



High-Performance 16-Bit Microcontrollers

ZNEO™ Z16F Series

Z i L O G Product Brief

PB019204-0806



## Product Block Diagram

Up to 128 KB Flash	Up to 4 KB SRAM	12-Channel 10-Bit ADC
12-Bit PWM Module	<b>20 MHz ZNEO™ 16-Bit CPU</b>	Three 16-Bit Timers
Watchdog Timer with RC Oscillator		POR/VBO and Reset Control
Operational Amplifier	On-Chip Debugger	Crystal/RC Oscillator
4-Channel DMA Controller	Analog Comparator	Internal Precision Oscillator
ESPI, I <sup>2</sup> C, and two UARTs with IrDA & LIN		
Up to 76 General-Purpose I/O Pins		
External Interface		

## Overview

The ZNEO Z16F Series Flash microcontrollers are based on ZiLOG's advanced ZNEO 16-bit CPU core. The ZNEO Z16F Series MCU family of devices set a new standard of performance and efficiency with up to 20 MIPS performance at 20 MHz. It supports 16-bit internal and external bus widths and provides near single cycle instruction execution.

The External Interface allows seamless connection to external memory and peripherals. A 24-bit address bus and a selectable 8-bit or 16-bit data bus allows parallel access up to 16 MB. Up to 128 KB internal Flash memory accessible by the ZNEO CPU 16-bits at a time to improve processor throughput. Up to 4 KB internal RAM provides storage of data, variables, and stack operations.

Like the Flash memory, the internal RAM can be accessed with 16-bit access paths for improved processor performance.

The ZNEO Z16F Series features a high speed 12-channel 10-bit SAR Analog-to-Digital Converter (ADC) with a sample and hold circuit. The ADC facilitates analog input signal to a 10-bit binary number conversion. It also features an operational amplifier and an analog comparator.

The 12-bit PWM module provides three complementary pairs or six independent PWM outputs with deadband generation 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 pulse-by-pulse or latched fast shutdown of the PWM pins during fault condition.

The ZNEO Z16F Series features two full-duplex UARTs providing 8-bit asynchronous data transfer and supporting the Local Interconnect Network (LIN) serial communications protocol.

Two fully functional, high performance UART to Infrared Encoder/Decoders (Endecs), allowing IrDA encoding and decoding capability.

The Enhanced Serial Peripheral Interface (ESPI) and I<sup>2</sup>C Master/Slave Controller allows easy data exchange between ZNEO Z16F Series and peripheral devices.

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

The ZNEO Z16F Series also includes an internal precision oscillator (5.5 MHz) and 4-channel DMA Controller that supports internal or external requests.



## ZNEO Z16F Series MCU Features

Key features of ZNEO Z16F Series MCU include:

- 20 MHz ZiLOG ZNEO CPU Core
- Up to 128 KB internal Flash program memory with 16-bit access and in-circuit programming capability
- Up to 4 KB internal RAM with 16-bit access
- External Interface allows seamless connection to external data memory and peripherals with:
  - 6 chip selects with programmable Wait states
  - 24-bit address bus supports up to 16 MB
  - Selectable 8-bit or 16-bit data bus widths
  - Programmable Chip Select signal polarity
  - ISA-compatible mode
- 12-channel, 10-bit ADC
- Operational Amplifier
- Analog Comparator
- 4-channel DMA controller supports internal or external DMA requests
- Two full-duplex 9-bit UARTs with support for LIN and IrDA
- Internal Precision Oscillator
- I<sup>2</sup>C master/slave controller
- ESPI controller
- 12-bit PWM module with three complementary pairs or six independent PWM outputs with dead-band generation and fault trip input
- Three standard 16-bit timers with capture, compare, and PWM capability
- Watchdog Timer (WDT) with internal RC oscillator
- Up to 76 I/O pins
- Up to 24 interrupts with programmable priority
- Single-pin on-chip debugger

- Power-On Reset (POR)
- Voltage Brownout Protection (VBO)
- 2.7 V to 3.6 V operating voltage with 5 V tolerant inputs
- 0 °C to +70 °C standard temperature, –40 °C to +105 °C extended temperature, and –40 °C to +125 °C automotive operating ranges

## ZNEO CPU Features

ZiLOG's ZNEO CPU is designed to meet the continuing demand for faster and more code-efficient microcontrollers. The features of ZNEO CPU include:

