F0830/3A SERIES ADVANTAGE

SUMMARY

- HIGHLY INTEGRATED PERIPHERALS
- 10 MIPS, 20 MHz eZ8™ CPU CORE
- UP TO 12 KB OF FLASH MEMORY
- FAST INT PRECISION OSCILLATOR
- BEST-IN-CLASS FAST ADC
- UP TO 100 B OF EEPROM
- FASTER RESPONSE TIME

TARGET APPLICATIONS

- UNIVERSAL MOTOR CONTROL
- BRUSHED DC MOTOR CONTROL
- ELECTRIC FAN CONTROL
- SENSOR INTERFACING
- BALLAST CONTROL
- BATTERY CHARGING
- HOME APPLIANCES
- CONSUMER ELECTRONICS

Z8 Encore!® F0830 & F083A Series Microcontrollers Cost-Efficient 8-Bit Flash Solutions

Overview

The Z8 Encore! F0830 and F083A Series of Flash microcontrollers is based on Zilog's 8-bit eZ8™ CPU core. Wrapped around this highly-acclaimed core are key peripherals that are tied together to offer a complete solution with greater scalability, lower overall system cost and reduced energy consumption.

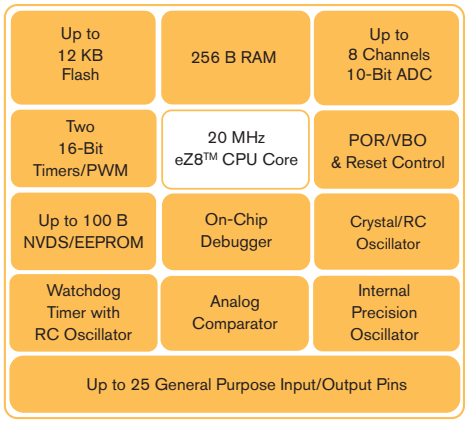
Both the F0830 and F083A Series of devices share similar features, and offer a full line of products that are selectable by Flash memory size, EEPROM, and ADC speed. The F083A, by contrast, extends the solution from the existing F0830 series, and adds substantial cost-to-performance improvements for fan control and universal motor control applications. In addition, the F083A Series is also suitable for digital power management, battery charging, and environmental sensor applications. Both the F0830 and F083A Series devices are pin-for-pin compatible with the award-winning Z8 Encore! F082A family and with each other.

Common features available to both the F0830 and F083A devices, include an optimized 8-bit eZ8 core, direct memory-to-memory arithmetic operation, a flexible Internal Precision Oscillator (IPO), and a best-in-class fast ADC. If your solution requires even more precision, the F083A takes all the performance and key peripheral features of the F0830, and adds to it a more optimized peripheral set specifically catered to applications that require faster response times. The F083A enhanced peripheral set enables critical motor control loop operations, for example, that accommodate for features such as current and temperature monitoring that is crucial for applications requiring fan control, universal motor control, and digital power management. Both devices are supported by a full development kit, Zilog's integrated development environment (IDE), and software sample libraries that bring your design to market both quickly and cost effectively.

F0830 & F083A Series Key Feature Summary

- 20 MHz eZ8™ CPU core
- Up to 12 KB Flash memory with in-circuit programming capability
- Up to 256 B register RAM
- Up to 100 B non-volatile data storage (NVDS) or EEPROM
- Up to eight channels, 10-bit Analog-to-Digital Converter (ADC) with fast conversion times
- On-chip analog comparator
- Two 16-bit timers with Capture, Compare, and Pulse Width Modulation (PWM) capabilities
- Up to 17 interrupts with configurable priority
- Internal precision oscillator (output frequency: 5.5 MHz for the F0830; 20 MHz for the F083A)

F0830/3A Series Block Diagram



Electrical Characteristics

- Power supply: 2.7 V-3.6 V (5 V-tolerant for digital inputs only)
- Standard temperature: 0 °C to 70 °C
- Extended temperature: –40 °C to +105 °C
- Supply current: 20 MHz; 8 mA (typical)
- Supply current in HALT mode with peripherals powered down: 2 mA (typical)
- Supply current in STOP mode: 2 µA (max.; w/o WDT running)

