Product Block Diagram

eZ80190 MPU		
8 KB SRAM	MACC with 1 KB Dual-Port SRAM	32-Bit GPIO
6 PRT		WDT
4 CS + WSG	2 DMA	2 UZI	ZDI

Features

The eZ80190 microprocessor is a member of ZiLOG's eZ80® product family. It offers the following features:

- Single-cycle instruction fetch, high-performance 50 MHz eZ80® CPU core
- 8 KB high-speed data SRAM
- 16 x 16-bit Multiply and 40-bit Accumulate with 1 KB dual-port SRAM
- 32 bits of General-Purpose I/O
- Six Counter/Timers with prescalers
- Watch-Dog Timer
- Four Chip Selects with individual Wait State generators
- 2-channel DMA controller
- 2 Universal ZiLOG Interface (UZI) channels (I^2C, SPI, UART) with built-in Baud Rate Generator
- Fixed-priority vectored interrupts (32 external, 11 internal)
- On-chip oscillator

- 3.3 V ±0.3 V supply voltage with 5 V tolerant inputs
- 100-pin LQFP package
- Up to 50 MHz clock speed
- Operating Temperature:
  - Standard Temperature Range: 0ºC to +70ºC
  - Extended Temperature Range: –40ºC to +105ºC
- ZiLOG Debug Interface (ZDI)

General Description

The eZ80190 device is a high-speed, optimized pipeline architecture microprocessor, operating at 50 MHz. It is the first in a line of new eZ80®-based standard products targeted toward embedded Internet applications.

The eZ80® CPU is one of the fastest 8-bit CPUs available today, executing code four times faster than a standard Z80 operating at the same clock speed. In addition, the eZ80190 device includes a high-performance Multiply-Accumulator, ideal for signal processing.

The eZ80® CPU can operate in Z80-compatible (64 KB) mode, or full 24-bit (16 MB) addressing mode. Considering both the increased clock speed and processor efficiency, the eZ80® CPU's processing power rivals the performance of 16-bit microprocessors.

eZ80® CPU Core

The eZ80® CPU core is an 8-bit microprocessor that performs in either a 16- or 24-bit addressing mode.

The eZ80® CPU improves on the world-famous Z80 architecture. Like the Z80, it features dual bank registers for fast context switching.

eZ80190 Peripherals

Memory

On-board memory consists of 8 KB x 8 general-purpose SRAM and 1 KB x 8 dual-port SRAM for the Multiply-Accumulator. Both memories can be individually enabled or disabled and can be relocated to the top of any 64 KB page.

Multiply-Accumulator

The Multiply-Accumulator on the eZ80190 device performs DSP functions without incurring the overhead associated with a separate DSP.

Features include:

- A 16x16-bit multiplier feeds 32-bit product into one input of the adder. The other input of the adder is fed from one of two 40-bit accumulators.

- Two dual-port RAMs called X and Y. One port of each RAM is 16-bit Read-Only and supplies one side of the multiplier. The second port is 8-bit Read/Write RAM, and is connected to the microprocessor bus. This connection allows RAM to simultaneously be part of the multiprocessor's memory space and constitute the X and Y banks of the Multiply-Accumulator.

- A set of registers in the microprocessor's I/O space start the Multiply-Accumulator, determine when the Multiply-Accumulator completes a calculation, and retrieves the resulting accumulation. Software can provide calculation parameters to these registers.

General Purpose Input/Output

There are 32 bits of General Purpose Input or Output (GPIO). All port signals can be individually programmable in either the Input or Output mode of operation. The 32 port bits can be used as vectored interrupt sources. The pins can be set to recognize either level- or edge-triggered interrupts.

Programmable Reload Timers

The eZ80190 device features six Programmable Reloadable Counter Timers (PRT). Each timer is a 16-bit down counter and offers a 4-bit clock prescaler with four selectable taps for CLK ÷ 2,

CLK ÷ 4, CLK ÷ 8 and CLK ÷ 16. The timers' two modes of operation are single-pass and continuous count mode. The timer can be programmed to start, stop, restart to continue, or restart from an initial value.

Watch-Dog Timer

The Watch-Dog Timer (WDT) features four programmable time-out periods: 2^{18}, 2^{22}, 2^{25}, 2^{27} Clock Cycles. It allows the user to monitor the status of a time-out and generate a RESET or Non-Maskable Interrupt.

