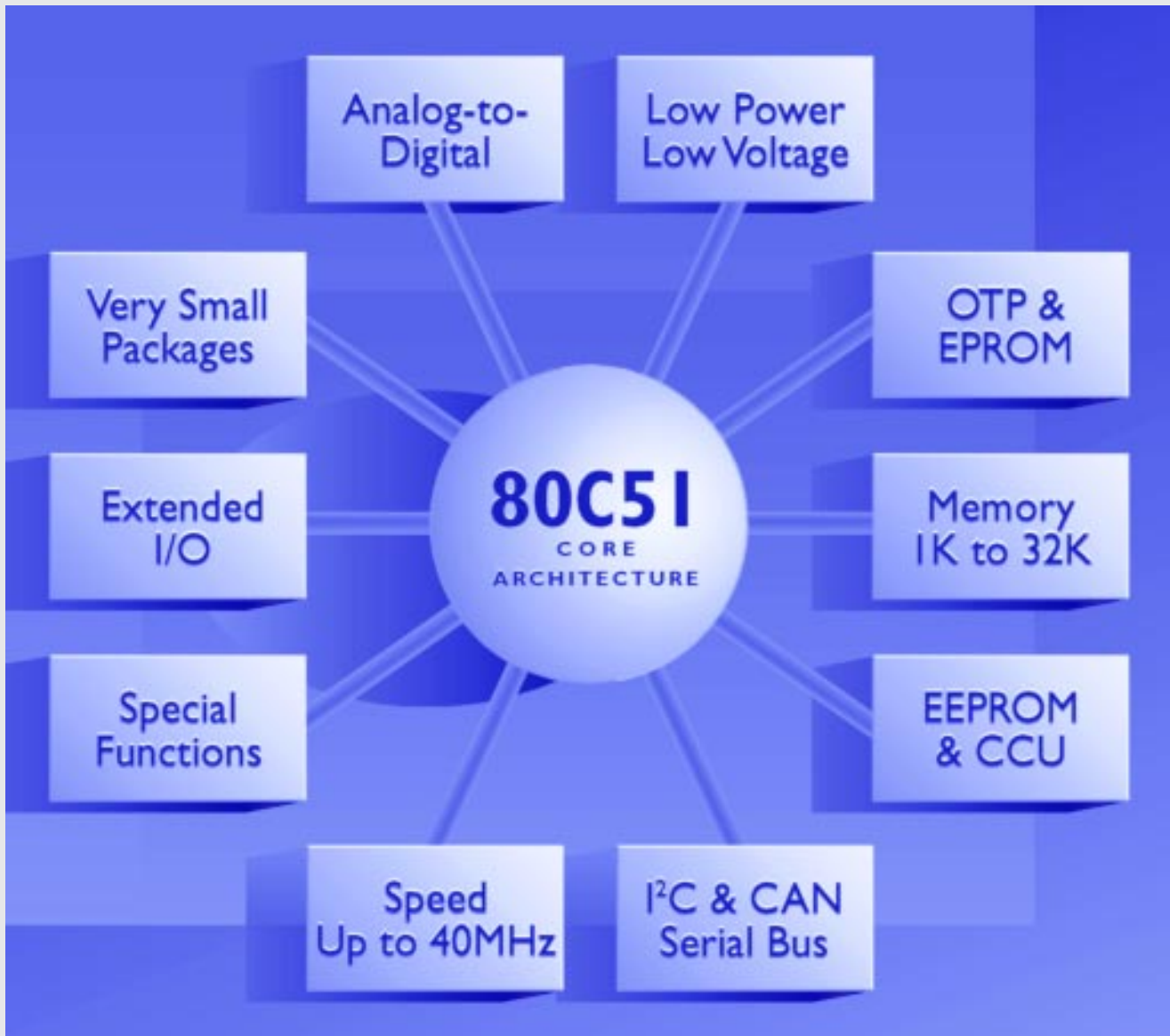


Selection Guide for the 80C51 Microcontroller Family

January 1995



When you need microcontroller solutions, you want options.

Now you can choose among the largest selection of feature-rich 80C51 derivatives in the world.

Philips has developed the broadest line of derivative devices in the industry, all based on the 80C51 core architecture. Designed for real-time applications, these 80C51 derivative products are used in applications ranging from consumer products and computer peripherals to automotive systems and aerospace designs.

When you need a full range of memory options for your microcontroller applications, turn to Philips 80C51 derivatives for: EPROM, OTP, and masked-ROM from 1K to 32K; and ROMless versions that can address up to 64K bytes of external memory. If your application requires more than 64K bytes, you can combine Philips ROMless devices with our PSD external EPROM memory family for up to 128K bytes of program memory and 2K bytes of data memory. With the PSD family you can even increase memory capacity of our 3 Volt products without increasing the voltage requirements of your design.

For applications operating on battery power, low-power devices are essential. Philips has a growing family of 80C51 microcontrollers that operate down to 1.8V—significantly lower than most other 80C51 microcontrollers on the market. Philips low-power microcontrollers also have idle and power-down modes that can reduce total power consumption and allow you to get maximum battery life from your application. So, Philips low-power microcontrollers give you an important advantage over your competitors.

To make the selection of Philips 80C51 derivative microcontrollers easy, the following pages summarize the available devices in seven key categories. A complete listing of the full family of Philips 80C51 microcontrollers, divided by memory size, may be found on the last four pages of this brochure. Each category features key design solutions and highlights individual product features.

These feature categories include:

Memory and Speed

Devices listed in this section by memory size include the 8XC750, the smallest 80C51 with 1K of ROM/OTP in the very small SSOP package, and the fastest 80C51 with speed up to 40MHz. And there are eight 32K byte ROM or EPROM/OTP devices including the highly integrated 8XC558.

Counters/Timers

Philips offers the widest selection of derivatives with built-in counters and timers including Watchdog timers and Programmable Counter Arrays (PCA).

Serial Interface

Offering more serial interface options than any other supplier, Philips microcontrollers feature I²C, UART, enhanced UART, ACCESS.bus, and CAN bus interface options to meet your needs.

Low Voltage Operation

Philips offers a full family of low voltage derivatives including low volt OTP devices optimized at 20MHz.

Analog Features

With a variety of devices featuring 8- and 10-bit A/D converters, Philips has the products to meet your specific analog-to-digital application needs.

Protection Capabilities and Reduced EMI/RFI

Philips offers several built-in protection circuits such as Watchdog, oscillator failure detection, and low V_{cc} detection capabilities. And, as the demand for reduced EMI products rises, Philips family of devices with low EMI/RFI grows to meet that demand.

Additional Features

Many of Philips unique additional features are detailed in this section including: On-Screen Display, Universal Peripheral Interface, Smart Card, and the PSD family of peripheral devices.

Microcontroller Characteristic Guide

Philips created the "Microcontroller Characteristic Guide," found on the last four pages of this brochure, as a quick-reference for the full line of Philips 80C51 derivatives.

