
8-kbyte Flash, 256-byte RAM			28 SOP, 28 TSSOP	16-bit watchdog, 16-bit PWM	USART, 22 PIO	All peripherals and I/O	Eight channel, 10-bit	-40 to 85		\$2.79
8-kbyte Flash, 256-byte RAM			64 QFP	16-bit watchdog, 16-bit PWM	USART, 48 PIO	All peripherals and I/O	Eight channel, 12-bit	-40 to 85		\$2.96
16-kbyte Flash, 512-byte RAM			64 QFP	16-bit watchdog, 16-bit PWM	USART, 48 PIO	All peripherals and I/O	Eight channel, 12-bit	-40 to 85		\$3.55
32-kbyte Flash, 1024-byte RAM			64 QFP	16-bit watchdog, 16-bit PWM	Two USART, 48 PIO	All peripherals and I/O	Eight channel, 12-bit	-40 to 85		\$4.95
32-kbyte Flash, 1024-byte RAM			64 QFP	16-bit watchdog, 16-bit PWM	Two USART, 48 PIO	All peripherals and I/O	slope	-40 to 85		\$4.60
48-kbyte Flash, 2048-byte RAM			64 QFP	16-bit watchdog, 16-bit PWM	Two USART, 48 PIO	All peripherals and I/O	Eight channel, 12-bit	-40 to 85		\$5.65
48-kbyte Flash, 2048-byte RAM			64 QFP	16-bit watchdog, 16-bit PWM	Two USART, 48 PIO	All peripherals and I/O	slope	-40 to 85		\$5.30
60-kbyte Flash, 2048-byte RAM			64 QFP	16-bit watchdog, 16-bit PWM	Two USART, 48 PIO	All peripherals and I/O	Eight channel, 12-bit	-40 to 85		\$5.95
60-kbyte Flash, 2048-byte RAM			64 QFP	16-bit watchdog, 16-bit PWM	Two USART, 48 PIO	All peripherals and I/O	slope	-40 to 85		\$5.60
16-kbyte Flash, 512-byte RAM			64 QFP	16-bit watchdog, 16-bit PWM	USART, 48 PIO	All peripherals and I/O	Eight-channel, 12-bit ADC; two-channel, 12-bit DAC	-40 to 85		\$4.95
24-kbyte Flash, 1024-byte RAM			64 QFP	16-bit watchdog, 16-bit PWM	USART, 48 PIO	All peripherals and I/O	Eight-channel, 12-bit ADC; two-channel, 12-bit DAC	-40 to 85		\$5.65
32-kbyte Flash, 1024-byte RAM			64 QFP	16-bit watchdog, 16-bit PWM	USART, 48 PIO	All peripherals and I/O	Eight-channel, 12-bit ADC; two-channel, 12-bit DAC	-40 to 85		\$5.85
32-kbyte Flash, 5120-byte RAM			64 QFP	16-bit watchdog, 16-bit PWM	Two USART, 48 PIO	All peripherals and I/O	Eight-channel, 12-bit ADC; two-channel, 12-bit DAC	-40 to 85		\$8.45

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16-BIT MICROPROCESSORS (by instruction set)

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
	MSP430 F1611	MSP	Up to 8	16/16	16	1.8 to 3.6	250 mA/MIP	standby: 0.8 mA off: 0.1 mA	One-cycle MPY, MPYS, MAC, MACS		
	MSP430 F167	MSP	Up to 8	16/16	16	1.8 to 3.6	250 mA/MIP	standby: 0.8 mA off: 0.1 mA	One-cycle MPY, MPYS, MAC, MACS		
	MSP430 F168	MSP	Up to 8	16/16	16	1.8 to 3.6	250 mA/MIP	standby: 0.8 mA off: 0.1 mA	One-cycle MPY, MPYS, MAC, MACS		
	MSP430 F169	MSP	Up to 8	16/16	16	1.8 to 3.6	250 mA/MIP	standby: 0.8 mA off: 0.1 mA	One-cycle MPY, MPYS, MAC, MACS		
	MSP430 F412	MSP	Up to 8	16/16	16	1.8 to 3.6	250 mA/MIP	standby: 0.8 mA off: 0.1 mA			
	MSP430 F413	MSP	Up to 8	16/16	16	1.8 to 3.6	250 mA/MIP	standby: 0.8 mA off: 0.1 mA			
	MSP430 F435	MSP	Up to 8	16/16	16	1.8 to 3.6	250 mA/MIP	standby: 0.8 mA off: 0.1 mA			
	MSP430 F436	MSP	Up to 8	16/16	16	1.8 to 3.6	250 mA/MIP	standby: 0.8 mA off: 0.1 mA			
	MSP430 F437	MSP	Up to 8	16/16	16	1.8 to 3.6	250 mA/MIP	standby: 0.8 mA off: 0.1 mA			
