Application Note

Date Code Migration for Z8 Encore! XP® F0822 Series Flash MCUs

AN028001-0608

Z8 Encore! XP® Flash Microcontrollers

Abstract

This application note highlights the differences in Zilog's high-performance Z8 Encore!XP F0822 Series Flash Microcontrollers silicon devices based on their date codes. It also reviews the feature differences that must be addressed when migrating from an earlier date code to a later date code.

Discussion

In this migration, there are only three Z8 Encore! XP F0822 Series Flash Microcontrollers differences that impacts an existing design. All other differences are unlikely to impact existing application designs. Table 1 lists the Z8 Encore! XP F0822 Series Flash Microcontrollers devices that exhibit differences based on their date codes. The date codes marked on the Z8 Encore! XP F0822 Series Flash Microcontrollers devices identify the version of the device (see Table 2).

Table 1. Z8 Encore! XP F0822 Series Flash Microcontrollers Devices

Z8F0811	Z8F0821	Z8F0411	Z8F0421
Z8F0812	Z8F0822	Z8F0412	Z8F0422

The format of date codes is yyww, where yy is the year and ww is the week of the year. Other top markings on these devices, such as ENGSMPL, ES, or PROTO, may also be present. These markings represent the initial issue of the version and do not define a version. The versions of Z8 Encore! XP F0822 Series Flash Microcontrollers discussed in this document are AA and BA.

Table 2. Z8 Encore! XP F0822 Series Flash Microcontrollers Version Date Codes

	Version	
	AA	BA
Date Code Coverage	Before 0402	0402 and after

Feature Differences

Figure 1 displays an overview of the Z8 Encore! XP F0822 Series Flash Microcontrollers modules that are different between the two versions of the Z8 Encore! XP F0822 Series Flash Microcontrollers silicon. The differences are described under three categories:

1. **No Change**—Modules in this category have identical features and are functionally compatible. Application design is not impacted.
2. **Modified and Enhanced**—Modules in this category have some modified and enhanced features. Application design may be impacted regarding WDT RC oscillator, Reset pin, DBG pin, SMR pin, and Flash Protection features.
3. **New Upward-Compatible Feature Addition**—Modules in this category are upward-compatible and have some new features. Existing features are not affected. *Upward-compatible* means that new features are added using unimplemented register bits and modules operate in the same way as long as the bits are written as `0`. Existing application designs are not impacted by this change.

