



Z8FMC16100 Series

Product Brief

PB016607-0308



Product Block Diagram

| | | |
|--|----------------------------------|-------------------------------|
| 12-Bit PWM Module for Motor Control | 16-Bit Timer Capture/Compare/PWM | Operational Amplifier |
| Up to 16 KB Flash | 20 MHz eZ8™ CPU | 8-Channel 10-Bit ADC |
| 512 B SRAM | | VBO/POR and Reset Control |
| I ² C, SPI, and UART with LIN | | |
| Watchdog Timer | Single-Pin Debugger | Internal Precision Oscillator |
| Comparator | | Interrupt Controller |
| 17 General Purpose I/O Pins | | |

Overview

Zilog's Z8FMC16100 Series Flash microcontrollers, a part of the Z8 Encore! MC™ family of motor control devices, are based on Zilog's advanced eZ8™ 8-bit CPU core. Optimized for motor control applications, these devices support the control of Single and Multiphase variable-speed motors. Target applications are large appliances, small appliances, HVAC, automotive, power tools, and personal care devices.

Z8FMC16100 Series Flash MCUs feature a flexible pulse width modulator (PWM) module with three complementary pairs or six independent PWM outputs supporting dead-band operation and fault protection trip input. These features provide multiphase control capability for a variety of motor types and ensure safe operation of the motor by

providing Pulse-by-Pulse or latched fast shutdown of the PWM pins during fault condition.

Z8FMC16100 Series MCU features up to eight single-ended channels of 10-bit analog-to-digital conversion, with a sample and hold circuit. It also features one operational amplifier for current sampling and one comparator for over-current limiting or shutdown.

A high-speed analog-to-digital converter (ADC) enables voltage, current, and back-EMF sensing, while dual-edge interrupts and a 16-bit timer provide a Hall-effect sensor interface.

A full-duplex 9-bit UART provides serial, asynchronous communication and supports the local interconnect network (LIN) serial communications protocol. The LIN bus is a cost-efficient Single Master, Multiple Slave organization that supports speed up to 20 kbps.

Included in its rich-set of peripherals are other features such as: one additional 16-bit timer with Capture/Compare/PWM capability, SPI or I²C Master/Slave for serial communication, and an internal precision oscillator (IPO).

The single-pin debugger and programming interface simplifies code development and allows easy in-circuit programming.

Z8FMC16100 Series MCU Features

The features of Z8FMC16100 Series MCU include:

- 20 MHz eZ8 CPU core
- Up to 16 KB Flash program memory
- 512 B register SRAM

- Fast 8-channel 10-bit ADC for current sampling and back-EMF detection
- 12-bit PWM module with three complementary pairs or six independent PWM outputs with dead-band generation and fault trip input
- One 16-bit timer with Capture/Compare/PWM capability
- One analog comparator for current limiting or over current shutdown
- One operational amplifier provides current level-shifting and amplification for ADC current sampling
- I²C in MASTER, SLAVE, and MULTIMASTER modes
- SPI controller
- UART with LIN interface
- Internal Precision Oscillator (IPO)
- Oscillator supports either internal IPO or external crystals and ceramic resonators
- 17 General-Purpose I/O pins (GPIO)
- Voltage Brownout/Power-On Reset (VBO/POR)
- Watchdog Timer (WDT) with internal RC oscillator
- Single-Pin On-Chip Debugger
- In-circuit serial programming
- Operating at 2.7 V to 3.6 V
- 32-pin QFN and LQFP packages
- Lead-free packaging option
- Standard and extended temperature ranges: 0 °C to 70 °C (standard) and -40 °C to +105 °C (extended)
- Up to 20 interrupts with configurable priority

eZ8™ CPU Features

The features of eZ8 CPU include:

- New instructions for improved performance including BIT, BSWAP, BTJ, CPC, LDC, LDCI, LEA, MULT, and SRL
- Compatible with existing Z8® code
- Up to 10 MIPS operation
- C-Compiler friendly
- 2 to 9 clock cycles per instruction

Architecture

Figure 1 displays the Z8FMC16100 Series MCU block diagram.



Figure 1. Z8FMC16100 Series MCU Block Diagram

Ordering Information

Table 1 provides the basic features available for each device within the Z8FMC16100 Series product line. Table 2 provides ordering information for the Z8FMC16100 Series products, by part number. See [Part Number Suffix Designations](#) on page 6 for product numbering details.

Table 1. Z8FMC16100 Series Part Selection Guide

| Product Feature | Z8FMC16100 | Z8FMC08100 | Z8FMC04100 |
|---|------------|------------|------------|
| Flash (KB) | 16 | 8 | 4 |
| SRAM (B) | 512 | 512 | 512 |
| General-Purpose I/O | 17 | 17 | 17 |
| Motor Control PWM Channels | 6 | 6 | 6 |
| ADC Inputs | 8 | 8 | 8 |
| Operational Amplifier | Yes | Yes | Yes |
| Comparator | Yes | Yes | Yes |
| 16-bit Standard Timers with Capture, Compare, PWM | Yes | Yes | Yes |
| UART with support for LIN and IrDA | Yes | Yes | Yes |
| I ² C | Yes | Yes | Yes |
| SPI Controller | Yes | Yes | Yes |
| Watchdog Timer | Yes | Yes | Yes |
| 5.5296 MHz Internal Precision Oscillator | Yes | Yes | Yes |

Each of the parts listed in Table 2 is available in a lead-free package that conforms to responsible environmental standards. For more information regarding ordering, contact your local Zilog[®] sales office. Zilog web site, www.zilog.com, lists all regional offices and provides additional Z8FMC16100 Series product information.