- ZNEO CPU is capable up to 20 MIPS throughput at 20 MHz
- 16-bit internal and external bus widths
- Built-in 32 x 32 multiply operations (signed and unsigned)
- Built-in 64 by 32 divide (unsigned)
- Compiler friendly instruction set and compact code (multi byte push/pop and frame pointer manipulation)
- User programmable sharing of internal bus bandwidth between DMA and CPU
- 16 MB of Program Memory address space for object code and data with 8-bit or 16-bit data paths
- Support for 8-bit, 16-bit, and 32-bit ALU operations
- 24-bit stack with overflow protection
- Direct register-to-register architecture allows each memory address to function as an accumulator. This improves execution time and decreases the required program memory
- New instructions improve execution efficiency for the code developed using higher-level programming languages, including C language
- Pipelined instructions fetch, decode, and execution



## ZNEO Z16F Series Development Kit

The ZNEO Z16F Series Development Kit includes the following:

### Hardware

- ZNEO Series Development Board
- USB Smart Cable for PC to ZNEO Series Development Board
- 5 V DC power supply

### Software on CD-ROM

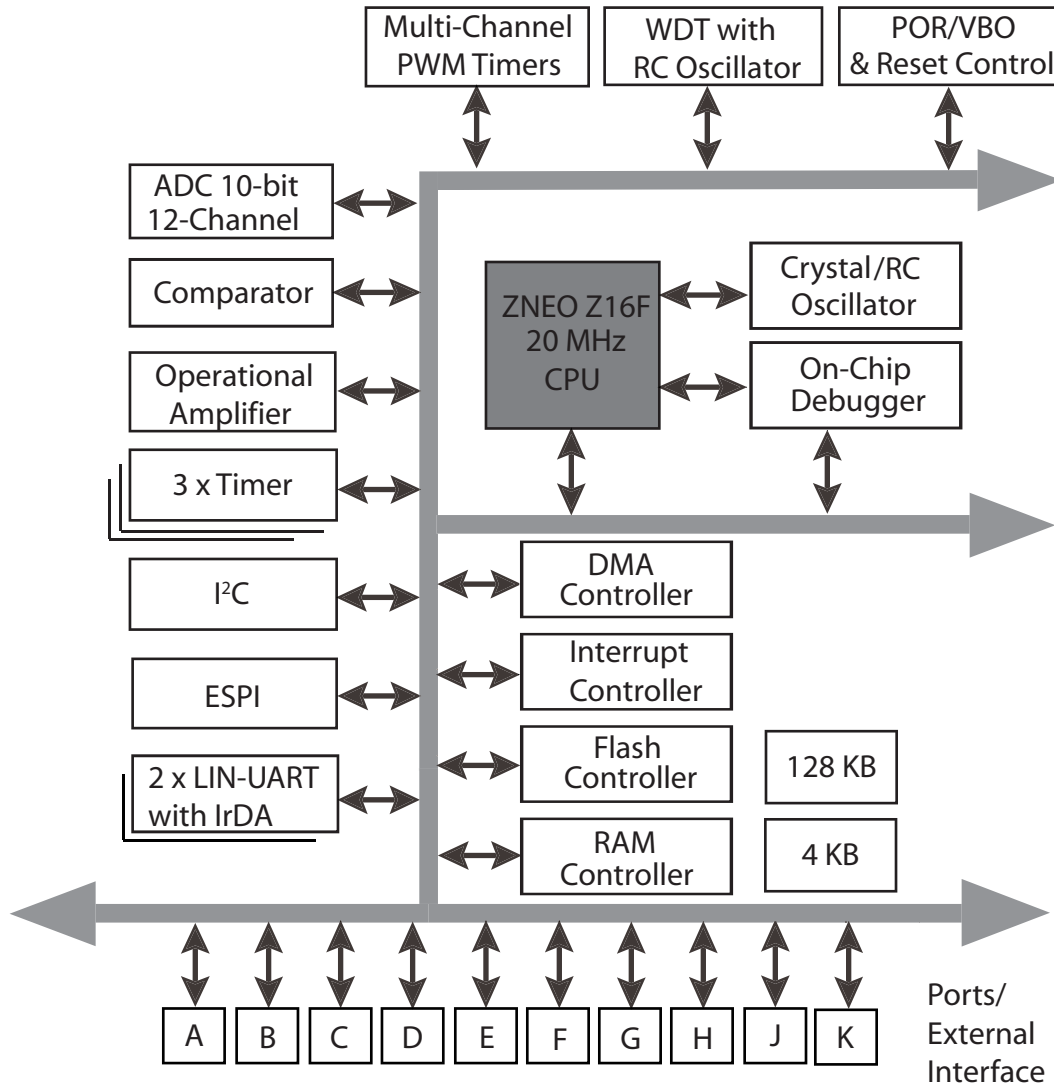
- ZDS II ZNEO IDE with ANSI C-complier
- Sample code
- Document browser