Memory and Speed

The Philips family of 80C51 derivative microcontrollers provides the broadest range of memory and speed capabilities offered by any supplier.

OTP/EPROM

Philips offers more OTPs than any other microcontroller supplier, providing effective solutions for prototyping, low- and high-volume production runs, and applications requiring unique codes.

At each step of the design cycle, Philips' broad range of user-programmable devices provides outstanding flexibility and choice. From the software development stage through device emulation and the system debug stage, our windowed ceramic EPROM devices are the most effective solutions to your design challenges. Because these devices are UV erasable, you can reuse them until your design is perfected.

Early in the production phase, OTP devices are ideal because they provide the flexibility to make software changes quickly and easily. In many applications, OTP devices are being used for volume production runs because they allow you to respond quickly to changes in production requirements. And, if you have to make a software change during production, OTP devices allow you to put the software changes into production at a lower cost—because there are no NRE (Non-Recurring Engineering) charges, no work-in-process charges, no need to scrap large amounts of inventory, and none of the long leadtimes required by mask devices. Best of all, OTP devices mean you can respond to your market quickly.

EEPROM

EEPROM memory means *you* decide when you want to program—either in circuit or in a programmer.

With the Philips 89CE558 (FLASH), 83C852 and 8XC851 we are now offering a range of 80C51 microcontrollers that have EEPROM memory. EEPROM is available as either data memory or program memory. The 83C852 and 8XC851 have EEPROM data memory that stores critical data even when power is turned off.

EEPROM program memory is electrically erasable and can be erased and programmed in or out of circuit. This non-volatile memory makes field upgrades and design changes easier because the part can be reprogrammed without removing it from the circuit board. With the 89CE558, supporting 32K of FLASH EEPROM memory, you can choose to erase only selected sectors of data.

Speed and Performance

Philips offers high performance 80C51s that run at speeds up to 40MHz. That means you may not have to move up to a more expensive microcontroller architecture to get the processing power you need. If your design requires low power dissipation and speed is not that important, you can select from devices that operate down to DC and feature static operation.

Philips is the first to offer 3V operation without sacrificing speed. Philips developed processing capability that yields high speed and low voltage operation. The 8XL51FX is Philips' first family of microcontrollers that operates at 3V with oscillator frequencies up to 20MHz.

MEMORY AND SPEED

Memory Size	Part Number	OTP/EPROM (Bytes)	ROM (Bytes)	RAM (Bytes)	External Memory Capability	Speed (MHz) Min-Max	Comments/ Special Features
1K	83C750/87C750	1K	1K	64	No	3.5-40	40 MHz, Lowest Cost, 24-pin Skinny DIP and SSOP
2K	83C748/87C748*	2K	2K	64	No	3.5-16	Low-Cost, 24-pin Skinny DIP and SSOP
	83C751/87C751	2K	2K	64	No	3.5-16	Low-Cost 24-pin Skinny DIP and SSOP
	83C749/87C749*	2K	2K	64	No	3.5-16	5 Channel 8-bit A/D, PWM Output and SSOP
	83C752/87C752	2K	2K	64	No	3.5-16	5 Channel 8-bit A/D, PWM Output and SSOP
4K	80C31/80C51/87C51	4K	4K	128	Yes	3.5-33	Industry Standard
	80CL31/80CL51		4K	128	Yes	0-16	Low Voltage (1.8V to 6V), Low Power
	80CL410/83CL410		4K	128	Yes	0-12	Low Voltage (1.8V to 6V), Low Power
	80C451/83C451/87C451	4K	4K	128	Yes	3.5-16	Extended I/O, Processor Bus Interface
	80C550/83C550/87C550	4K	4K	128	Yes	3.5-16	8 Channel 8-bit A/D
	80C851/83C851		4K	128	Yes	1.2-16	128 bytes SRAM, 256 bytes EEPROM, 80C51 Pin-Compatible
	83C542/87C542*	4K	4K	256	No	3.5-16	ACCESS.bus, replaces 8042 Keyboard Controller
	83C852		6K	256	No	1-12	Smart Card with 2K EEPROM, 256 bytes SRAM, (Data, Code) CCU
6K	80CL580/83CL580		6K	256	Yes	0-12	4 Ch 8-bit A/D, PWM Output, Low Power/Volt (2.5V to 6V)
	80C32/80C52/87C52	8K	8K	256	Yes	3.5-24	Industry Standard
8K	80C652/83C652		8K	256	Yes	1.2-24	80C51 Pin-Compatible
	87C652	8K		256	Yes	1.2-20	80C51 Pin-Compatible
	80C453/83C453/87C453*	8K	8K	256	Yes	3.5-16	Extended I/O, Processor Bus Interface
	83C51FA/87C51FA	8K	8K	256	Yes	3.5-24	Enhanced UART, 3 Timers + PCA
	83L51FA/87L51FA	8K	8K	256	Yes	3.5-20	Low Voltage 8XC51FA (3V@20MHz), 87L51FA is OTP
	80C575/83C575/87C575	8K	8K	256	Yes	4-16	High Rel, Low Vcc/Osc Fail Detect, Analog Comparators, PCA
	80C576/83C576/87C576	8K	8K	256	Yes	4-16	Same as 8XC575 plus UPI and 10-bit A/D
	80C562/83C562		8K	256	Yes	1.2-16	8 Channel 8-bit A/D, 2 PWM Outputs, Capture/Compare Timer
	80C552/83C552		8K	256	Yes	1.2-30	8 Channel 10-bit A/D, 2 PWM Outputs, Capture/Compare Timer
	87C552	8K		256	Yes	1.2-16	8 Channel 10-bit A/D, 2 PWM Outputs, Capture/Compare Timer
	12K	83CL267		12K	256	No	4-8
83CL268			12K	256	No	4-8	OSD, 9 PWM Outputs, 4 Channel 4-bit A/D, 8 LED Drivers
16K	83C055/87C055	16K	16K	256	No	3.5-20	OSD, 9 PWM Outputs, 3 Software A/D Inputs
	80C54/87C54*	16K	16K	256	Yes	3.5-16	Enhanced UART, Industry Standard, 8XC51 Pin-Compatible
	80C504/83C504/87C504*	16K	16K	256	Yes	1.2-20	8XC654 with Hardware Divide (no I ² C), Enhanced UART
	83C654		16K	256	Yes	1.2-24	80C51 Pin-Compatible
	87C654	16K		256	Yes	1.2-20	80C51 Pin-Compatible
	83CE654		16K	256	Yes	1.2-16	83C654 with Reduced EMI
	83CL781		16K	256	Yes	0-12	Low Voltage (1.8V to 6V), Low Power
	83CL782		16K	256	Yes	0-12	83CL781 Optimized for 12MHz@3.1V
	83C51FB/87C51FB	16K	16K	256	Yes	3.5-24	Enhanced UART, 3 Timers + PCA
	83L51FB/87L51FB	16K	16K	256	Yes	3.5-20	Low Voltage OTP 87C51FB (3V@20MHz)
	83CL167		16K	256	No	4-8	OSD, 9 PWM Outputs, 4 Channel 4-bit A/D, 8 LED Drivers
	83CL168		16K	256	No	4-8	OSD, 9 PWM Outputs, 4 Channel 4-bit A/D, 8 LED Drivers
	83C524		16K	512	Yes	1.2-16	512 RAM
87C524	16K		512	Yes	3.5-20	512 RAM	
80C592/83C592/87C592	16K	16K	512	Yes	1.2-16	CAN Bus, 8x10-bit A/D, 2 PWM Outputs, Capture/Compare	
32K	80C58/87C58*	32K	32K	256	Yes	3.5-16	Industry Standard, 80C51 Pin-Compatible, Enhanced UART
	83C51FC/87C51FC*	32K	32K	256	Yes	3.5-24	Enhanced UART, 3 Timers + PCA
	80C528/83C528		32K	512	Yes	1.2-16	Large Memory for High Level Languages
	87C528	32K		512	Yes	3.5-20	Large Memory for High Level Languages
	80CE528/83CE528*		32K	512	Yes	3.5-16	Reduced EMI, and Large Memory for High Level Languages
	80CE598/83CE598/87CE598*	32K	32K	512	Yes	1.2-16	CAN Bus, 8x10-bit A/D, Low EMI, 2 PWM Outputs, Enhanced UART
	80CE558/83CE558	32K		1024	Yes	3.5-16	Low EMI, 8 Channel 10-bit A/D, 2 PWM Outputs, Capture/Compare Timer
	89CE558	32K		1024	Yes	3.5-16	32K FLASH EEPROM, Low EMI, 8 Channel 10-bit A/D, 2 PWM Outputs, Capture/Compare Timer