F0830 & F083A Series Flash Controller Detailed Feature Set

KEY HARDWARE FEATURES
- eZ8 CPU CORE
- ON-CHIP FLASH MEMORY
- NVDS/EEPROM
- FAST ADC
- ANALOG COMPARATOR

eZ8™ CPU CORE

The eZ8 CPU, Zilog's latest 8-bit CPU, meets the continuing demand for faster and more code-efficient microcontrollers. The eZ8 CPU features include:

- New instructions for improved performance including BIT, BSWAP, BTJ, CPC, LDC, LDCI, LEA, MULT and SRL
- New instructions supporting 12-bit linear addressing of the Register file
- Compatible with existing Z8® code
- Up to 10 MIPS operation
- C-Compiler friendly
- Two to nine clock cycles per instruction

ON-CHIP FLASH MEMORY

The products in the Z8 Encore! F0830 Series feature up to 12 KB of non-volatile Flash memory, whereas the F083A Series feature up to 8 KB of non-volatile Flash memory. Both offer full read, write and erase functionality. The Flash memory is programmed and erased in-circuit by either user code or through the On-Chip Debugger. For program/data protection, the Flash memory is also divided into sectors.

NON-VOLATILE DATA STORAGE (NVDS) OR EEPROM

The Z8 Encore! F083A Series devices contain a Non-Volatile Data Storage (NVDS) element of up to 100 bytes. This memory (also referred to as EEPROM) can perform over 100,000 write cycles. The NVDS is implemented by special purpose Zilog software stored in areas of program memory not accessible to you. These special purpose routines use the Flash memory to store the data. The routines incorporate a dynamic addressing scheme to maximize the write/erase endurance of the Flash.

ANALOG-TO-DIGITAL CONVERTER (ADC)

The Z8 Encore! includes an eight-channel Successive Approximation Register (SAR) analog to digital converter (ADC). The ADC converts an analog input signal to a 10-bit binary number. Depending on your performance requirements, two different conversion times are available for both devices - for the F0830, conversion times are as low as 11.9 µs; on the F083A, conversion times are as low as 2.8 µs. The features of the SAR ADC include:

- Eight analog input sources multiplexed with general purpose I/O ports.
- Fast conversion time, as low as 2.8 µs (ADC conversion clock should be less than 10 MHz).
- Programmable timing controls.
- Interrupt on conversion complete.
- Internal voltage reference generator.
- Ability to select external reference voltage.
- When configuring ADC using external Vref, PB5 is used as Vref in 28-pin package

ANALOG COMPARATOR

The Z8 Encore! F0830 and F083A Series devices feature a general purpose comparator that compares two analog input signals. A GPIO (CINP) pin provides the positive comparator input. The negative input (CINN) is taken from either an external GPIO pin or from an internal reference. The output is available as an interrupt source or is routed to an external pin using the GPIO multiplex. The comparator includes the following features:

- Positive input is connected to a GPIO pin.
- Negative input is connected to either a GPIO pin or an programmable internal reference.
- Output is either an interrupt source or an output to an external pin.

F0830 & F083A Series Flash Controller Detailed Feature Set (continued...)

KEY HARDWARE FEATURES
- TIMERS
- OSCILLATOR CONTROLS
- IPO

TIMERS

The Z8 Encore! F0830 & F083A Series devices contain up to two 16-bit re-loadable timers that are used for timing, event counting, or generation of pulse width modulated (PWM) signals. The timers features include:

- 16-bit reload counter
- Programmable prescaler with prescale values ranging from 1 to 128
- PWM output generation
- Capture and compare capability
- External input pin for timer input, clock gating, or capture signal. External input pin signal frequency is limited to a maximum of one-fourth the system clock frequency
- Timer output pin
- Timer interrupt

OSCILLATOR CONTROLS & AVAILABLE OPTIONS

The Z8 Encore! F0830 & F083A Series devices use five possible clocking schemes. Each one of these is user selectable.