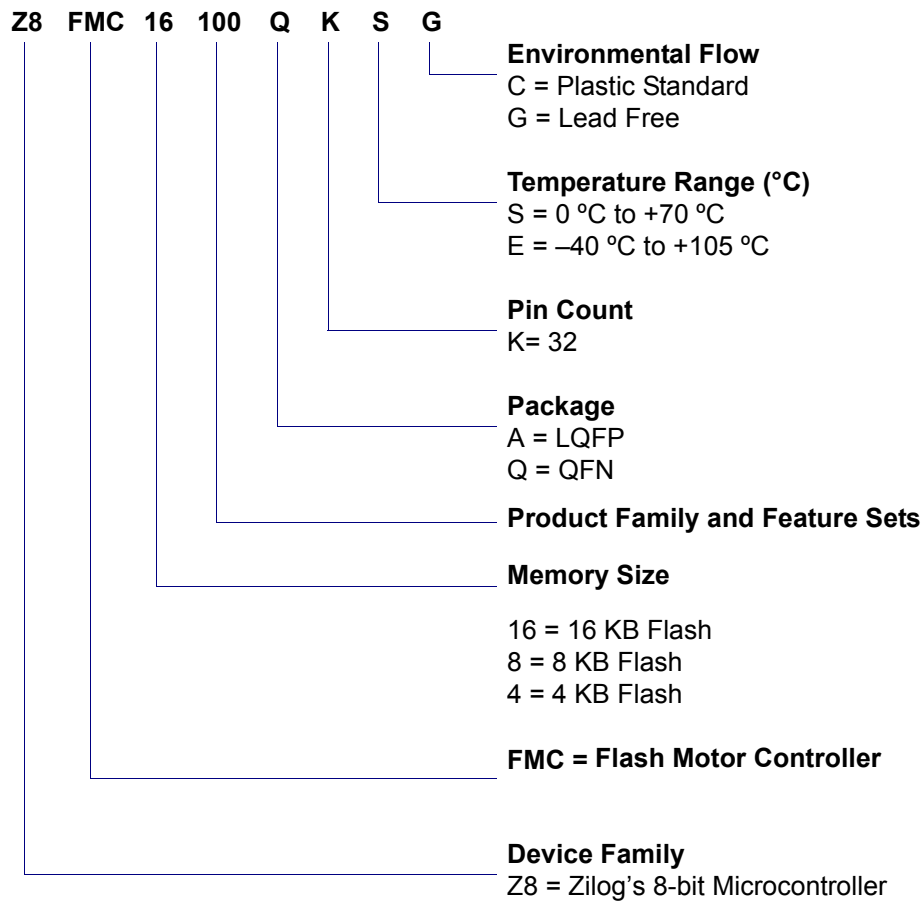
Table 2. Ordering Information for the Z8FMC16100 Series Products*

| Part Number | Flash KB (Bytes) | SRAM Bytes | GPIO | Max. Speed (MHz) | I ² C/SPI | Trimmed IPO | Package | Temp (°C) |
|---|---|---------------|------|------------------------|----------------------|----------------|---------|-------------|
| Z8FMC16100 with 16 KB Flash and 512 B SRAM | | | | | | | | |
| Z8FMC16100QKSG | 16 | 512 | 17 | 20 | I ² C/SPI | Y | QFN-32 | 0 to +70 |
| Z8FMC16100QKEG | (16,384) | | | | | | | -40 to +105 |
| Z8FMC16100AKSG | 16 | 512 | 17 | 20 | I ² C/SPI | Y | LQFP-32 | 0 to +70 |
| Z8FMC16100AKEG | (16,384) | | | | | | | -40 to +105 |
| Z8FMC08100 with 8 KB Flash and 512B SRAM | | | | | | | | |
| Z8FMC08100QKSG | 8 | 512 | 17 | 20 | I ² C/SPI | Y | QFN-32 | 0 to +70 |
| Z8FMC08100QKEG | (8,192) | | | | | | | -40 to +105 |
| Z8FMC08100AKSG | 8 | 512 | 17 | 20 | I ² C/SPI | Y | LQFP-32 | 0 to +70 |
| Z8FMC08100AKEG | (8,192) | | | | | | | -40 to +105 |
| Z8FMC04100 with 4 KB Flash and 512B SRAM | | | | | | | | |
| Z8FMC04100QKSG | 4 | 512 | 17 | 20 | I ² C/SPI | Y | QFN-32 | 0 to +70 |
| Z8FMC04100QKEG | (4,096) | | | | | | | -40 to +105 |
| Z8FMC04100AKSG | 4 | 512 | 17 | 20 | I ² C/SPI | Y | LQFP-32 | 0 to +70 |
| Z8FMC04100AKEG | (4,096) | | | | | | | -40 to +105 |
| Z8FMC16100 Series Development Tools | | | | | | | | |
| Z8FMC160100KITG | Z8FMC16100 Series Development Kit | | | | | | | |
| Z8FMC161000ZEM | Z8 Encore! Z8FMC16100 Series In-Circuit Emulator Development Tool | | | | | | | |
| ZUSBOPTSC01ZACG | USB Opto-isolated Smart Cable Accessory Kit | | | | | | | |
| Z8FMC16100 Series Development Tools | | | | | | | | |
| *Factory programming of the devices in this table are available upon request from Zilog®. | | | | | | | | |



Part Number Suffix Designations

Zilog part numbers consist of a number of components. This section describes an example part number, Z8FMC16100QKSG, to indicate each component's description.





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