	MSP430 F447	MSP	Up to 8	16/16	16	1.8 to 3.6	250 mA/MIP	standby: 0.8 mA off: 0.1 mA	One-cycle MPY, MPYS, MAC, MACS		
	MSP430 F448	MSP	Up to 8	16/16	16	1.8 to 3.6	250 mA/MIP	standby: 0.8 mA off: 0.1 mA	One-cycle MPY, MPYS, MAC, MACS		
	MSP430 F449	MSP	Up to 8	16/16	16	1.8 to 3.6	250 mA/MIP	standby: 0.8 mA off: 0.1 mA	One-cycle MPY, MPYS, MAC, MACS		
	MSP430 FE423	MSP	Up to 8	16/16	16	1.8 to 3.6	250 mA/MIP	standby: 0.8 mA off: 0.1 mA			
	MSP430 FE425	MSP	Up to 8	16/16	16	1.8 to 3.6	250 mA/MIP	standby: 0.8 mA off: 0.1 mA			
	MSP430 FE427	MSP	Up to 8	16/16	16	1.8 to 3.6	250 mA/MIP	standby: 0.8 mA off: 0.1 mA			
	MSP430 FW423	MSP	Up to 8	16/16	16	1.8 to 3.6	250 mA/MIP	standby: 0.8 mA off: 0.1 mA			
	MSP430 FW425	MSP	Up to 8	16/16	16	1.8 to 3.6	250 mA/MIP	standby: 0.8 mA off: 0.1 mA			
	MSP430 FW427	MSP	Up to 8	16/16	16	1.8 to 3.6	250 mA/MIP	standby: 0.8 mA off: 0.1 mA			

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(by instruction set) 16-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)
48-kbyte Flash, 10.2-kbyte RAM			64 QFP	16-bit watchdog, 16-bit PWM	Two USART, 48 PIO	All peripherals and I/O	Eight channel 12-bit ADC, two channel 12-bit DAC	-40 to 85		\$8.95
32-kbyte Flash, 1024-byte RAM			64 QFP	16-bit watchdog, 16-bit PWM	Two USART, 48 PIO	All peripherals and I/O	Eight channel 12-bit ADC, two channel 12-bit DAC	-40 to 85		\$6.73
48-kbyte Flash, 2048-byte RAM			64 QFP	16-bit watchdog, 16-bit PWM	Two USART, 48 PIO	All peripherals and I/O	Eight channel 12-bit ADC, two channel 12-bit DAC	-40 to 85		\$7.45
60-kbyte Flash, 2048-byte RAM			64 QFP	16-bit watchdog, 16-bit PWM	Two USART, 48 PIO	All peripherals and I/O	Eight channel 12-bit ADC, two channel 12-bit DAC	-40 to 85		\$7.95
4-kbyte Flash, 256-byte RAM			64 QFP	Two 8-bit, 16-bit watchdog, 16-bit PWM	48 PIO	All peripherals and I/O	slope	-40 to 85		\$2.55
8-kbyte Flash, 256-byte RAM			64 QFP	Two 8-bit, 16-bit watchdog, 16-bit PWM	48 PIO	All peripherals and I/O	slope	-40 to 85		\$2.90
16-kbyte Flash, 512-byte RAM			80/100 LQFP	Two 8-bit, 16-bit watchdog, two 16-bit PWM	USART, 48 PIO	All peripherals and I/O	Eight channel, 12-bit	-40 to 85		\$4.40
24-kbyte Flash, 1024-byte RAM			80/100 LQFP	Two 8-bit, 16-bit watchdog, two 16-bit PWM	USART, 48 PIO	All peripherals and I/O	Eight channel, 12-bit	-40 to 85		\$4.65
32-kbyte Flash, 1024-byte RAM			80/100 LQFP	Two 8-bit, 16-bit watchdog, two 16-bit PWM	USART, 48 PIO	All peripherals and I/O	Eight channel, 12-bit	-40 to 85		\$4.85
32-kbyte Flash, 1024-byte RAM			100 LQFP	Two 8-bit, 16-bit watchdog, two 16-bit PWM	Two USART, 48 PIO	All peripherals and I/O	Eight channel, 12-bit	-40 to 85		\$5.65
48-kbyte Flash, 2048-byte RAM			100 LQFP	Two 8-bit, 16-bit watchdog, two 16-bit PWM	Two USART, 48 PIO	All peripherals and I/O	Eight channel, 12-bit	-40 to 85		\$6.40
60-kbyte Flash, 2048-byte RAM			100 LQFP	Two 8-bit, 16-bit watchdog, two 16-bit PWM	Two USART, 48 PIO	All peripherals and I/O	Eight channel, 12-bit	-40 to 85		\$6.95
8-kbyte Flash, 256-byte RAM			80 LQFP	Two 8-bit, 16-bit watchdog, two 16-bit PWM	USART, 48 PIO	All peripherals and I/O	16-bit	-40 to 85		