* Added since previous publication

Counters/Timers

To better meet your design needs, Philips offers a wide range of timer configurations on many of its microcontrollers, including the three standard 16-bit 80C51 timers: Timer 0, Timer 1, and Timer 2. We also offer enhancements to these standard timers on selected products that feature other specialized timers, such as PCAs and hardware Watchdog timers.

PCA

The Philips PCA (Programmable Counter Array) is identical in function to the industry-standard PCA and offers significant timing advantages over standard 80C51 timers.

A PCA is a special timer with five associated 16-bit capture/compare modules. Offered as an integral part of the device to enable you to simplify your software design, each module of the PCA can be programmed individually to operate in one of four modes: rising- and/or falling-edge capture, software timer, high-speed output, or pulse width modulator. And each PCA module has an associated pin in Port 1 which you can use as input or output for that module.

All of our microcontrollers that feature a PCA, such as the 8XC51FX family, the 8XC575 and the 8XC576, are ideal for applications requiring pulse width modulation, high-speed I/O, and counting capabilities. Some key applications most likely to benefit from the PCA are automotive control, cellular and cordless phones, high-end storage device controls, instrumentation, medical diagnostics, power supply control and sequencing, and monitoring equipment.

Hardware Watchdog Timer

The Philips hardware Watchdog timer assures you that the microcontroller in your application will continue to operate properly.

Watchdog timers protect your design from disruptions to microcontroller execution, which can be caused by voltage spiking or other external conditions. If a Watchdog timer is allowed to overflow, it will reset the microcontroller. To prevent an overflow, a Watchdog timer must be cleared before it overflows. A specific load sequence is used to clear the timer so it can't be cleared accidentally. The timeout period for the Philips Watchdog timer is adjustable from 2,000 instruction cycles to 512,000. (See also Protection Capabilities section for more information on the special features of the Philips Watchdog timer.)

COUNTERS/TIMERS

Device	Timer Types	Capture	Compare	High-Speed Outputs					
1 Timer	83C750/87C750								
	83C751/87C751								
	83C752/87C752								
2 Timers	83C748/87C748*		TR						
	83C749/87C749*		TR						
	80C31/80C51/87C51	T0	T1						
	80CL31/80CL51	T0	T1						
	80CL410/83CL410	T0	T1						
	80C451/83C451/87C451	T0	T1						
	83C542/87C542*	T0	T1						
	80C550/83C550/87C550	T0	T1						
	80C851/83C851	T0	T1						
	83C852	T0	T1						
	80C652/83C652/87C652	T0	T1						
	80C453/83C453/87C453*	T0	T1	Watchdog					
	83C055/87C055	T0	T1						
	80C504/83C504/87C504*	T0	T1						
	83C654/87C654	T0	T1						
83CE654	T0	T1							
3 Timers	80CL580/83CL580	T0	T1	T2	Watchdog	X			
	80C32/80C52/87C52	T0	T1	T2		X			
	83C524/87C524	T0	T1	T2	Watchdog	X			
	80C58/87C58*	T0	T1	T2					
	80C528/83C528/87C528	T0	T1	T2	Watchdog	X			
	80CE528/83CE528/87CE528*	T0	T1	T2	Watchdog	X			
	80C552/83C552/87C552	T0	T1	ST2	Watchdog	X	X	X	
	80CE558/83CE558/89CE558	T0	T1	ST2	Watchdog	X	X	X	
	80C562/83C562	T0	T1	ST2	Watchdog	X	X	X	
	80C592/83C592/87C592	T0	T1	T2	Watchdog	X	X	X	
	80CE598/83CE598/87CE598*	T0	T1	T2	Watchdog	X	X	X	
	83CL167/83CL168	T0	T1	T2					
	83CL267/83CL268	T0	T1	T2					
	80C54/87C54*	T0	T1	T2					
	83CL781	T0	T1	T2		X			
83CL782	T0	T1	T2		X				
4 Timers	83C51FA/87C51FA	T0	T1	ET2	PCA	X	X	X	
	83L51FA/87L51FA	T0	T1	ET2	PCA	X	X	X	
	83C51FB/87C51FB	T0	T1	ET2	PCA	X	X	X	
	83L51FB/87L51FB	T0	T1	ET2	PCA	X	X	X	
	83C51FC/87C51FC*	T0	T1	T2	PCA	X	X	X	
	80C575/83C575/87C575	T0	T1	ET2	PCA	Watchdog	X	X	X
	80C576/83C576/87C576	T0	T1	ET2	PCA	Watchdog	X	X	X

Timer Type	Description
T0	16-bit Standard 80C51 Timer
ET0	Enhanced T0 with 16-bit auto re-load capability
T1	16-bit Standard 80C51 Timer
T2	16-bit Standard 80C51 Timer with 16-bit auto re-load capability
TR	Free running 10-bit Timer (T1)
ET2	Enhanced T2 with 16-bit up down counter capability
ST2	16-bit Standard 80C51 Timer with capture/compare and 16-bit auto re-load capability

* Added since previous publication

Serial Interface

Philips microcontrollers offer a broad range of serial communication protocols. These serial interfaces are designed to meet all the different performance and cost requirements of your design.