- On-chip Internal Precision Oscillator
- On-chip oscillator using off-chip crystal or resonator
- On-chip oscillator using external RC network
- External clock drive
- On-chip low precision Watchdog Timer Oscillator

In addition, all devices contain clock failure detection and recovery circuitry, allowing continued operation despite a failure of the primary oscillator.

INTERNAL PRECISION OSCILLATOR

The internal precision oscillator (IPO) is designed for use without external components. You either manually trim the oscillator for a non-standard frequency or use the automatic factory trimmed version to achieve up to a 20 MHz frequency with ± 4% accuracy and 45%~55% duty cycle over the operating temperature and supply voltage of the device (available on the F083A devices only; the IPO frequency available for the F0830 is 5.5 MHz with ± 4% accuracy) . The IPO features include:

- On-chip RC oscillator that does not require external components
- Output frequency of either 20 MHz or 5.5 MHz (contains both a FAST and a SLOW mode)
- Trimming possible through Flash option bits with user override
- Elimination of crystals or ceramic resonators in applications where high timing accuracy is not required

AVAILABLE INTERFACES
- ON-CHIP DEBUGGER

ON-CHIP DEBUGGER INTERFACE

The Z8 Encore! F0830 and F083A Series devices both contain an integrated On-Chip Debugger (OCD) that provides the following advanced debugging features:

- Reading and writing of the Register File
- Reading and writing of program and data memory
- Setting of breakpoints and watch points
- Executing eZ8™ CPU instructions

F0830 & F083A Series Development Tool Support

The Z8 Encore! F0830 & F083A Series devices are supported by Zilog's easy-to-use development tools. For the F083A, the tools package includes the following: a USB Smart Cable, an Ethernet USB Smart Cable, an Opto-Isolated USB Smart Cable, and the Z8 Encore! F083A Series Development Kit.; for the F0830, the only hardware element needed is either a USB Smart Cable, an Opto-Isolated USB Smart Cable or an Ethernet USB Smart Cable.

Both the F0830 and F083A Series are supported by ZDS II—Zilog's Integrated Development Environment (IDE) with ANSI C-Compiler for the Z8 Encore! (available on www.zilog.com). The ZDS II IDE includes:

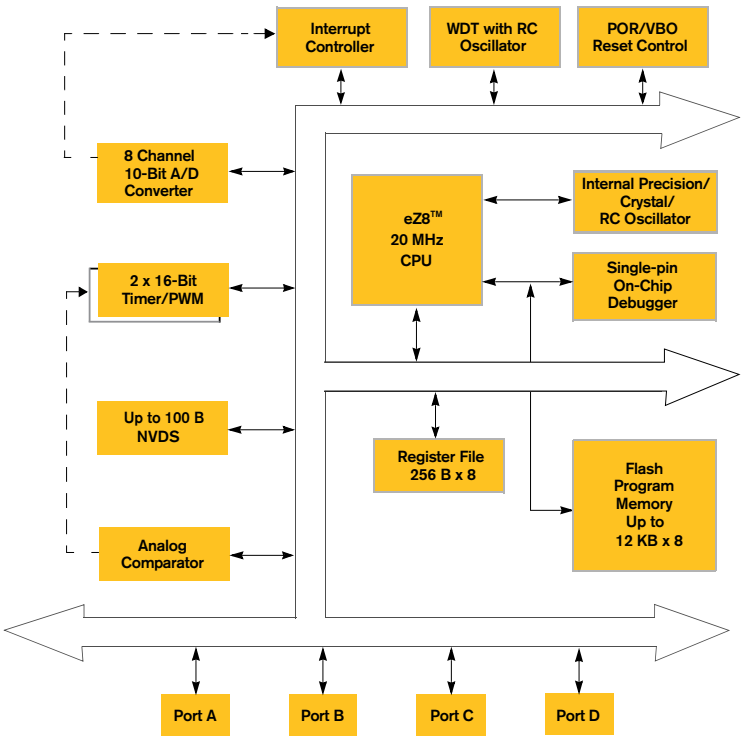
- Sample Code
- Product Specifications (Data Sheet)
- Product Briefs
- Multiple Application Notes
- eZ8™ CPU User Manual

