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High-Performance 8-Bit Microcontrollers

Z8 Encore![®] F0830 Series

Product Specification

PS025113-1212



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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	13	GPIO	Modified GPIO Port D0 language in Shared Reset Pin section and Port Alternate Function Mapping table.	35 , 36
Sep 2011	12	LED Drive Enable Register	Clarified statement surrounding the Alternate Function Register as it relates to the LED function; revised Sector Based Flash Protection description; revised Packaging chapter.	51 , 115 , 199
Dec 2007	11	n/a	Updated all instances of <i>Z8 Encore! XP F0830</i> to <i>Z8 Encore! F0830</i> .	All
Nov 2007	10	DC Characteristics, On-Chip Peripheral AC and DC Electrical Characteristics	Updated Tables 116 and 122.	185 , 193
Sep 2007	09	Timers, PWM SINGLE OUTPUT Mode, PWM DUAL OUTPUT Mode, Analog-to-Digital Converter, Reference Buffer.	Updated Figures 2 and 4, Table 4.	8 , 9 , 11 , 68 , 74 , 75 , 98 , 101
Apr 2007	08	Optimizing NVDS Memory Usage for Execution Speed, On-Chip Peripheral AC and DC Electrical Characteristics	Added a note under Table 93 in Nonvolatile Data Storage chapter. Updated Table 121 and Table 122 in Electrical Characteristics chapter. Other style updates.	137 , 193 , 193
Dec 2006	07	General Purpose Input/Output	Added PD0 in Table 16.	38
		Overview, Interrupt Controller	Changed the number of interrupts to 17.	1.5 , 53
		Nonvolatile Data Storage	Updated chapter.	136
		Oscillator Control Register Definitions, AC Characteristics, On-Chip Peripheral AC and DC Electrical Characteristics	Updated Tables 117 and 122. Added Figure 24.	156 , 189 , 193
		Ordering Information	Updated Part Number Suffix Designations.	205
		n/a	Removed <i>Preliminary</i> stamp from footer.	All

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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! F0830 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! F0830 Series makes it suitable for a variety of applications including motor control, security systems, home appliances, personal electronic devices and sensors.

Features

The key features of Z8 Encore! F0830 Series MCU include:

- 20MHz eZ8 CPU
- Up to 12KB Flash memory with in-circuit programming capability
- Up to 256B register RAM
- 64B Nonvolatile Data Storage (NVDS)
- Up to 25 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)
- Optional 8-channel, 10-bit Analog-to-Digital Converter (ADC)
- On-chip analog comparator
- Up to 17 interrupt sources
- Voltage Brown-Out (VBO) protection
- Power-On Reset (POR)
- 2.7V to 3.6V operating voltage
- Up to thirteen 5V-tolerant input pins
- 20- 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! F0830 Series product line. See [the Ordering Information](#) chapter on page 200 for details.

Table 1. Z8 Encore! F0830 Series Family Part Selection Guide

Part Number	Flash (KB)	RAM (B)	NVDS (64B)	ADC
Z8F1232	12	256	No	Yes
Z8F1233	12	256	No	No
Z8F0830	8	256	Yes	Yes
Z8F0831	8	256	Yes	No
Z8F0430	4	256	Yes	Yes
Z8F0431	4	256	Yes	No
Z8F0230	2	256	Yes	Yes
Z8F0231	2	256	Yes	No
Z8F0130	1	256	Yes	Yes
Z8F0131	1	256	Yes	No

Block Diagram

Figure 1 displays a block diagram of the Z8 Encore! F0830 Series architecture.