UART/Enhanced UART

The 80C51 UART is an interface for microcontrollers that provides all the features you need to implement simple serial communication. The 80C51 UART is bi-directional and can simultaneously send and receive data. The 80C51 UART is the serial I/O most often used on 80C51 microcontrollers.

Philips also offers the Enhanced 80C51 UART on selected microcontrollers. Enhanced UART has all the standard UART functions plus framing error detection and automatic address recognition.

I²C

Philips I²C, or Inter-Integrated Circuit, is a 2-wire serial communication with unique start-and-stop conditions, bi-directional communication, full synchronization, and multimaster operation.

I²C is primarily used to communicate between two ICs, or multiple ICs in close proximity (13 feet, at 100K bit/sec). By using Philips I²C Bus Extender, P82B715, the communication is increased by a factor of 10 (excess of 130 feet). This enables I²C to be used in applications between a central control box and remote locations.

The Philips proprietary I²C serial bus protocol is an industry standard found in more than 100 products and licensed to more than 30 IC manufacturers.

ACCESS.bus

ACCESS.bus is a new industry-standard technology that allows you to connect keyboards, joysticks, tablets, high-speed modems, and other peripherals into a single port on your computer or workstation. ACCESS.bus provides a simple, inexpensive, plug-and-play way to connect as

many as 125 peripherals into a single PC or workstation without needing to reconfigure, power down, or reboot.

ACCESS.bus can now be easily implemented in the PC by using the Philips 8XC542 to replace the standard 8042 keyboard controller. Extensions to the Universal Peripheral Interface (UPI) allow ACCESS.bus communication from a host CPU to the microcontroller to produce an ACCESS.bus controller. ACCESS.bus peripherals (mouse, joystick, tablets, and others) can be implemented using microcontrollers with I²C communication.

CAN bus

The CAN (Control Area Network) bus operates well in noisy, harsh environments, such as in industrial and heavy equipment applications, and in numeric control equipment, such as lathes and mills.

The CAN bus is ideal for designs requiring reliable serial communication or multiplexed wiring. The CAN 2-wire serial bus in our 8XC592 and 8XCE598 microcontrollers is able to transmit data at speeds up to 1 million bits per second and over distances of up to 5,000 meters.

The 8XC592 and 8XCE598 are the first members of a growing family of Philips products that support CAN, and we are continually developing new products to add to this family of powerful serial interface parts.

High-Speed Serial Interface

For very high-speed data transmission between the CPU and other peripheral devices, the 8-bit, 3-wire serial I/O features a maximum speed of 1MHz baud rate. Other features include an interrupt generated whenever a complete byte has been sent or received, baud rate clocks, Schmitt trigger inputs on clock and data-in ports, and software-select of LSB or MSB first.

SERIAL INTERFACE

Device	UART	Enhanced UART	I ² C Bit	I ² C Byte	ACCESS. bus	CAN bus	High-Speed Serial	Comments/ Special Features
83C751/87C751			X		X			40 MHz, Lowest Cost, 24-pin Skinny DIP and SSOP
83C752/87C752			X		X			5 Channel 8-bit A/D, PWM Output and SSOP
80C31/80C51/87C51	X							Industry Standard
80CL31/80CL51	X							Low Voltage (1.8V to 6V), Low Power
80CL410/83CL410				X	X			Low Voltage (1.8V to 6V), Low Power
80C451/83C451/87C451		X						Extended I/O, Processor Bus Interface
80C550/83C550/87C550	X							8 Channel 8-bit A/D
80C851/83C851	X							128 bytes SRAM, 256 bytes EEPROM, 80C51 Pin-Compatible
83C542/87C542*		X		X	X			ACCESS.bus, replaces 8042 Keyboard Controller
80CL580/83CL580	X			X	X			4 Ch 8-bit A/D, PWM Output, Low Power/Volt (2.5V to 6V)
80C32/80C52/87C52	X							80C51 Pin-Compatible
80C652/83C652/87C652	X			X	X			80C51 Pin-Compatible
80C453/83C453/87C453*		X						Extended I/O, Processor Bus Interface
83C51FA/87C51FA		X						Enhanced UART, 3 Timers + PCA
83L51FA/87L51FA		X						Low Voltage 8XC51FA (3V@20MHz), 87L51FA is OTP
80C575/83C575/87C575		X			X			High Rel, Low Vcc/Osc Fail Detect, Analog Comparators, PCA
80C576/83C576/87C576		X						Same as 8XC575 plus UPI and 10-bit A/D
80C562/83C562	X							8 Channel 8-bit A/D, 2 PWM Outputs, Capture/Compare Timer
80C552/83C552/87C552	X			X				8 Channel 10-bit A/D, 2 PWM Outputs, Capture/Compare Timer
83CL267				X	X			OSD, 9 PWM Outputs, 4 Channel, 4-bit A/D, 8 LED Drivers
83CL268				X	X		X	OSD, 9 PWM Outputs, 4 Channel, 4-bit A/D, 8 LED Drivers
80C54/87C54*		X						Enhanced UART, Industry Standard, 8XC51 Pin Compatible
83C654/87C654	X			X	X			80C51 Pin Compatible
83CE654	X			X	X			83C654 with Reduced EMI
80C504/83C504/87C504*		X						8XC654 with Hardware Divide (no I ² C), Enhanced UART
83CL781	X			X	X			Low Voltage (1.8V to 6V), Low Power
83CL782	X			X	X			83CL781 Optimized for 12MHz@3.1V
83C51FB/87C51FB		X						Enhanced UART, 3 Timers + PCA
83L51FB/87L51FB		X						Low Voltage OTP 87C51FB (3V@20MHz)
83CL167				X	X			OSD, 9 PWM Outputs, 4 Channel 4-bit A/D, 8 LED Drivers
83CL168				X	X		X	OSD, 9 PWM Outputs, 4 Channel 4-bit A/D, 8 LED Drivers
83C524/87C524	X		X					512 RAM
80C592/83C592/87C592	X					X		CAN Bus, 8x10-bit A/D, 2 PWM Outputs, Capture/Compare
80C58/87C58*		X						Industry Standard, 80C51 Pin-Compatible, Enhanced UART
83C51FC/87C51FC*		X						Enhanced UART, 3 Timers + PCA
80C528/83C528/87C528	X		X		X			Large Memory for High Level Languages
80CE528/83CE528/87CE528*	X		X		X			Reduced EMI, Large Memory for High Level Languages
80CE598/83CE598*		X				X		CAN Bus, 8x10-bit A/D, Low EMI, 2 PWM Outputs, Enhanced UART
80CE558/83CE558	X			X	X			Low EMI, 8 Channel 10-bit A/D, 2 PWM Outputs, Capture/Compare Timer
89CE558	X			X	X			32K FLASH EEPROM, Low EMI, 8 Channel 10-bit A/D, 2 PWM Outputs, Capture/Compare Timer

* Added since previous publication

Low Voltage Operation

Philips offers 80C51 derivative microcontrollers that have the lowest operating voltages available today. In addition, you can select from devices that operate from 6V down to 1.8V, with such features as idle and power down modes or a fully static core.