Hardware Tools & Part Number Ordering Information

- F083A Series Full Development Kit with USB Smart Cable (part #: Z8F083A0128ZCOG)
- Opto-Isolated USB Smart Cable Accessory Kit (part #: ZUSBOPTSC01ZACG)
- USB Smart Cable Accessory Kit (part #: ZUSBSC00100ZACG)
- Ethernet Smart Cable Accessory Kit (part #: ZENETSC0100ZACG)

Software Tools & Support

- Full ANSI C-Compiler
- Zilog Developer Studio Integrated Development Environment (ZDS II IDE) including an assembler, linker, debugger, and simulator



F0830/3A Series Block Diagram & System Flow Chart

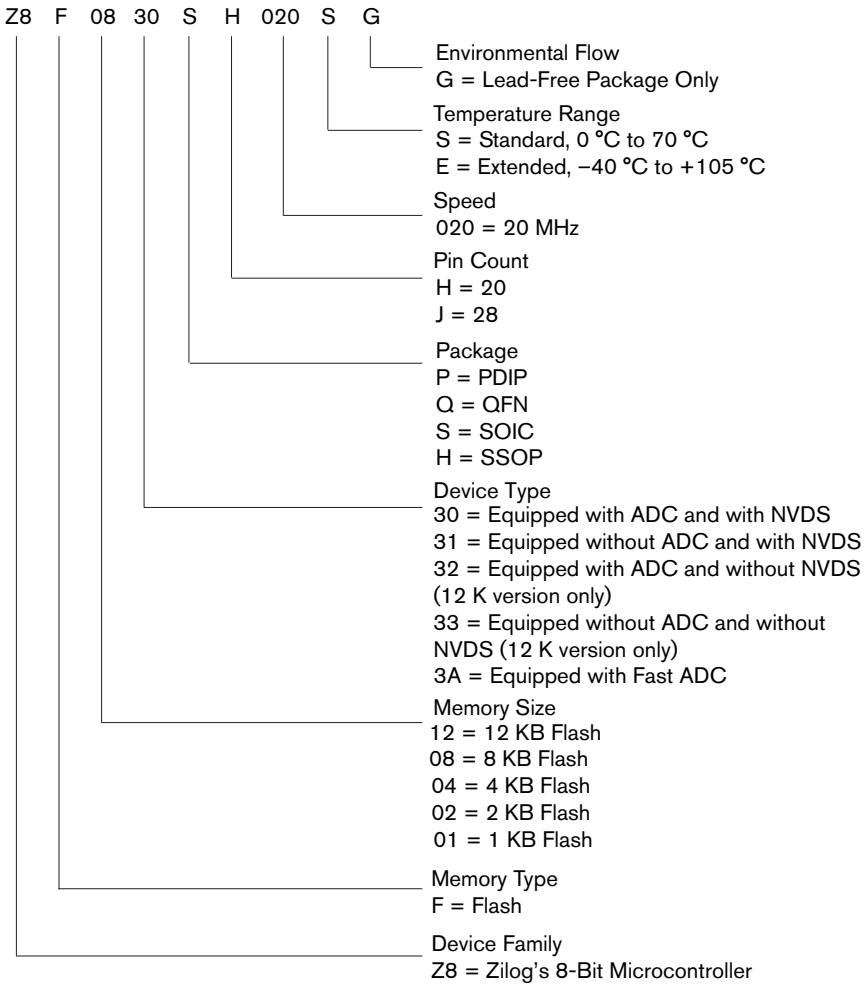
Silicon Ordering Information

Order the Z8 Encore! F0830 and F083A Series Flash microcontrollers from your local Zilog sales representative by using the part numbers below. For more information, or to download product collateral and/or software, please visit us at www.zilog.com.