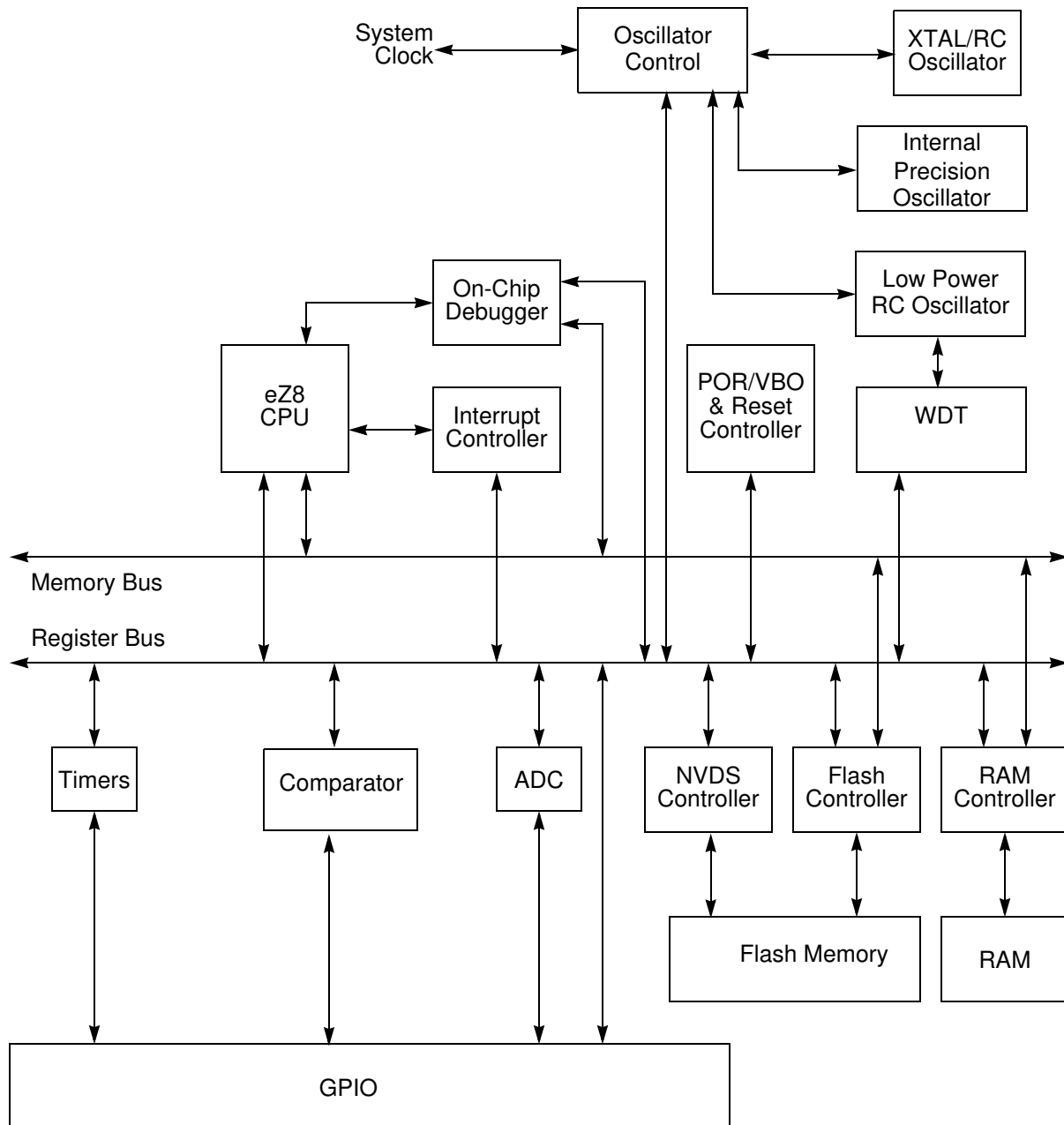


Figure 1. Z8 Encore! F0830 Series Block Diagram

CPU and Peripheral Overview

The eZ8 CPU, Zilog's latest 8-bit 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 execution
- 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
- 2 to 9 clock cycles per instruction

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

General Purpose Input/Output

The Z8 Encore! F0830 Series features up to 25 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 the Flash memory. It also supports protection against accidental programming and erasure.

Nonvolatile Data Storage

The Nonvolatile Data Storage (NVDS) function 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) function, with an accuracy of $\pm 4\%$ full voltage/temperature range, is a trimmable clock source that requires no external components.

External Crystal Oscillator

The crystal oscillator circuit provides highly accurate clock frequencies using an external crystal, ceramic resonator or RC network.

10-Bit Analog-to-Digital Converter

The optional 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.

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 can be 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! F0830 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! F0830 Series products are reset using any one of the following: the $\overline{\text{RESET}}$ pin, Power-On Reset, Watchdog Timer (WDT) time-out, STOP Mode exit or Voltage Brown-Out (VBO) warning signal. The $\overline{\text{RESET}}$ pin is bidirectional; i.e., it functions as a reset source as well as a reset indicator.

On-Chip Debugger

The Z8 Encore! F0830 Series products feature an integrated On-Chip Debugger (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 Brown-Out
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 Regis-

Pin Description

The Z8 Encore! F0830 Series products are available in a 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 199.

Available Packages

Table 3 lists the package styles that are available for each device in the Z8 Encore! F0830 Series product line.

Table 3. Z8 Encore! F0830 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	28-pin PDIP
Z8F1232	Yes	X	X	X	X	X	X	X	X
Z8F1233	No	X	X	X	X	X	X	X	X
Z8F0830	Yes	X	X	X	X	X	X	X	X
Z8F0831	No	X	X	X	X	X	X	X	X
Z8F0430	Yes	X	X	X	X	X	X	X	X
Z8F0431	No	X	X	X	X	X	X	X	X
Z8F0230	Yes	X	X	X	X	X	X	X	X
Z8F0231	No	X	X	X	X	X	X	X	X
Z8F0130	Yes	X	X	X	X	X	X	X	X
Z8F0131	No	X	X	X	X	X	X	X	X

Pin Configurations

Figures 2 and 3 display the pin configurations of all of the packages available in the Z8 Encore! F0830 Series. See [Table 4](#) on page 11 for a description of the signals. Analog input alternate functions (ANAx) are not available on the following devices:

- Z8F0831
- Z8F0431
- Z8F0131
- Z8F0231
- Z8F1233