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High-Performance 8-Bit Microcontrollers

Z8 Encore![®] F083A Series

Product Specification

PS026310-1212

PRELIMINARY



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Revision History

Each instance in this document's revision history reflects a change from its previous edition. For more details, refer to the corresponding page(s) or appropriate links furnished in the table below.

Date	Revision Level	Chapter/Section	Description	Page No.
Dec 2012	10	GPIO	Modified GPIO Port D0 language in Shared Reset Pin section and Port Alternate Function Mapping table.	35 , 36
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Overview

Zilog's Z8 Encore! MCU family of products are the first in a line of Zilog microcontroller products based on the 8-bit eZ8 CPU. The Z8 Encore! F083A Series products expand on Zilog's extensive line of 8-bit microcontrollers. The Flash in-circuit programming capability allows for faster development time and program changes in the field. The new eZ8 CPU is upward-compatible with existing Z8 CPU instructions. The rich peripheral set of Z8 Encore! F083A Series makes it suitable for a variety of applications including motor control, security systems, home appliances, personal electronic devices and sensors.

Features

Z8 Encore! F083A Series MCU include the following key features:

- 20MHz eZ8 CPU
- Up to 8KB Flash memory with in-circuit programming capability
- Up to 256 B register RAM
- 100 B nonvolatile data storage (NVDS)
- Up to 23 I/O pins depending upon package
- Internal precision oscillator (IPO)
- External crystal oscillator
- Two enhanced 16-bit timers with capture, compare and PWM capability
- Watchdog Timer (WDT) with dedicated internal RC oscillator
- Single-pin, On-Chip Debugger (OCD)
- Fast 8-channel, 10-bit Analog-to-Digital Converter (ADC)
- On-chip analog comparator
- Up to 17 interrupt sources
- Voltage Brown-Out protection (VBO)
- Power-On Reset (POR)
- 2.7V to 3.6V operating voltage
- Up to thirteen 5V-tolerant input pins
- 20-pin and 28-pin packages

- 0°C to +70°C standard temperature range and –40°C to +105°C extended temperature operating ranges

Part Selection Guide

Table 1 lists the basic features available for each device within the Z8 Encore! F083A Series product line. For details, see the [Ordering Information](#) chapter on page 199.

Table 1. Z8 Encore! F083A Series Family Part Selection Guide

Part Number	Flash (KB)	RAM (B)	NVDS (100B)	ADC	I/O Pins
Z8F083A	8	256	Yes	Yes	17/23
Z8F043A	4	256	Yes	Yes	17/23

Block Diagram

Figure 1 displays a block diagram of the Z8 Encore! F083A Series architecture.