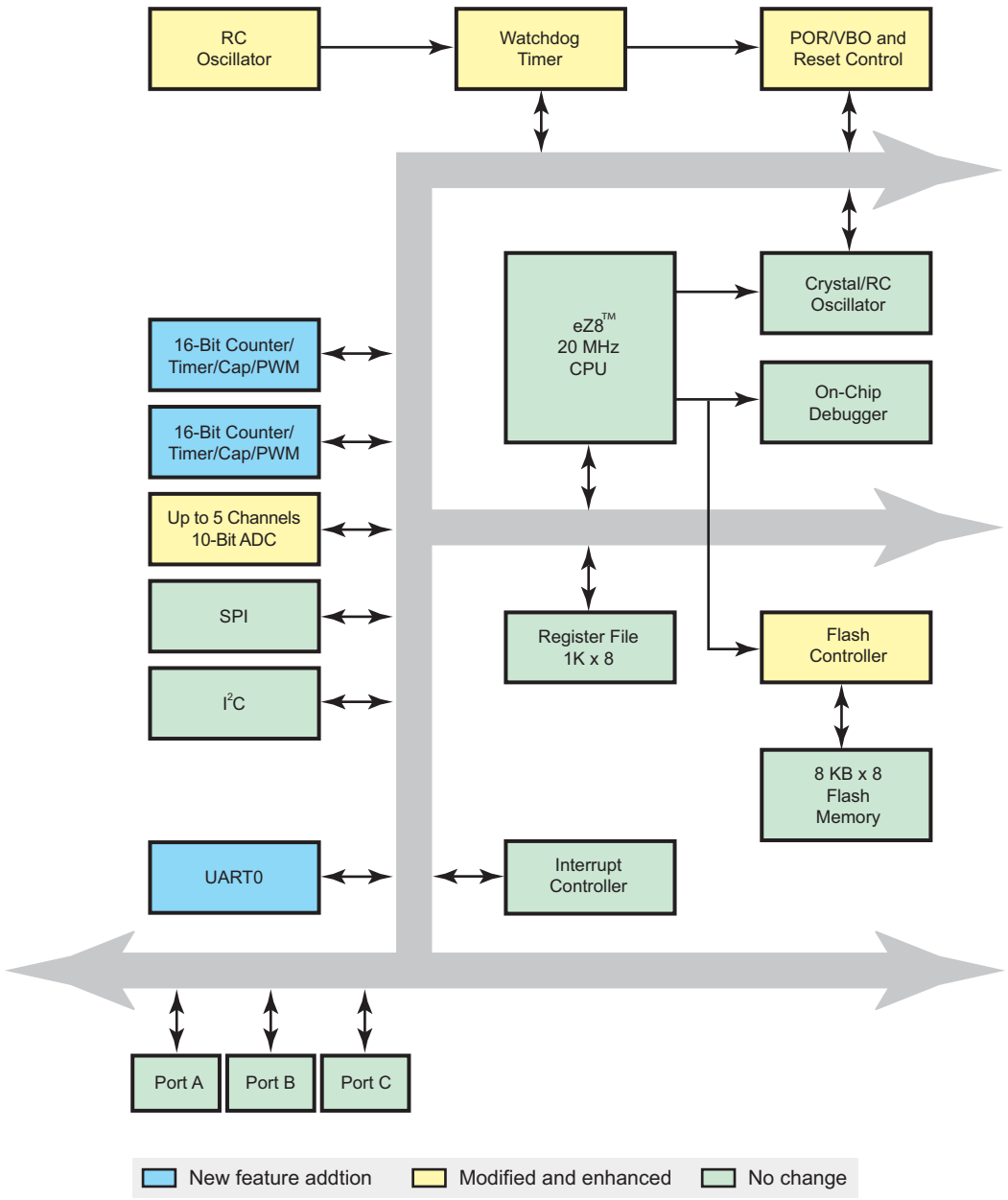

Figure 1. Z8 Encore! XP® F0822 Series Flash Microcontrollers Block Diagram

Table 3 on page 3 lists the feature differences and impacts resulted due to migration from version AA to version BA of Z8 Encore! XP F0822 Series Flash Microcontrollers silicon. For convenience, it is color-coded to correspond to Figure 1.

Table 3. Summary of Feature Differences

Z8 Encore! XP® F0822 Series Flash Microcontrollers Feature	AA to BA Difference	Description	Existing Design Impact
Package and pin compatibility	No Change	20-pin PDIP and SSOP, 28-pin PDIP and SSOP.	No impact.
Program Memory		Up to 8 KB Flash.	
Data RAM		1 KB SRAM.	
Peripherals register map and bit locations		256 locations; only previously reserved locations and bits used to add new features.	
Power supply		2.7–3.6 V.	
General-Purpose Input/Output (GPIO) pins		Up to 19 GPIO pins.	
Interrupt controller		19 interrupts with configurable priority.	
Infrared endecs		1 IrDA-compliant Encoder/ Decoder.	
Inter-Integrated Circuit (I^2C)		Master with 7-bit and 10-bit addressing modes.	
Serial Peripheral Interface (SPI)		Master and slave operation.	
On-Chip Debugger		1-pin interface.	
eZ8 CPU		20 MHz operation.	

Table 3. Summary of Feature Differences (Continued)

Z8 Encore! XP® F0822 Series Flash Microcontrollers Feature	AA to BA Difference	Description	Existing Design Impact
Watchdog Timer (WDT) RC oscillator	Modified and Enhanced	Modified to 10 kHz low-current RC oscillator.	Software: WDT time-out delay impacted.
Reset, DBG, and SMR pin filtering		Filtering on select pins to improve noise immunity.	Reset pulse must be a minimum of 4 system clock cycles.
Flash protection		Enhanced multiple sector protection.	Software: Flash program/erase procedure impacted.
Reset and Stop Mode latency		Modified to 66 RC clocks to accommodate change to 10 kHz low-current RC oscillator.	No impact.
Power and EMI reduction		Automatically disable clock to idle and disable peripherals.	
Analog-to-Digital Converter (ADC)		Latch ADC low byte during read.	
Voltage Brownout (VBO)		Flash option to disable VBO in STOP mode.	
Universal Asynchronous Receiver/Transmitter (UART)	New upward-compatible feature addition	Automatic address matching in MULTIPROCESSOR mode.	No impact.
Timer		New Cascade feature to connect output of one timer to input of the next.	

Modifications and Migration Impact

Watchdog Timer RC Oscillator

Modifications

The following changes are incorporated in WDT peripheral in the Z8 Encore! XP F0822 Series Flash Microcontrollers BA silicon:

- A new low-power 10 kHz RC oscillator is used to replace the 50 kHz WDT RC oscillator on Z8 Encore! XP F0822 Series Flash Microcontrollers AA silicon, resulting in a WDT time-out delay of 400 ms–1677.5 s.
- The WDT Control Register at address FF0h permits a new control sequence to disable the WDT RC oscillator in STOP mode.

Impact

The impact on WDT RC Oscillator is described below:

- Due to the new RC oscillator, the stop-mode current with the WDT running is reduced and expected to be in the 2–5 µA.

- The WDT time-out delay calculation is now based on the new 10 kHz RC oscillator frequency. Therefore, software initialization of the WDT Reload registers may require modification for new delay constants.
- Application software can now optionally disable the WDT RC oscillator to further reduce stop-mode current.