16-kbyte Flash, 512-byte RAM			80 LQFP	Two 8-bit, 16-bit watchdog, two 16-bit PWM	USART, 48 PIO	All peripherals and I/O	16-bit	-40 to 85		
32-kbyte Flash, 1024-byte RAM			80 LQFP	Two 8-bit, 16-bit watchdog, two 16-bit PWM	USART, 48 PIO	All peripherals and I/O	16-bit	-40 to 85		
8-kbyte Flash, 256-byte RAM			64 QFP	Two 8-bit, 16-bit watchdog, two 16-bit PWM	48 PIO	All peripherals and I/O	Scan I/F	-40 to 85		
16-kbyte Flash, 512-byte RAM			64 QFP	Two 8-bit, 16-bit watchdog, two 16-bit PWM	48 PIO	All peripherals and I/O	Scan I/F	-40 to 85		
32-kbyte Flash, 1024-byte RAM			64 QFP	Two 8-bit, 16-bit watchdog, two 16-bit PWM	48 PIO	All peripherals and I/O	Scan I/F	-40 to 85		

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16-BIT MICROPROCESSORS (by instruction set)

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
	MSP430 X1XX	MSP	Up to 8	16/16	16	1.8 to 3.6	250 mA/MIP	standby: 0.8 mA off: 0.1 mA	One-cycle MPY, MPYS, MAC, MACS		
	MSP430 X4XX	MSP	Up to 8	16/16	16	1.8 to 3.6	250 mA/MIP	standby: 0.8 mA off: 0.1 mA	One-cycle MPY, MPYS, MAC, MACS		
	MSP430 XF1111A	MSP	Up to 8	16/16	16	1.8 to 3.6	250 mA/MIP	standby: 0.8 mA off: 0.1 mA			
STMicroelectronics www.st.com	ST92F250 ST92F150 ST92F124	ST9	24	external: 22/8	8, 16	4.5 to 5.5	45 mA	Slow: 2.5 mA/MHz halt/stop: 10 mA	Hardware multiply and divide		
Toshiba America Electronic Components www.toshiba.com	900/H family	TLCS	Up to 25	24/16	8, 16, 32	2.7 to 5.5	40 mA	Idle2: 30 mA idle1: 3.5 mA stop: 0.5 mA	16x16 to 32-bits signed/unsigned		
	900/L family	TLCS	Up to 20	24/16	8, 16, 32	2.7 to 5.5	24 mA	Run: 17 mA idle2: 2.5 mA idle1: 0.7mA stop: 0.2 mA	16x16 to 32-bits signed/unsigned		
	900/L1 family	TLCS	Up to 27	24/16	8, 16, 32	1.8 to 5.5	30 mA	Idle2: 4.5 mA idle1: 2 mA stop: 1.0 mA	16x16 to 32-bits signed/unsigned		
Intel www.intel.com	80C186EA/XL 80C188EA/XL		8, 12, 13, 20, 25	external: 16/16	8, 16	3, 5	100 to 105 mA	Idle, powerdown, powersave		Co-processor	
	80C186EB 80C188EB		8, 13, 16, 20, 25	external: 16/16	8, 16	3, 5	115 mA	Idle, powerdown		Co-processor	
	80C186EC 80C188EC		13, 16, 20, 25	external: 16/16	8, 16	5/3, 5.5 tolerant	125 mA	Idle, powerdown, powersave		Co-processor	
	MCS-296 80C296SA		40, 50	16 to 24/16	24	4.4 to 5.5	150 mA	Idle, powerdown	Enhanced instructions, 40-bit accumulator		
	MCS-96 EPA 8XC196 Cx/Nx/EA		14, 16, 20, 25, 40, 50	16 to 24/16	24	4.4 to 5.5	150 mA	Idle, powerdown			
	MCS-96 HSIO 8XC196Kx		16, 20	16 to 24/16	24	4.4 to 5.5	150 mA	Idle, powerdown			
	MCS-96 Motion 8XC196Mx		16	16 to 24/16	24	4.4 to 5.5	150 mA	Idle, powerdown			
National Semiconductor www.national.com	CP3000 family		24	16/16	16	2.25 to 2.75/ 2.25 to 3.63	33 mW	Active idle: 2.5 mW sleep: 800 mW	16x16 MAC		

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(by instruction set) 16-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)
1 to 60-kbyte Flash, up to 10-kbyte of RAM			20 TSSOP, 20 TVSOP, 24 QFN, 28 SOP, 28 TSSOP, 64 QFP	16-bit watchdog, two 16-bit PWM	Up to two USART, 48 PIO	All peripherals and I/O	Up to 12-bit	-40 to 85		99 cents to \$8.95