Fast 3V Operation

For low voltage EPROM/OTP, the Philips 87L51FA and 87L51FB are the first members of a family of 3 Volt EPROM/OTP microcontrollers. Featuring performance characteristics similar to the industry-standard 87C51FA/FB, the 87L51FA/FB are the functional equivalents of the 87C51FA/FB. And, since both the 87L51FA and

87L51FB operate at 20MHz from a 3 Volt supply, you no longer must sacrifice performance to have 3 Volt 87C51 derivative OTPs.

Static and 1.8V Operation

The 8XCLXXX family of devices addresses your need for very low power and very low operating voltage microcontrollers. Our 8XCLXXX family of microcontrollers is designed to operate down to 1.8 Volts and have an operating frequency range from DC to 16MHz. The 8XCL580, which is designed to operate down to 2 Volts, and the 8XCL167/8 and 8XCL267/8, which are designed to operate down to 4.5 Volts, are the only exceptions in this family. The family is designed with a fully static core so the oscillator can be stopped for minimal power consumption and then be restarted easily without complicated restart procedures or loss of data.

LOW VOLTAGE OPERATION

3 Volt OTP and ROM Microcontrollers:

Device	ROM	EPROM	RAM	Operating Voltage Range	Frequency	Timers	Special Features
83L51FA	8K		256	3V-4.5V	3.5MHz-20MHz	3+PCA	Optimized for 20MHz@3V
87L51FA		8K	256	3V-4.5V	3.5MHz-20MHz	3+PCA	Optimized for 20MHz@3V
83L51FB	16K		256	3V-4.5V	3.5MHz-20MHz	3+PCA	Optimized for 20MHz@3V
87L51FB		16K	256	3V-4.5V	3.5MHz-20MHz	3+PCA	Optimized for 20MHz@3V

Low Voltage (broad range) ROM Microcontrollers:

Device	ROM	RAM	Operating Voltage Range	Frequency	Fully Static	Timers	Special Features
80CL31		128	1.8V-6V	DC-16MHz	Yes	2	80C31 Pin-Compatible, UART
80CL51	4K	128	1.8V-6V	DC-16MHz	Yes	2	80C31 Pin-Compatible, UART
80CL410/83CL410	4K	128	1.8V-6V	DC-12MHz	Yes	2	80C31 Pin-Compatible, I ² C
80CL580/83CL580	6K	256	2.5V-6V	DC-12MHz	Yes	3+Watchdog	4x8-bit A/D, PWM, I ² C, UART
83CL267	12K	256	4.5V-5.5V	4MHz-8MHz		3	OSD, 9 PWM Outputs, 4 Channel 4-bit A/D, 9 LED Drivers
83CL268	12K	256	4.5V-5.5V	4MHz-8MHz		3	OSD, 9 PWM Outputs, 4 Channel 4-bit A/D, 9 LED Drivers
83CL781	16K	256	1.8V-6V	DC-12MHz	Yes	3	UART, I ² C
83CL782	16K	256	1.8V-6V	DC-12MHz	Yes	3	Optimized for 12MHz@3.1V, UART, I ² C
83CL167	16K	256	4.5V-5.5V	4MHz-8MHz		3	OSD, 9 PWM Outputs, 4 Software A/D Inputs, 8 LED Drivers
83CL168	16K	256	4.5V-5.5V	4MHz-8MHz		3	OSD, 9 PWM Outputs, 4 Software A/D Inputs, 8 LED Drivers

Analog Features

Philips offers a variety of 80C51 derivative microcontrollers with on-board 8-bit and 10-bit A/D converters. Also offered are 80C51 derivatives with Pulse Width Modulated (PWM) output, and those with precision comparators.

Analog-to-Digital Converters

Philips analog-to-digital converters, or A/Ds, have multiplexed inputs. This enables the selection of up to eight analog sources, and a sample-and-hold front end, making it easier for high frequency measurement. Each input has a high input impedance to reduce loading, resulting in a more accurate measurement.

Pulse Width Modulation (PWM)

The Pulse Width Modulated output allows wave forms to be generated with a very precise frequency and duty cycle. The PWM output offers two features that provide a wide degree of design flexibility: variable frequency and adjustable duty cycle. For the 8-bit PWM, the duty cycle is adjustable from 0% to 100% in 255 steps. These PWM outputs are useful in the design of low cost digital-to-analog converters and, with a comparator, an analog-to-digital converter can be designed.

Comparators

Philips integrated precision comparators provide low-input offset and high flexibility. To reduce the number of external components, Philips has integrated four comparators on the 8XC575 and 8XC576 which can be used for many functions, such as low cost A/D conversion and cross-over detection.

ANALOG FEATURES

Device	Analog-to-Digital		Pulse Width Modulation		Number of Comparators
	Bits	Multiplexed Inputs	# PWM Timers	Frequency Range @12MHz	
83C749/87C749*	5	8	1 8-bit	90Hz-23.5KHz	
83C752/87C752	5	8	1 8-bit	90Hz-23.5KHz	
80C550/83C550/87C550	8	8	1 8-bit	90Hz-23.5KHz	
80CL580/83CL580	8	4	1 8-bit	90Hz-23.5KHz	
80C562/83C562	8	8	2 8-bit	90Hz-23.5KHz	
80C552/83C552/87C552	10	8	2 8-bit	90Hz-23.5KHz	
80C592/83C592/87C592	10	8	2 8-bit	90Hz-23.5KHz	
80CE598/83CE598/87CE598*	10	8	2 8-bit	90Hz-23.5KHz	
80CE558/83CE558/89CE558	10	8	2 8-bit	90Hz-23.5KHz	
80C575/83C575/87C575			5 8-bit (PCA)	15Hz-11.7KHz	4
80C576/83C576/87C576	10	6	5 8-bit (PCA)	15Hz-11.7KHz	4
83C51FA/87C51FA			5 8-bit (PCA)	15Hz-11.7KHz	
83L51FA/87L51FA			5 8-bit (PCA)	15Hz-11.7KHz	
83C51FB/87C51FB			5 8-bit (PCA)	15Hz-11.7KHz	
83L51FB/87L51FB			5 8-bit (PCA)	15Hz-11.7KHz	
83C055/87C055			1 14-bit/8 6-bit (MTV)	60Hz-47KHz	
83CL267/83CL268	4	4	1 14-bit/4 6-bit/4 7-bit	90Hz-20KHz@8MHz	
83CL167/83CL168	4	4	1 14-bit/4 6-bit/4 7-bit	90Hz-20KHz@8MHz	

* Added since previous publication

Protection Capabilities and Reduced EMI/RFI

The Philips family of microcontrollers that contains extremely low levels of EMI and RFI can result in easier FCC certification, lower board design costs, simpler shielding solutions, easier power and ground layout, and reduced cross-talk. In addition, Philips offers protection circuits, such as Watchdog timers, oscillator-failure detection, and low-voltage detection, giving you shorter design cycles, lower system costs, and no external component requirements.