Chip Select/Wait State Generator

There are four chip selects for external devices. Each chip select may be programed for either memory or I/O space. Each memory chip select can be individually programmed on a 64 KB boundary. The I/O chip selects can choose a 16-byte section of I/O space. Each chip select may be programmed for up to seven wait states.

Direct Memory Access Controller

The Direct Memory Access (DMA) controller can be used for direct memory-to-memory data transfers without CPU intervention. There are two DMA channels, channel 0 and channel 1. Each channel features independent registers. Transfers can be either in burst mode or cycle-steal mode.

Universal ZiLOG Interface

Each of the two Universal ZiLOG Interface (UZI) devices contains three serial communication controller blocks (SPI, UART, and I^2C) along with control registers and a Baud Rate Generator (BRG). Only one of the serial devices is active at any time.

- The Baud Rate Generator provides a lower frequency clock from the system clock. This module consists of a 16-bit counter, two 8-bit preload registers and associated decoding logic.

- The UART module implements all the logic required to support asynchronous communications. The module also contains 16-byte deep FIFOs for both transmit and receive.

- The SPI is a synchronous interface allowing several SPI-type devices to be interconnected.

The SPI may be configured as either a master or a slave.

- The I^{2}C operates in four modes: Master Transmitter, Master Receiver, Slave Transmitter, and Slave Receiver.

ZiLOG Debug Interface

The ZiLOG Debug Interface (ZDI) incorporates most of the functions of an In-Circuit Emulator on-chip. ZDI allows the user to single step code, change registers, edit programs, and view status of internal registers.

On-Chip Crystal Oscillator

The eZ80190 microprocessor features an on-chip crystal oscillator that supplies clocks to both the internal eZ80® CPU core and peripherals and to an external pin. The clock circuitry uses three dedicated pins: X_{IN}. X_{OUT}, and PHI.