Reset and Stop Mode Latency

Modifications

The latency for System Reset and Stop Mode Recovery of Z8 Encore! XP® F0822 Series Flash Microcontrollers BA silicon is changed to 66 WDT clock cycles + 16 system clock cycles. In Z8 Encore! XP F0822 Series Flash Microcontrollers AA silicon, this value is 514 WDT clock cycles + 16 system clock cycles. This modification accommodates a WDT RC oscillator frequency change from 50 kHz to 10 kHz. With this change, overall Stop Mode Recovery delay is reduced.

Impact

There is no direct impact on existing Z8 Encore! XP F0822 Series Flash Microcontrollers designs because of this change. Overall, the system resumes from Reset and STOP mode faster. Table 4 lists the timing difference between Z8 Encore! XP F0822 Series Flash Microcontrollers BA and AA silicon.

Table 4. Timing Differences

Reset Type	AA Silicon (ms)	BA Silicon (ms)
System	10.28	6.6
Short*	1.32	6.6
Stop	10.28	6.6

Note: *Short Reset is replaced by System Reset in BA silicon.

Flash Protection

Modifications

The Flash protection scheme is enhanced in Z8 Encore! XP F0822 Series Flash Microcontrollers BA silicon. The following modifications are incorporated to achieve a higher granularity of protection and flexibility:

- All the Flash Memory is now divided into 8 sectors, each of which can be individually protected. User software can select different Flash sectors for protection.
- Page-level division of Flash Memory is maintained. Only pages of an unprotected sector can be programmed or erased. For an added level of protection, user software must reconfirm any page number selected for unlocking.
- Page-level protection is enhanced to confine byte programming only within an unlocked page.
- A mass erase is permitted only through the debug port. Application software cannot perform a mass erase.

Impact

Application-level Flash Erase and Flash Program routines can be impacted by this change.

Reset, Debug, and Stop Mode Recovery Filtering

Modifications

The following modifications are incorporated to improve noise immunity in Z8 Encore! XP® F0822 Series Flash Microcontrollers BA devices:

- A digital filter is added to the $\overline{\text{RESET}}$ input pin signal to reject pulses less than 4 system clock periods. This filter works only in ACTIVE and HALT modes. It does not work in STOP mode when the system clock is disabled. When the $\overline{\text{RESET}}$ pin is asserted for at least 4 system

clock cycles, the device progresses though the System Reset sequence.

- A 10 ns (minimum) analog glitch filter is added to the Stop Mode Recovery signals, DBG and $\overline{\text{RESET}}$, to prevent glitches from causing an exit from STOP mode. All Stop Mode Recovery sources are ORed together and then filtered. The DBG and $\overline{\text{RESET}}$ pins signals have their own filters.

Impact

Applications using external $\overline{\text{RESET}}$ input must ensure that the reset pulse is, at minimum, 4 system clock periods.

Power and EMI Reduction

Modifications

In Z8 Encore! XP F0822 Series Flash Microcontrollers BA silicon, the clock to all idle or disabled peripherals is automatically disabled to reduce switching currents. As a result, power and EMI are reduced.

Impact

Existing designs are not impacted by this change.

Analog-to-Digital Converter

Modifications

There is one modification to the Analog-to-Digital block in Z8 Encore! XP F0822 Series Flash Microcontrollers BA silicon. Reading the ADC High Byte Register latches data in the ADC Low Byte Register.

Impact

Improved analog-to-digital samples.

Voltage Brownout

Modifications

In High-Performance 8-Bit Microcontrollers BA silicon, a new Flash option bit is introduced to allow Voltage Brownout to be either enabled or disabled in STOP mode.

Impact

The Flash option bit is a feature that aids power reduction in STOP mode. Existing designs are not impacted by this change.

New Features

This section reviews the new features supported in the Z8 Encore! XP F0822 Series Flash Microcontrollers BA silicon. For a complete description, refer to *Z8 Encore! XP® F0822 Series Flash Microcontrollers Product Specification (PS0225)*.

Universal Asynchronous Receiver/ Transmitter

The Z8 Encore! XP F0822 Series Flash Microcontrollers BA Universal Asynchronous Receiver/ Transmitter supports one new upward-compatible feature addition, an automatic **Address Compare** feature in MULTIPROCESSOR mode, as described below.

Address Compare

When enabled, the UART automatically checks whether incoming address bytes match the address of the UART. When an incoming address byte does not match the UART's address, it is ignored. All successive data bytes contained in the frame are also ignored. When a matching address byte occurs, an interrupt is optionally issued and further interrupts occur upon each successive data byte. This feature reduces the load on the CPU because it does not need to access the UART when it receives data directed to other devices on a multinode network.

Timers

The High-Performance 8-Bit Microcontrollers BA Timer Control Register supports a new cascade control bit, which allows the output from one timer

to be connected as the input of the next. This feature allows applications to cascade one timer to another without connecting two external pins. Timer cascading can be used to generate a very low-frequency timing control while running the eZ8 CPU at high clock speeds.

Summary

This application note discusses the feature differences that must be addressed when migrating from an earlier date code to a later date code of Z8 Encore!XP F0822 Series Flash Microcontrollers silicon.

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