Protection Circuits for High Reliability

Reliability is always a key design concern. This concern is amplified when a circuit is used in life-critical applications like medical instrumentation, aboard aircraft or on vehicles where circuit lock-up could be disastrous. And, in industrial applications, the failure of one component could shut down an entire production line. Philips offers a wide range of protection circuits that answers these concerns with a sophisticated set of built-in, hardware-based protection circuits that enhance your system's fault tolerance and improve its reliability: a Watchdog timer, low voltage detection, and oscillator failure detection.

Watchdog Timer

The Philips Watchdog timer is designed to be fail-safe. The Watchdog timer actually resets the microcontroller within a programmable time if the microcontroller enters any potentially fatal processor state. If the user program fails to reload the Watchdog timer within a specified time, the Watchdog circuitry automatically generates a system reset. Protection circuits, such as the Philips Watchdog timer, greatly increase a designer's confidence that the microcontroller will reliably recover from any uncontrolled situations.

Because Philips Watchdog timers are hardware configured, they cannot be corrupted by software-based problems or events that often can occur in microcontroller applications. For added flexibility, the Watchdog timer offers an adjustable timeout period, from 2mS to 512mS at 12MHz oscillator depending on the demands of your applications. (See also Counters/Timers section for more information on the special features of the Philips Watchdog timer.)

Failure Detection Circuits

Other protection features integrated into the Philips products with Watchdog timers are Oscillator Failure Detection (OFD) and Low Voltage Detection. Like the Watchdog timer, these features generate a reset if the oscillator frequency slows below a predefined frequency range or if voltage levels to the part are reduced.

Our integrated protection features mean you don't have to spend extra design time adding components to protect the microcontroller and system. The result is a highly reliable design featuring reduced part count, quicker time-to-market, and reduced cost.

Reduced EMI

Recognizing the challenges in meeting FCC certification, Philips has developed a family of products that has significantly reduced EMI signatures. By changing the internal circuitry on our reduced EMI microcontrollers, radiated noise is reduced by more than 20db, especially important for frequencies greater than 100MHz where board-level noise reduction is difficult and expensive to achieve. With our reduced EMI/RFI devices, your design is simpler, your costs are lower, and your

power, ground layout, and shielding are simplified. And by using our reduced EMI/RFI products, you're already a step closer to FCC approval.

One example of our family of reduced EMI/RFI devices is the 8XC575, on which many techniques are used to reduce EMI/RFI to a level that is 100 times lower than emissions from a standard 80C51 microcontroller. And everything we've learned from the 8XC575 has been incorporated into the growing list of reduced EMI/RFI products.

PROTECTION CAPABILITIES AND REDUCED EMI/RFI

Device	Watchdog	Oscillator Failure Detection	Low Voltage Detection	Reduced EMI	Comments/ Special Features
83C542/87C542*				X	ACCESS.bus, replaces 8042 Keyboard Controller
80C550/83C550/87C550	X				8 Channel 8-bit A/D
80CL580/83CL580	X			X	4 Channel 8-bit A/D, PWM Output, Low Power/Volt (2.5V to 6V)
80C575/83C575/87C575	X	X	X	X	High Reliability, Low Vcc/Osc Fail Detect, Analog Comparators, PCA
80C576/83C576/87C576	X	X	X	X	Same as 8XC575 plus UPI and 10-bit A/D
80C562/83C562	X				8 Channel 8-bit A/D, 2 PWM Outputs, Capture/Compare Timer
80C552/83C552/87C552	X				8 Channel 10-bit A/D, 2 PWM Outputs, Capture/Compare Timer
83C055/87C055				X	OSD, 9 PWM Outputs, 3 Software A/D Inputs
83CE654				X	80C51 Pin Compatible, Reduced EMI
83C524/87C524	X				512 RAM
80C528/83C528/87C528	X				Large Memory for High Level Languages
80CE528/83CE528*	X			X	Reduced EMI, Large Memory for High Level Languages
80CE598/83CE598/87CE598*	X			X	CAN Bus, 8x10-bit A/D, Low EMI, 2 PWM Outputs, Enhanced UART
80CE558/83CE558/89CE558	X			X	Low EMI, 8 Channel 10-bit A/D, 2 PWM Outputs, Capture/Compare

* Added since previous publication

Additional Features

To make your designs easier, Philips has several specialty microcontroller products, each offered in a range of packages.

On-Screen Display (OSD)

Philips OSD, featured on our 8XC055, 83CL167/168, and 83CL267/268 microcontrollers, allows you to put text over video easily, and with a surprising degree of color and shading flexibility.

Philips OSD offers a user-defined character set, including font types and sizes, starting position, character matrix, foreground and background colors and shadowing, as well as character blinking ratio and vertical jitter cancelling. With Philips OSD you can put as many as 128 characters on screen at a time. Both the number of rows and the number of characters per row are user-defined.

Philips OSD microcontroller capability offers all the design flexibility you need to custom tailor your system. In addition, Philips combines that flexibility with hardware that makes OSD simple to include in many different designs.

Universal Peripheral Interface (UPI)

For products that require interface to the ISA bus in personal computer and other host CPU buses, the 8XC451, 87C453, 8XC542, and 8XC576 are ideal because they have the UPI built in.

On-board UPI means it's easier for you to design serial I/O controllers, servo controllers, and keyboard scanners.

Smart Card

The Philips Smart Card microcontroller provides features for a range of applications and devices, such as credit cards, electronic keys, medical records, and identification.

Typical access control applications that use Smart Cards are satellite TV networks, mobile phones, computers, pay TV, auto key cards, and electronic keys. Other Smart Card applications are medical records, patient passports, and cash cards. In production markets, Smart Card is used in flow control, tool handling, maintenance, and process control.

Philips' Smart Card microcontroller, the 83C852, features 6K bytes of ROM, 256 bytes of RAM, and 2K bytes of EEPROM. The 83C852 has a cryptographic calculation unit (CCU) to enhance data security, and it comes in a credit card style package or can be purchased in die form.

PSD

The PSD3XX family of programmable microcontroller peripherals offers 32K to 128K bytes of EPROM (UV erasable or One Time Programmable) external program memory, 2K bytes of SRAM external data memory, as well as memory paging and port reconstruction logic. This family of products interfaces directly with our 80C51 microcontrollers, allowing the memory of the microcontroller to be increased without losing functionality of the microcontroller ports used in the interface. The PSD3XX family is the first solution that provides microcontrollers with port expansion, latched addresses, page logic, two programmable logic arrays, an interface to shared resources, 256K, 512K or 1M bit EPROM and 16K bit SRAM on a single chip.

