



NXP 80C51-based MCUs LPC91x1

14/16-pin, 8-bit MCUs with enhanced RC oscillator

These high-performance MCUs use an accelerated 80C51 CPU to enhance performance. They offer high integration and are available in small, 14/16-pin packages.

Key features

- ▶ Accelerated 80C51 CPU
- ▶ 2-KB code Flash
- ▶ 256-Byte RAM
- ▶ System supervisory functions (POR, enhanced brownout detection)
- ▶ Two 16-bit timers
- ▶ System timer/RTC, Watchdog timer
- ▶ 8-bit ADC/DAC
- ▶ Two analog comparators
- ▶ Enhanced UART, I²C-bus
- ▶ SPI interface (P89LPC9161)
- ▶ Internal RC oscillator trimmed to a $\pm 1\%$ accuracy with clock doubler option
- ▶ Clock switching on the fly
- ▶ 12/14 configurable I/O pins
- ▶ Temperature range: -40 to +85 °C
- ▶ Small packages:
 - TSSOP14, DIP14 – P89LPC9151
 - TSSOP16 – P89LPC9161/9171

Applications

- ▶ Consumer
- ▶ Industrial products
- ▶ Battery-powered devices
- ▶ Security systems
- ▶ HVAC
- ▶ Protocol conversion

The NXP LPC91x1 family uses an accelerated architecture that executes instructions in two to four clocks, delivering performance that is six times higher than that of a standard 80C51 device. Integrated features such as byte-erasable Flash memory, enhanced timing functions, and power monitoring make these microcontrollers well suited to a very wide range of applications. On-chip features combine to reduce chip count, save board space, and lower overall cost.

Each MCU has 2 KB of byte-erasable Flash code memory that can be used to simulate an EEPROM, with a full erase or program taking only 2 ms. They also have 256 bytes of Data RAM.

Serial interfaces include a 400-kHz I²C bus and an enhanced UART with fractional baud-rate generator, break detect,

framing error detection, automatic address detection, and versatile interrupt capabilities. The LPC9161 has a SPI interface.

The LPC91x1 has a 4-channel, 8-bit A/D and a 1-channel D/A converter. There are two 16-bit counter/timers, with one or both (LPC9171 only) configurable to toggle a port output on timer overflow or act as a PWM output.

A 7.37-MHz internal RC oscillator with a $\pm 1\%$ tolerance over voltage and ambient temperature lets the microcontroller operate without external oscillator components. Users can adjust the IRC oscillator to other frequencies. When the clock-doubler option is enabled, the output frequency is 14.746 MHz. The on-chip Watchdog timer has a separate on-chip oscillator (nominal 400 kHz), calibrated to $\pm 5\%$ at room temperature,

LPC91x1 block diagram



requires no external components, and is selectable from eight values. To provide optimal support for active mode with minimal power, there is on-the-fly clock switching for the internal RC oscillator, the Watchdog oscillator, and the external clock source. Fast switching maximizes performance.

System supervisory functions include Power-on reset (POR) and enhanced brownout detection (BOD). Enhanced low-voltage (brownout) detect allows a graceful system shutdown when power fails and can be optionally configured as an interrupt. The integrated real-time clock is equipped with independent power and clock supplies, permitting extremely low power consumption in power-save modes. To reduce power consumption further, each processor supports an idle mode and two different power-down modes. Total power-down current is less than 1 μA .

There are up to 14 I/O, each with a V_{DD} operating range of 2.4 to 3.6 V and a tolerance to 5 V. The MCUs are pin-to-pin compatible with P89LPC915/916/917 devices housed in the same packages.

Third-party development tools

Through third-party suppliers, NXP offers a range of development and evaluation tools for its MCUs. For the most current listing, please visit www.nxp.com/microcontrollers.

LPC9151/9161/9171 selection guide

Type	Memory		I/O pins	ADC	DAC	Serial interfaces			Temperature range (°C)	Package
	Flash	RAM				I ² C-bus	UART	SPI		
P89LPC9151	2 K	256 B	12	4ch/8b	1x8b	•	•		-40 to +85 -40 to +125	TSSOP14, DIP14
P89LPC9161	2 K	256 B	14	4ch/8b	1x8b	•	•	•	-40 to +85	TSSOP16
P89LPC9171	2 K	256 B	14	4ch/8b	1x8b	•	•		-40 to +85	TSSOP16

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