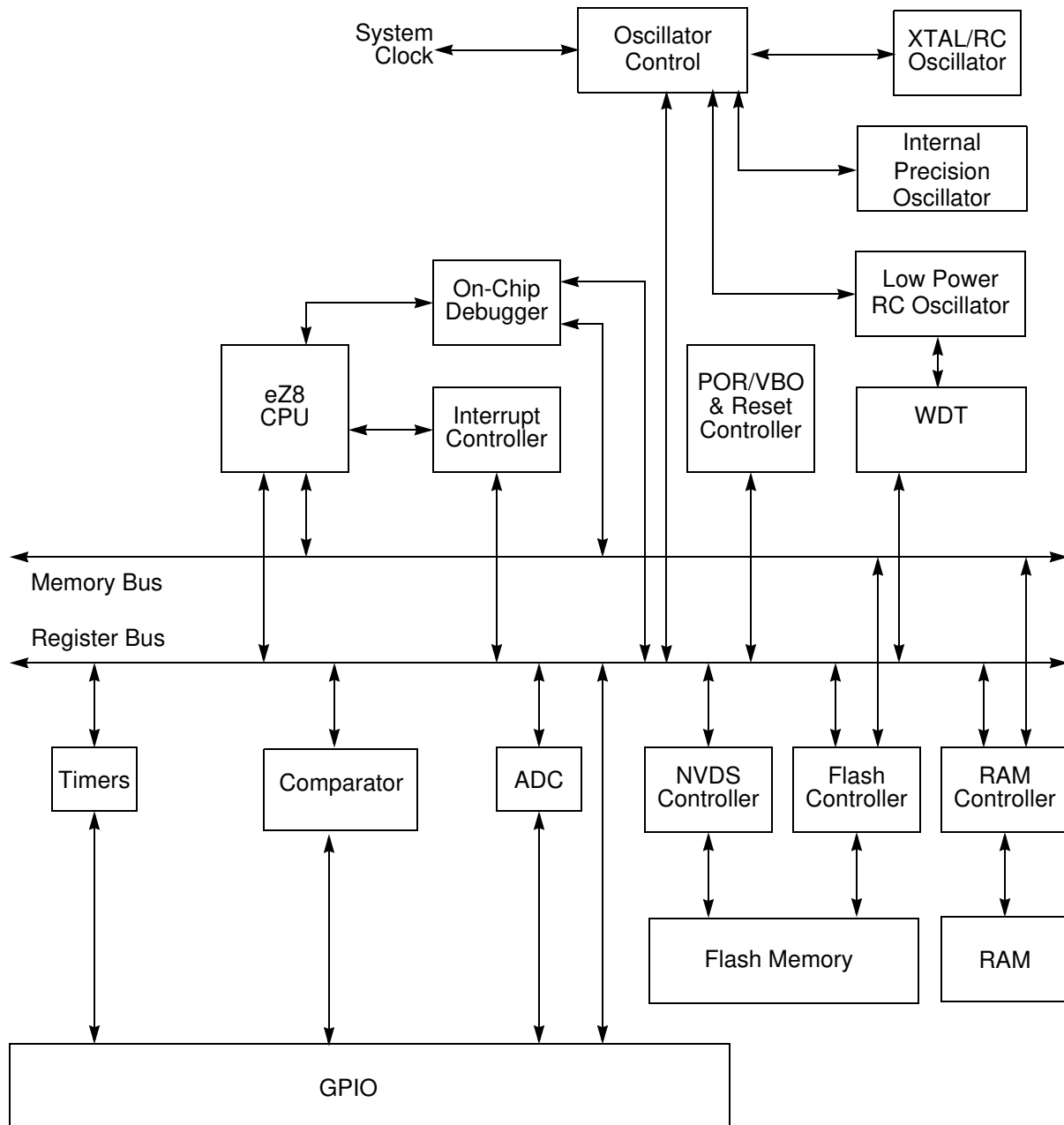


Figure 1. Z8 Encore! F083A Series Block Diagram

CPU and Peripheral Overview

Zilog's 8-bit eZ8 CPU meets the continuing demand for faster and more code-efficient microcontrollers. The eZ8 CPU executes a superset of the original Z8 instruction set. The eZ8 CPU features include:

- Direct register-to-register architecture allows each register to function as an accumulator, improving execution time and decreasing the required program memory
- Software stack allows much greater depth in subroutine calls and interrupts than hardware stacks
- Compatible with existing Z8 CPU code
- Expanded internal Register File allows access up to 4KB
- New instructions improve execution efficiency for code developed using high-level programming languages, including C
- Pipelined instruction fetch and execute
- New instructions for improved performance including BIT, BSWAP, BTJ, CPC, LDC, LDCI, LEA, MULT and SRL
- New instructions support 12-bit linear addressing of the Register File
- Up to 10 MIPS operation
- C Compiler-friendly
- Two to nine clock cycles per instruction

For more information regarding the eZ8 CPU, refer to [eZ8 CPU Core User Manual \(UM0128\)](#), available for download on www.zilog.com.

General Purpose Input/Output

The Z8 Encore! F083A Series features up to 23 port pins (Ports A–D) for general purpose input/output (GPIO). The number of GPIO pins available is a function of package. Each pin is individually programmable.

Flash Controller

The Flash Controller programs and erases Flash memory. It also supports protection against accidental programming and erasure.

Nonvolatile Data Storage

The nonvolatile data storage (NVDS) uses a hybrid hardware/software scheme to implement a byte programmable data memory and is capable of storing about 100,000 write cycles.

Internal Precision Oscillator

The internal precision oscillator (IPO) with accuracy of $\pm 4\%$ full voltage/temperature range is a trimable clock source that requires no external components.

External Crystal Oscillator

The external crystal oscillator circuit provides highly accurate clock frequencies with the use of an external crystal, ceramic resonator or RC network.