Microcontroller Characteristic Guide, 1K through 12K

Part Number	Memory			Counter Timers	I/O Ports	Serial Interfaces	External Interrupt	Comments/ Special Features
	ROM (Bytes)	EPROM (Bytes)	RAM (Bytes)					
83C750/87C750	1K	1K	64	1(16-bit)	2 3/8	-	2	40MHz, Lowest Cost, 24-pin Skinny DIP and SSOP
83C748/87C748*	2K	2K	64	1(16-bit)/1(10-bit)	2 3/8	-	2	Low-Cost, 24-pin Skinny DIP and SSOP
83C751/87C751	2K	2K	64	1(16-bit)	2 3/8	I ² C (bit)	2	Low-Cost 24-pin Skinny DIP and SSOP
83C749/87C749*	2K	2K	64	1(16-bit)/1(10-bit)	2 5/8	-	2	5 Channel 8-bit A/D, PWM Output and SSOP
83C752/87C752	2K	2K	64	1(16-bit)	2 5/8	I ² C (bit)	2	5 Channel 8-bit A/D, PWM Output and SSOP
80C31/80C51/87C51	4K	4K	128	2	4	UART	2	Industry Standard
80CL31/80CL51	4K		128	2	4	UART	10	Low Voltage (1.8V to 6V), Low Power
80CL410/83CL410	4K		128	2	4	I ² C	10	Low Voltage (1.8V to 6V), Low Power
80C451/83C451/87C451	4K	4K	128	2	7	UART	2	Extended I/O, Processor Bus Interface, Enhanced UART
80C550/83C550/87C550	4K	4K	128	2+ Watchdog	4	UART	2	8 Channel 8-bit A/D
80C851/83C851	4K		128	2	4	UART	2	256 bytes EEPROM, 80C51 Pin-Compatible
83C542/87C542*	4K	4K	256	2	1	UART, I ² C	2	ACCESS.bus, replaces 8042 Keyboard Controller, Enhanced UART
83C852	6K		256	2(16-bit)	2/8	-	1	Smart Card Controller with 2K EEPROM (Data, Code), Cryptographic Calculation Unit
80CL580/83CL580	6K		256	3+ Watchdog	5	UART, I ² C	10	4 Channel 8-bit A/D, PWM Output, Low Voltage (2.5V to 6V), Low Power
80C32/80C52/87C52	8K	8K	256	3	4	UART	2	80C51 Pin-Compatible
80C652/83C652	8K		256	2	4	UART, I ² C	2	80C51 Pin-Compatible
87C652		8K	256	2	4	UART, I ² C	2	80C51 Pin-Compatible
80C453/83C453/87C453*	8K	8K	256	2	7	UART	2	Extended I/O, Processor Bus Interface
83C51FA/87C51FA	8K	8K	256	3+PCA	4	UART	2	Enhanced UART, 3 Timers + PCA
83L51FA/87L51FA	8K	8K	256	3+PCA	4	UART	2	Low Voltage 8XC51FA (3V@20MHz), 87L51FA is OTP
80C575/83C575/87C575	8K	8K	256	3+PCA+WD	4	UART	2	High Reliability with Low Voltage Detect, Oscillator Fail Detect, Analog Comparators, PCA, Enhanced UART
80C576/83C576/87C576	8K	8K	256	3+PCA+WD	4	UART	2	Same as 8XC575 plus UPI and 10-bit A/D
80C562/83C562	8K		256	3+ Watchdog	6	UART	2	8 Channel 8-bit A/D, 2 PWM Outputs, Capture/Compare Timer
80C552/83C552	8K		256	3+ Watchdog	6	UART, I ² C	2	8 Channel 10-bit A/D, 2 PWM Outputs, Capture/Compare Timer
87C552		8K	256	3+ Watchdog	6	UART, I ² C	2	8 Channel 10-bit A/D, 2 PWM Outputs, Capture/Compare Timer
83CL267	12K		256	3	5 7/8	I ² C	13	OSD, 9 PWM Outputs, 4 Channel 4-bit A/D, 8 LED Drivers
83CL268	12K		256	3+RCP	5 7/8	I ² C, 1M Baud	13	OSD, 9 PWM Outputs, 4 Channel 4-bit A/D, 8 LED Drivers

* Added since previous publication

Find 16K to 32K products on pages 18-19.

Part Number	Clock Program Security?	Frequency (MHz)	Temperature Ranges (C)			Package				EPROM CDIP	Package CLCC
			0 to 70	-40 to +85	-55 to +125	PDIP	PLCC	PQFP	Other		
83C750/87C750	N/Y	3.5-40	X	X		N24	A28		SSOP (0-70)	F24	
83C748/87C748*	N/Y	3.5-16	X	X		N24	A28		SSOP (0-70)	F24	
83C751/87C751	N/Y	3.5-16	X	X		N24	A28		SSOP (0-70)	F24	
83C749/87C749*	N/Y	3.5-16	X	X		N28	A28		SSOP (0-70)	F28	
83C752/87C752	N/Y	3.5-16	X	X	X	N28	A28		SSOP (0-70)	F28	
80C31/80C51/87C51	Y	3.5-33	X	X	X	N40	A44	B44		F40	K44
80CL31/80CL51	N	0-16		X		N40		B44	D40		
80CL410/83CL410	N	0-12		X		N40			D40		
80C451/83C451/87C451	N/Y	3.5-16	X	X	X		A68				
80C550/83C550/87C550	Y	3.5-16	X	X	-40 to +125	N40	A44			F40	K44
80C851/83C851	Y	1.2-16	X	X		N40	A44	B44			
83C542/87C542*	Y	3.5-16	X				A44				K44
83C852	Y	1-12	X						T28 or die		
80CL580/83CL580	N	0-12		X				B64	D56		
80C32/80C52/87C52	Y	3.5-24	X	X	X	N40	A44	B44		F40	K44
80C652/83C652	Y	1.2-24	X	X	-40 to +125	N40	A44	B44			
87C652	Y	1.2-20	X	X	X	N40	A44			F40	K44
80C453/83C453/87C453*	N/Y	3.5-16	X	X			A68				K68
83C51FA/87C51FA	Y	3.5-24	X	X		N40	A44	B44		F40	K44
83L51FA/87L51FA	Y	3.5-20	X	X		N40	A44	B44		F40	K44
80C575/83C575/87C575	Y	4-16	X		X	N40	A44	B44		F40	K44
80C576/83C576/87C576	Y	4-16	X		X	N40	A44	B44		F40	K44
80C562/83C562	N	1.2-16	X	X	-40 to +125		A68	B80			
80C552/83C552	N	1.2-30	X	X	-40 to +125		A68	B80			
87C552	Y	1.2-16	X				A68				K68
83CL267	N	4-8	X			R64		B64			
83CL268	N	4-8	X			R64		B64			

* Added since previous publication

Package Types

- A = Plastic Leaded Chip Carrier (PLCC)
- B = Plastic Quad Flat Pack (PQFP)
- D = Plastic Very Small Outline Package (VSO)
- DB = Shrink Small Outline Package (SSOP)
- F = Windowed Ceramic Dual In-Line Package (CDIP)
- K = Windowed Ceramic Leaded Chip Carrier (CLCC)
- N = Plastic Dual In-Line Package (PDIP)
- Q = Ceramic Quad Flat Pack (CQFP)
- R = Shrink DIP (SDIP)
- T = Small Outline (SO)

Microcontroller Characteristic Guide, 16K through 32K

Find 1K to 12K products on pages 16-17.