Pin Diagram
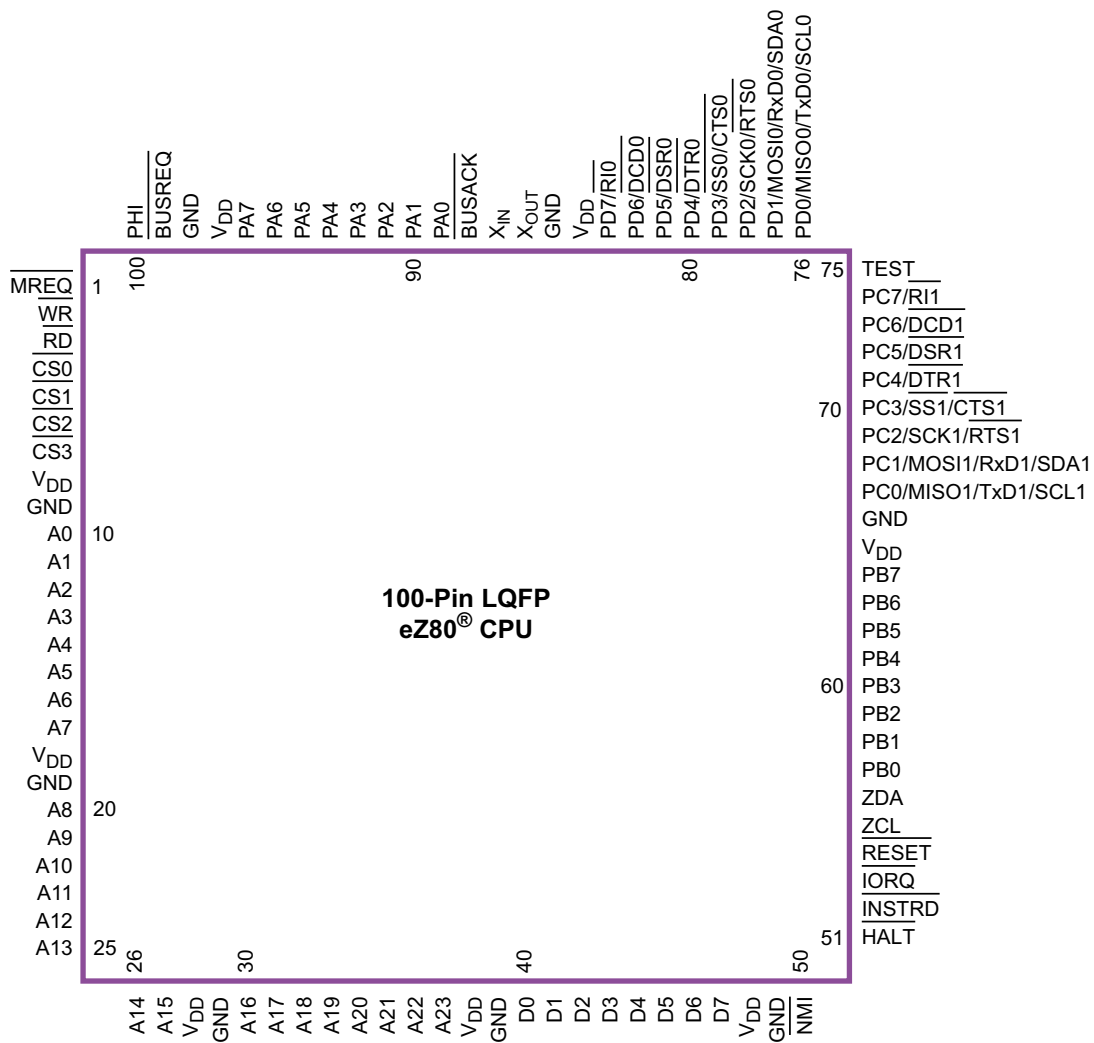
Figure 1. eZ80190 100-Pin LQFP Pin Configuration
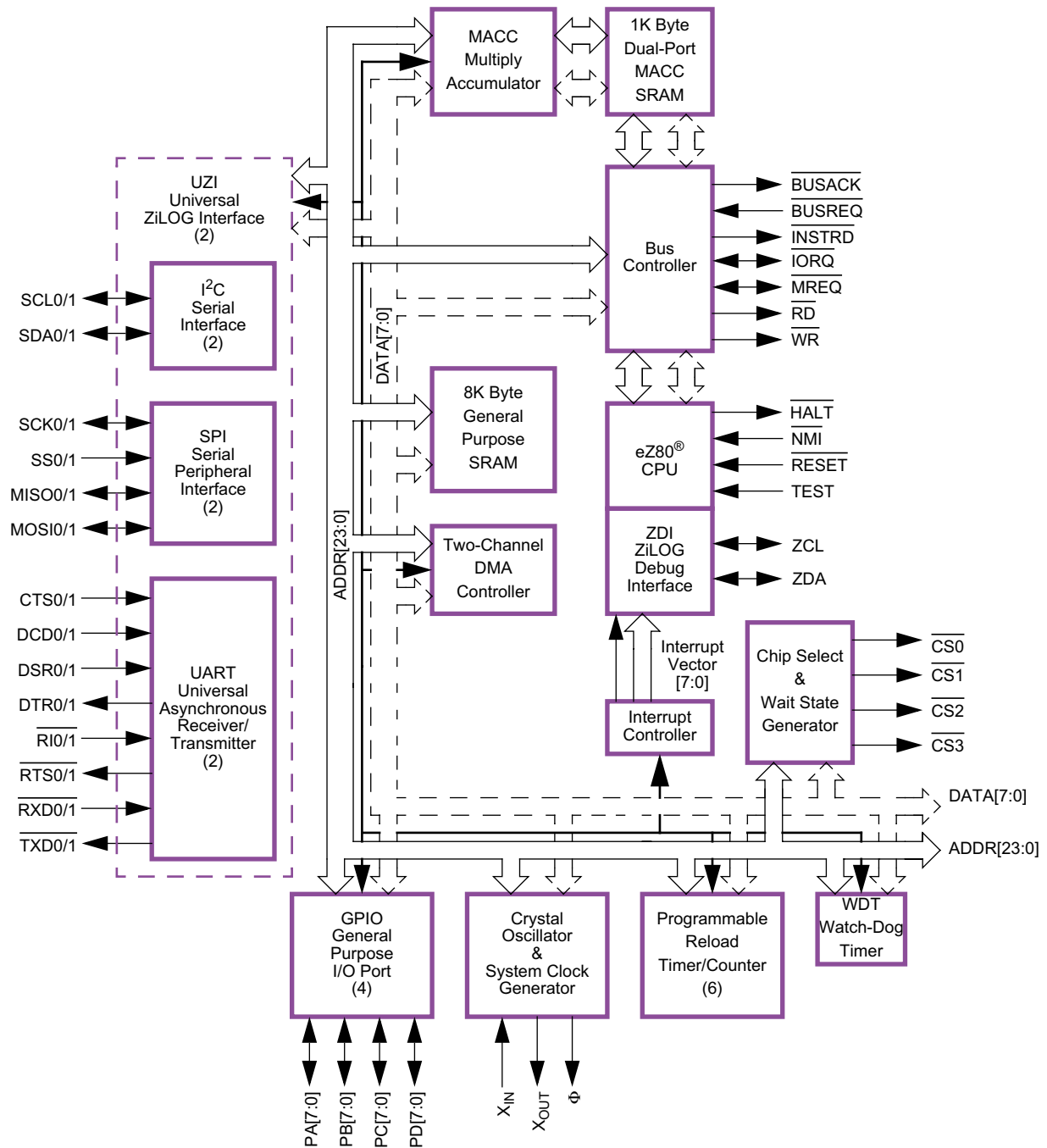
Block Diagram

