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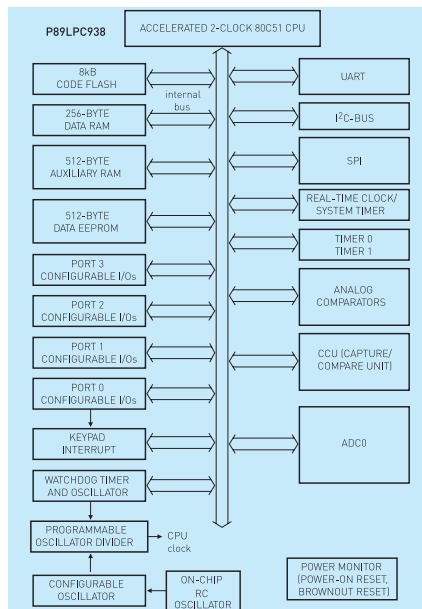
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LPC938

8-Bit MCU with 10-Bit A/D converter

Eberhard Kramp, Silica Germany

PHILIPS



P89LPC938 Block Diagram

The P89LPC938 is a single-chip microcontroller, available in different 28-pin low cost packages, based on a high performance processor architecture that executes instructions in two to four clock cycles. The high performance 80C51 CPU provides instruction cycle times of 111 ns to 222 ns for the most instructions if the MCU is running with 18 MHz clock. This is six times the performance of a standard 80C51 running at the same clock rate. To get the same performance like a standard 80C51 the clock frequency can be much lower. This results in a significant power saving and EMI reduction.

The P89LPC938 is designed for applications where features like low voltage, high integration, high performance, and low cost are important. A lot of system-level functions have been integrated into the P89LPC938 to reduce the number of components and the board space. On-chip

are included a byte-erasable Flash memory, a 10-bit A/D converter (not common in 8-Bit MCU's), enhanced timing functions, serial communications and system supervisory functions. The smallest available package (28-pin HVQFN) has only a size of 6x6x0.85 mm. So a very small and cost effective system with a lot of additional functionality is feasible. The ADC (10-bit resolution 8-channel multiplexed successive approximation analog-to-digital converter) allows a conversion time of 4 µs at an A/D clock of 9 MHz. Further features are low voltage reset (brownout detection), Serial Flash ICP/ISP, watchdog timer with a separate on-chip oscillator, etc. The P89LPC938 is part of the LPC900 family and is supported by a comprehensive set of low cost development tools, designed by Philips and third parties, to improve time-to-market, reduce design cycles and lower development costs.

Key Features

- 8 kB byte-erasable Flash code memory organized into 1 kB sectors and 64-byte pages. Single-byte erasing allows any byte(s) to be used as non-volatile data storage
- 256-byte RAM data memory and a 512-byte auxiliary on-chip RAM
- 512-byte customer Data EEPROM on chip allows serialization of devices, storage of set-up parameters, etc.
- 8-input multiplexed 10-bit A/D converter. Two analog comparators with selectable inputs and reference source
- Two 16-bit counter/timers (each may be configured to toggle a port output upon timer overflow or to become a PWM output) and a 23-bit system timer that can also be used as a RTC

RoHS compliant devices/packages available today. For specifications please see manufacturers documentation.

- Enhanced UART with fractional baud rate generator, break detect, framing error detection, and automatic address detection; 400 kHz byte-wide I²C-bus communication port and SPI communication port
- CCU provides PWM, input capture, and output compare functions
- High-accuracy internal RC oscillator option allows operation without external oscillator components. The RC oscillator option is selectable and fine tunable
- 2.4 V to 3.6 V V_{DD} operating range I/O pins are 5 V tolerant (may be pulled up or driven to 5.5 V)
- 28-pin TSSOP, PLCC, and HVQFN packages with 23 I/O pins minimum and up to 26 I/O pins while using on-chip oscillator and reset options

Key Applications

- Consumer applications
- Automotive and industrial products
- Battery powered devices
- White goods control

Key Design Tips

- Development boards, tools and software available by Keil (EPM900, IDE: µVision)
- Application Notes:
 - AN10337_1: Adding ISP firmware to an LPC900 software project
 - AN10342_1: Using LPC900 code Flash as data storage
 - AN10367_1: Power management for the LPC900 family

Service available or already delivered T&R from Manufacturer.
Tapes are available, but not stocked at Avnet Logistics due to low demand.
Device supported by or programming equipment, but the socket for this package must be provided by customer.

P/N	Package	Programming	Taping & Reeling	Marking	Lead Free
P89LPC938FA	28-pin PLCC				Y
P89LPC938FDH	28-pin TSSOP				Y
P89LPC938FHN	28-lead HVQFN			IF TUBES	Y