4 to 60-kbyte Flash, up to 2-kbyte of RAM			64 QFP, 80/100 LQFP	Two 8-bit, 16-bit watchdog, two 16-bit PWM	Up to two USART, 48 PIO	All peripherals and I/O	Up to 12-bit	-40 to 85		\$2.55 to \$6.95
2-kbyte Flash, 128-byte RAM			20 TSSOP, 20 TVSOP, 24 QFN	16-bit watchdog, 16-bit PWM	14 PIO	All peripherals and I/O	slope	-40 to 85		\$1.34
64K to 256-kbyte Flash or ROM, 2- to 8-kbyte SRAM, 1-kbyte E2PROM	Up to 4-mbyte, 8- or 16-bit wide data, multiplexed or demultiplexed	Yes	100 PQFP, 64/100 TQFP	Two 16-bit, two extended, watchdog	Two CAN, J1850, two UART, I ² C, SPI	128, 23 external, seven levels, NMI	16 channel, 10-bit	0 to +70 -40 to +85 -40 to +105 -40 to +125		\$4.90 to \$6.50
Up to 256-kbyte of ROM/Flash, up to 8-kbyte of RAM	Four micro DMA channels		64/144 QFP/LQFP	Up to eight 8-bit, up to two 16-bit, 22-bit watchdog	Up to three UART, synchronous SIO, SEI, CAN, IrDA, I2C, up to 81 PIO	28, nine CPU, 10 external, seven levels	Up to eight channel, 10-bit		Four 32-bit register banks	\$3.75 to \$8
Up to 192-kbyte of ROM, up to 4-kbyte of RAM	Four micro DMA channels		80/100 QFP, 44/100 LQFP	Up to four 8-bit, up to five 16-bit, 22-bit watchdog, 8/14-bit PWM	Up to five UART, synchronous SIO, I2C, up to 85 PIO	14, nine CPU, six external, seven levels	16-channel (maximum), 8-bit ADC; eight-channel (maximum), 10-bit DAC		Four 32-bit register banks	\$3 to \$10
Up to 256-kbyte of ROM/Flash, up to 16-kbyte of SRAM	Four micro DMA channels	Yes	64/144 QFP/LQFP	Up to eight 8-bit, up to two 16-bit, 22-bit watchdog, real-time, 8/16-bit PWM	Up to five UART, synchronous SIO, SIE, CAN, I2C, up to 81 PIO	28, nine CPU, 10 external, seven levels	Up to 12 channel, 10-bit		Four 32-bit register banks	\$4.50 to \$10
			68 PLCC, 68 PGA, 68 LCC, 80 QFP, 80 SQFP	Three 16-bit		Two, five external				\$3.90 to \$20.35
			80 QFP, 80 SQFP, 84 PLCC	Three 16-bit	Two	Up to 129 external				\$5.05 to \$7.75
			100 QFP(EIAJ)/PQFP/SQFP	Three 16-bit	Two	External (8259A)				\$8.81 to \$10
512-byte register RAM, 2-kbyte code RAM			SQFP	Two 16-bit, PWM	UART	19			Six chip selects, 6-Mbyte linear address range, EPA	\$14 to \$15.40
4-, 32-, 56-kbyte OTP, ROM, 1000-, 1500-byte register RAM, 256-, 512-, 3072-byte Code RAM			PLCC, QFP, SQFP, SDIP, CDIP	Two to four 16-bit, PWM, HSIO	One to three UART, CAN 2.0 (CA/CB)	19 to 37	Eight channel, 10 bit		EPA	\$11.73 to \$19.53
8-, 16-, 32-kbyte OTP, ROM, 232-, 488-, 1000-byte register RAM			PLCC, QFP	Two 16-bit, PWM, HSIO	UART	19 to 37	Eight channel, 10 bit		PTS	\$5.27 to \$16.07
16-, 32-kbyte OTP, ROM, 488-, 744-byte register RAM			PLCC, QFP, SQFP	Two 16-bit, PWM, HSIO	Two UART (MH only)	19 to 37	Eight channel, 10 bit		PTS, three-phase waveform generator, frequency generator	\$7.33 to \$13.33
64- to 256-kbyte Flash	8-kbyte data Flash, up to 32-kbyte SRAM		48 to 144	Four 8-bit, Two 16-bit, PWM	USB, SPI, up to two CAN, up to four USART, up to two I2C	Up to 30 vectored peripheral interrupts	Eight channel, 12 bit	-40 to +85	Touchscreen drivers (on parts with ADC)	\$4.00 to \$12.00