Part Number	Description/Options	Packages
F0830 Series		
Z8F1232XX020XX	12 KB Flash; 256 B RAM; no NVDS 7 or 8 ADC channels; Std./Ext. Temp.	20- & 28-pin SOIC/SSOP/PDIP/QFN
Z8F1233XX020XX	12 KB Flash; 256 B RAM; no NVDS no ADC channels; Std./Ext. Temp.	20- & 28-pin SOIC/SSOP/PDIP/QFN
Z8F0830XX020XX	8 KB Flash; 256 B RAM; NVDS 7 or 8 ADC channels; Std./Ext. Temp.	20- & 28-pin SOIC/SSOP/PDIP/QFN
Z8F0831XX020XX	8 KB Flash; 256 B RAM; NVDS no ADC channels; Std./Ext. Temp.	20- & 28-pin SOIC/SSOP/PDIP/QFN
Z8F0430XX020XX	4 KB Flash; 256 B RAM; NVDS 7 or 8 ADC channels; Std./Ext. Temp.	20- & 28-pin SOIC/SSOP/PDIP/QFN
Z8F0431XX020XX	4 KB Flash; 256 B RAM; NVDS no ADC channels; Std./Ext. Temp.	20- & 28-pin SOIC/SSOP/PDIP/QFN
Z8F0230XX020XX	2 KB Flash; 256 B RAM; NVDS 7 or 8 ADC channels; Std./Ext. Temp.	20- & 28-pin SOIC/SSOP/PDIP/QFN
Z8F0231XX020XX	2 KB Flash; 256 B RAM; NVDS no ADC channels; Std./Ext. Temp.	20- & 28-pin SOIC/SSOP/PDIP/QFN
Z8F0130XX020XX	1 KB Flash; 256 B RAM; NVDS 7 or 8 ADC channels; Std./Ext. Temp.	20- & 28-pin SOIC/SSOP/PDIP/QFN
Z8F0131XX020XX	1 KB Flash; 256 B RAM; NVDS no ADC channels; Std./Ext. Temp.	20- & 28-pin SOIC/SSOP/PDIP/QFN
F083A Series		
Z8F083AXX020XX	8 KB Flash; 256 B RAM; 7 or 8 ADC channels; Std./Ext. Temp.	20- & 28-pin SSOP/SOIC/PDIP/QFN
Z8F043AXX020XX	4 KB Flash; 256 B RAM; 7 or 8 ADC channels; Std./Ext. Temp.	20- & 28-pin SSOP/SOIC/PDIP/QFN

Note: The "X's" represented in the part number above refers to multiple options available at the time of ordering . The first "X" denotes package style; the second "X" denotes pin count.; the third and forth "X's" denotes temperature range and environmental flow respectively. Contact your local Zilog sales representative for more information and a complete list of available devices, or visit Zilog's corporate website at www.zilog.com. PDIP packages are available in 20-pin versions only.

Part Number Suffix Designations



Documentation

The collateral referenced below is just a sample of the documentation available for both the F0830 and F083A Series of embedded Flash microcontrollers. For a complete listing of all available application notes, product specifications, user manuals, and sample libraries, please visit us at www.zilog.com.

Document Number	Description
AN0242	Migration from Z8 Encore! XP F082A Series to Z8 Encore! F0830 Series
AN0245	Migration from Z8 Encore! F0830 Series to Z8 Encore! F083A Series
PS0251	Z8 Encore! F0830 Series Product Specification
PS0263	Z8 Encore!® F083A Series Product Specification
UM0206	Z8 Encore!® F083A Series Development Kit User Manual
UM0181	USB Smart Cable User Manual
UM0207	Ethernet Smart Cable User Manual
UM0128	eZ8™ CPU User Manual

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As used herein
Life support devices or systems are devices which (a) are intended for surgical implant into the body, or (b) support or sustain life and whose failure to perform when properly used in accordance with instructions for use provided in the labeling can be reasonably expected to result in a significant injury to the user. A critical component is any component in a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system or to affect its safety or effectiveness.

Engineering Notes:

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