Figure 2. eZ80190 Block Diagram

Electrical Features Summary

- Power supply: 3.3 V ± 300 mV
- Standard temperature: 0°C to 70°C
- Extended temperature: –40°C to +105°C

Support Tools

The following development tools are available to program and debug the eZ80190 device:

- eZ80® Development Platform
- Embedded Internet Software Suite including TCP/IP stack
- Real Time Operating System
- C-Compiler
- ZiLOG Development Suite (ZDS II) including assembler, linker, debugger, and simulator

Related Products

Other integrated devices of interest are:

eZ80L92	20MHz and 50MHz eZ80® CPU, low-power modes, 24 bits GPIO, IrDA, 2 UART, I²C, SPI, 6 Counter Timers with I/O features, WDT, RTC, 4-channel CS, JTAG, ZDI.
eZ80F92	20MHz eZ80® CPU, low-power modes, 128KB+256B Flash, 8KB SRAM, 24 bits GPIO, IrDA, 2 UART, I²C, SPI, 6 Counter Timers with I/O features, WDT, RTC, 4-channel CS+WSG, JTAG, ZDI, PLL.
eZ80F93	20MHz eZ80® CPU, low-power modes, 64KB+256B Flash, 4KB SRAM, 24 bits GPIO, IrDA, 2 UART, I²C, SPI, 6 Counter Timers with I/O features, WDT, RTC, 4-channel CS+WSG, JTAG, ZDI.
eZ80F91	50MHz eZ80® CPU, low-power modes, 256KB+512B Flash, 8KB SRAM, 32 bits GPIO, 10/100 EMAC, IrDA, 2 UART, I²C, SPI, 6 Counter Timers with I/O features, WDT, RTC, 4-channel CS+WSG, JTAG, ZDI.
Z84C00	Z80™ CPU (up to 20 MHz).
Z84C15	Z80™ CPU, 2 SIO, 4x8 CTC, 2 PIO, WDT, up to 16MHz clock speed.
Z80S180™	Improved Z80™ CPU, 1MB MMU, 2 DMA, 2 16-bit PRTs, 2 UARTs, CSIO, up to 33MHz clock speed.
Z80181	Z8S180 CPU, SCC, CTC, 16-bit GPIO, up to 33MHz clock speed.
Z80182	Z8S180 CPU, 2 ESCC, 24-bit GPIO, 16550 Mimic interface, up to 33MHz clock speed.
Z80L183	Z8S180 CPU, 8x10-bit A/D, 10-bit D/A, WDT, 1KB Boot ROM, 2KB SRAM, 1MB MMU, 2 CSIO, 2 UARTs, 2 DMA, 32-bit GPIO, up to 33MHz clock speed, TCP/IP software suite.
Z80S183	Z8S180 CPU, 8x10-bit A/D, 10-bit D/A, WDT, 1KB Boot ROM, 2KB SRAM, 1MB MMU, 2 CSIO, 2 UARTs, 2 DMA, 32-bit GPIO, up to 33MHz clock speed, TCP/IP software suite.

Ordering Information

Part	PSI	Description
eZ80190AZ050SC	50 MHz, Standard Temperature	eZ80190 microprocessor
eZ80190AZ050EC	50 MHz, Extended Temperature	eZ80190 microprocessor

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