10-Bit Analog-to-Digital Converter

The analog-to-digital converter (ADC) converts an analog input signal to a 10-bit binary number. The ADC accepts inputs from eight different analog input pins. It has a fast 2.8 μ s conversion speed.

Analog Comparator

The analog comparator compares the signal at an input pin with either an internal programmable reference voltage or with a signal at the second input pin. The comparator output is used either to drive a logic output pin or to generate an interrupt.

Timers

Two enhanced 16-bit reloadable timers are used for timing/counting events or for motor control operations. These timers provide a 16-bit programmable reload counter and operate in ONE-SHOT, CONTINUOUS, GATED, CAPTURE, CAPTURE RESTART, COMPARE, CAPTURE and COMPARE, PWM SINGLE OUTPUT and PWM DUAL OUTPUT modes.

Interrupt Controller

The Z8 Encore! F083A Series products support seventeen interrupt sources with sixteen interrupt vectors: up to five internal peripheral interrupts and up to twelve GPIO interrupts. These interrupts have three levels of programmable interrupt priority.

Reset Controller

The Z8 Encore! F083A Series products are reset using any one of the following: the RESET pin, POR, WDT time-out, STOP Mode exit or VBO warning signal. The RESET pin is bidirectional, that is, it functions as reset source as well as a reset indicator.

On-Chip Debugger

The Z8 Encore! F083A Series products feature an integrated OCD. The OCD provides a rich set of debugging capabilities, such as reading and writing registers, programming Flash memory, setting breakpoints and executing code. The OCD uses one single-pin interface for communication with an external host.

Acronyms and Expansions

This document references a number of acronyms; each is expanded in Table 2 for the reader's understanding.

Table 2. Acronyms and Expansions

Acronyms	Expansions
ADC	Analog-to-Digital Converter
NVDS	Nonvolatile Data Storage
WDT	Watchdog Timer
GPIO	General-Purpose Input/Output
OCD	On-Chip Debugger
POR	Power-On Reset
VBO	Voltage Brownout
IPO	Internal Precision Oscillator
PDIP	Plastic Dual Inline Package
SOIC	Small Outline Integrated Circuit
SSOP	Small Shrink Outline Package
QFN	Quad Flat No Lead
IRQ	Interrupt request
ISR	Interrupt service routine
MSB	Most significant byte
LSB	Least significant byte
PWM	Pulse Width Modulation
SAR	Successive Approximation Register

Pin Description

The Z8 Encore! F083A Series products are available in variety of package styles and pin configurations. This chapter describes the signals and the pin configurations for each of the package styles. For information about the physical package specifications, see the [Packaging](#) chapter on page 198.

Available Packages

Table 3 lists the package styles that are available for each device in the Z8 Encore! F083A Series product line.

Table 3. Z8 Encore! F083A Series Package Options

Part Number	ADC	20-pin QFN	20-pin SOIC	20-pin SSOP	20-pin PDIP	28-pin QFN	28-pin SOIC	28-pin SSOP
Z8F083A	Yes	X	X	X	X	X	X	X
Z8F043A	Yes	X	X	X	X	X	X	X

Pin Configurations

Figures 2 through 5 display the pin configurations of all of the packages available in the Z8 Encore! F083A Series. For the description of the signals, see [Table 4](#) on page 11.

The pin configurations listed are preliminary and subject to change based on manufacturing limitations.

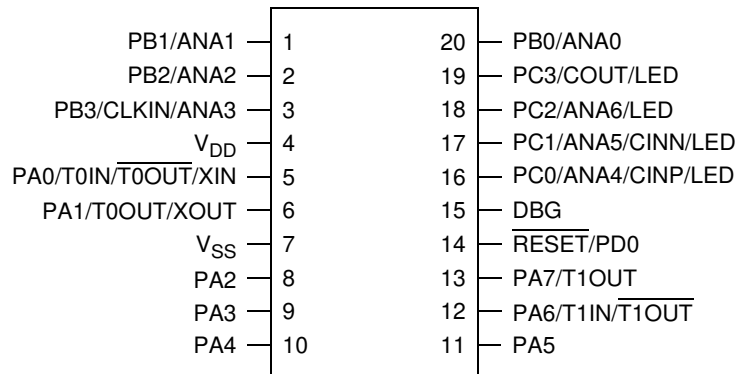


Figure 2. Z8F083A Series in 20-Pin SOIC, SSOP, PDIP Package