Part Number	Memory			Counter Timers	I/O Ports	Serial Interfaces	External Interrupt	Comments/ Special Features
	ROM (Bytes)	EPROM (Bytes)	RAM (Bytes)					
83C055/87C055	16K	16K	256	2(16-bit)	3 1/2	-	2	OSD, 9 PWM Outputs, 3 Software A/D Inputs
80C54/87C54*	16K	16K	256	3	4	UART	2	Enhanced UART, Industry Standard, 8XC51 Pin-Compatible
80C504/83C504/87C504*	16K	16K	256	2	4	UART	2	8XC54 with Hardware Divide (no I ² C), Enhanced UART
83C654	16K		256	2	4	UART, I ² C	2	80C51 Pin-Compatible
87C654		16K	256	2	4	UART, I ² C	2	80C51 Pin-Compatible
83CE654	16K		256	2	4	UART, I ² C	2	83C654 with Reduced EMI
83CL781	16K		256	3	4	UART, I ² C	10	Low Voltage (1.8V to 6V), Low Power
83CL782	16K		256	3	4	UART, I ² C	10	83CL781 Optimized for 12MHz@3.1V
83C51FB/87C51FB	16K	16K	256	3+PCA	4	UART	2	Enhanced UART, 3 Timers + PCA
83L51FB/87L51FB	16K	16K	256	3+PCA	4	UART	2	Low Voltage OTP 87C51FB (3V@20MHz)
83CLI67	16K		256	3	5 7/8	I ² C	13	OSD, 9 PWM Outputs, 4 Channel 4-bit A/D, 8 LED Drivers
83CLI68	16K		256	3	5 7/8	I ² C, 1M Baud	13	OSD, 9 PWM Outputs, 4 Channel 4-bit A/D, 8 LED Drivers
83C524	16K		512	3+Watchdog	4	UART, I ² C (bit)	2	512 RAM
87C524		16K	512	3+Watchdog	4	UART, I ² C (bit)	2	512 RAM
80C592/83C592	16K		512	3+Watchdog	6	UART, CAN	6	CAN Bus Controller with 8x10-bit A/D, 2 PWM Outputs, Capture/Compare Timer
87C592		16K	512	3+Watchdog	6	UART, CAN	6	CAN Bus Controller with 8x10-bit A/D, 2 PWM Outputs, Capture/Compare Timer
80C58/87C58*	32K	32K	256	3	4	UART	2	Industry Standard, 80C51 Pin-Compatible, Enhanced UART
83C51FC/87C51FC*	32K	32K	256	3+PCA	4	UART	2	Enhanced UART, 3 Timers + PCA
80C528/83C528	32K		512	3+Watchdog	4	UART, I ² C (bit)	2	Large Memory for High Level Languages
87C528		32K	512	3+Watchdog	4	UART, I ² C (bit)	2	Large Memory for High Level Languages
80CE528/83CE528*	32K		512	3+Watchdog	4	UART, I ² C (bit)	2	Reduced EMI, Large Memory for High Level Languages
80CE598/83CE598*	32K		512	3+Watchdog	6	UART, CAN	6	CAN Bus Controller with 8x10-bit A/D, Low EMI, 2 PWM Outputs, Enhanced UART
87CE598*		32K	512	3+Watchdog	6	UART, CAN	6	CAN Bus Controller with 8x10-bit A/D, Low EMI, 2 PWM Outputs, Enhanced UART
80CE558/83CE558	32K		1024	3+Watchdog	6	UART, I ² C (bit)	2	Low EMI, 8 Channel 10-bit A/D, 2 PWM Outputs, Capture/Compare Timer
89CE558		32K	1024	3+Watchdog	6	UART, I ² C (bit)	2	32K FLASH EEPROM, Low EMI, 8 Channel 10-bit A/D, 2 PWM Outputs, Capture/Compare Timer

* Added since previous publication

Part Number	Program Security?	Clock Frequency (MHz)	Temperature Ranges (C)			Package				EPROM CDIP	Package CLCC
			0 to 70	-40 to +85	-55 to +125	PDIP	PLCC	PQFP	Other		
83C055/87C055	N	3.5-20	X						R42		
80C54/87C54*	Y	3.5-16	X	X		N40	A44	B44		F40	K44
80C504/83C504/87C504*	Y	1.2-20	X	X	X	N40	A44	B44		F40	K44
83C654	Y	1.2-24	X	X	-40 to +125	N40	A44	B44	R42/TQFP44	F40	
87C654	Y	1.2-20	X	X	X	N40	A44	B44		F40	K44
83CE654	Y	1.2-16	X	X				B44			
83CL781	N	0-12		X		N40		B44			
83CL782	N	0-12		-25 to +55		N40		B44			
83C51FB/87C51FB	Y	3.5-24	X	X		N40	A44	B44		F40	K44
83L51FB/87L51FB	Y	3.5-20	X			N40	A44	B44		F40	K44
83CL167	N	4-8	X			R64		B64			
83CL168	N	4-8	X			R64		B64			
83C524	Y	1.2-16	X	X		N40	A44	B44			
87C524	Y	3.5-20	X	X		N40	A44	B44		F40	K44
80C592/83C592	Y	1.2-16		X	-40 to +125		A68				K68
87C592	Y	1.2-16	X				A68				K68
80C58/87C58*	Y	3.5-16	X	X		N40	A44	B44		F40	K44
83C51FC/87C51FC*	Y	3.5-24	X	X		N40	A44	B44		F40	K44
80C528/83C528	Y	1.2-16	X	X	-40 to +125	N40	A44	B44			
87C528	Y	3.5-20	X	X		N40	A44	B44		F40	K44
80CE528/83CE528*	Y	3.5-16	X	X	-40 to +125		A44	B44			
80CE598/83CE598*	Y	1.2-16		X	-40 to +125			B80			
87CE598*	Y	1.2-16		X					Q80		
80CE558/83CE558	Y	3.5-16	X	X	-40 to +125			B80			
89CE558	Y	3.5-16	X	X				B80			

* Added since previous publication

Package Types

A = Plastic Leaded Chip Carrier (PLCC)

B = Plastic Quad Flat Pack (PQFP)

D = Plastic Very Small Outline Package (VSO)

DB = Shrink Small Outline Package (SSOP)

F = Windowed Ceramic Dual In-Line Package (CDIP)

K = Windowed Ceramic Leaded Chip Carrier (CLCC)

N = Plastic Dual In-Line Package (PDIP)

Q = Ceramic Quad Flat Pack (CQFP)

R = Shrink DIP (SDIP)

T = Small Outline (SO)

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