## Documentation

- ZNEO Series of Microcontrollers Quick Start Guide (QS0057)
- ZNEO Series technical documentation (on CD-ROM)
  - ZNEO Series of Microcontrollers Development Kit User Manual (UM0202)
  - ZiLOG Developer Studio II—ZNEO User Manual (UM0171)
  - ZNEO CPU User Manual (UM0188)
  - ZNEO Z16F Series Product Specification (PS0220)
  - ZNEO Z16F Series Product Brief (PB0192)

## Architecture

Figure 1 illustrates the ZNEO Z16F Series block diagram.



**Figure 1. ZNEO Z16F Series Block Diagram**



## Ordering Information

You can order the ZNEO Z16F Series products from ZiLOG, using the part numbers in the table below. For more information regarding ordering, please consult your local ZiLOG sales office. The website [www.zilog.com](http://www.zilog.com) lists all regional offices, as well as additional ZNEO Z16F Series product information.

Part Number	Flash (Kbytes)	RAM (Kbytes)	External Interface	I/O	Multi-Channel timers with PWM	Standard Timers with PWM	ADC Inputs	I <sup>2</sup> C Master\Slave	UART with LIN and IrDA	ESPI	Package
<b>ZNEO Z16F Series</b>											
<b>Standard Temperature: 0 °C to +70 °C</b>											
Z16F2811AL20SG	128	4	Yes	76	1	3	12	1	2	1	100-pin LQFP
Z16F2811FI20SG	128	4	Yes	60	1	3	12	1	2	1	80-pin QFP
Z16F2810FI20SG	128	4	No	60	1	3	12	1	2	1	80-pin QFP
Z16F2810AG20SG	128	4	No	46	1	3	12	1	2	1	64-pin LQFP
Z16F2810VH20SG	128	4	No	46	1	3	12	1	2	1	68-pin PLCC
Z16F6411AL20SG	64	4	Yes	76	1	3	12	1	2	1	100-pin LQFP
Z16F6411FI20SG	64	4	Yes	60	1	3	12	1	2	1	80-pin QFP
Z16F3211AL20SG	32	2	Yes	76	1	3	12	1	2	1	100-pin LQFP
Z16F3211FI20SG	32	2	Yes	60	1	3	12	1	2	1	80-pin QFP
<b>Extended Temperature: -40 °C to +105 °C</b>											
Z16F2811AL20EG	128	4	Yes	76	1	3	12	1	2	1	100-pin LQFP
Z16F2811FI20EG	128	4	Yes	60	1	3	12	1	2	1	80-pin QFP
Z16F2810FI20EG	128	4	No	60	1	3	12	1	2	1	80-pin QFP
Z16F2810AG20EG	128	4	No	46	1	3	12	1	2	1	64-pin LQFP
Z16F2810VH20EG	128	4	No	46	1	3	12	1	2	1	68-pin PLCC
Z16F6411AL20EG	64	4	Yes	76	1	3	12	1	2	1	100-pin LQFP
Z16F6411FI20EG	64	4	Yes	60	1	3	12	1	2	1	80-pin QFP
Z16F3211AL20EG	32	2	Yes	76	1	3	12	1	2	1	100-pin LQFP
Z16F3211FI20EG	32	2	Yes	60	1	3	12	1	2	1	80-pin QFP
<b>Automotive Temperature: -40 °C to +125 °C</b>											
Z16F2811AL20AG	128	4	Yes	76	1	3	12	1	2	1	100-pin LQFP
Z16F2811FI20AG	128	4	Yes	60	1	3	12	1	2	1	80-pin QFP

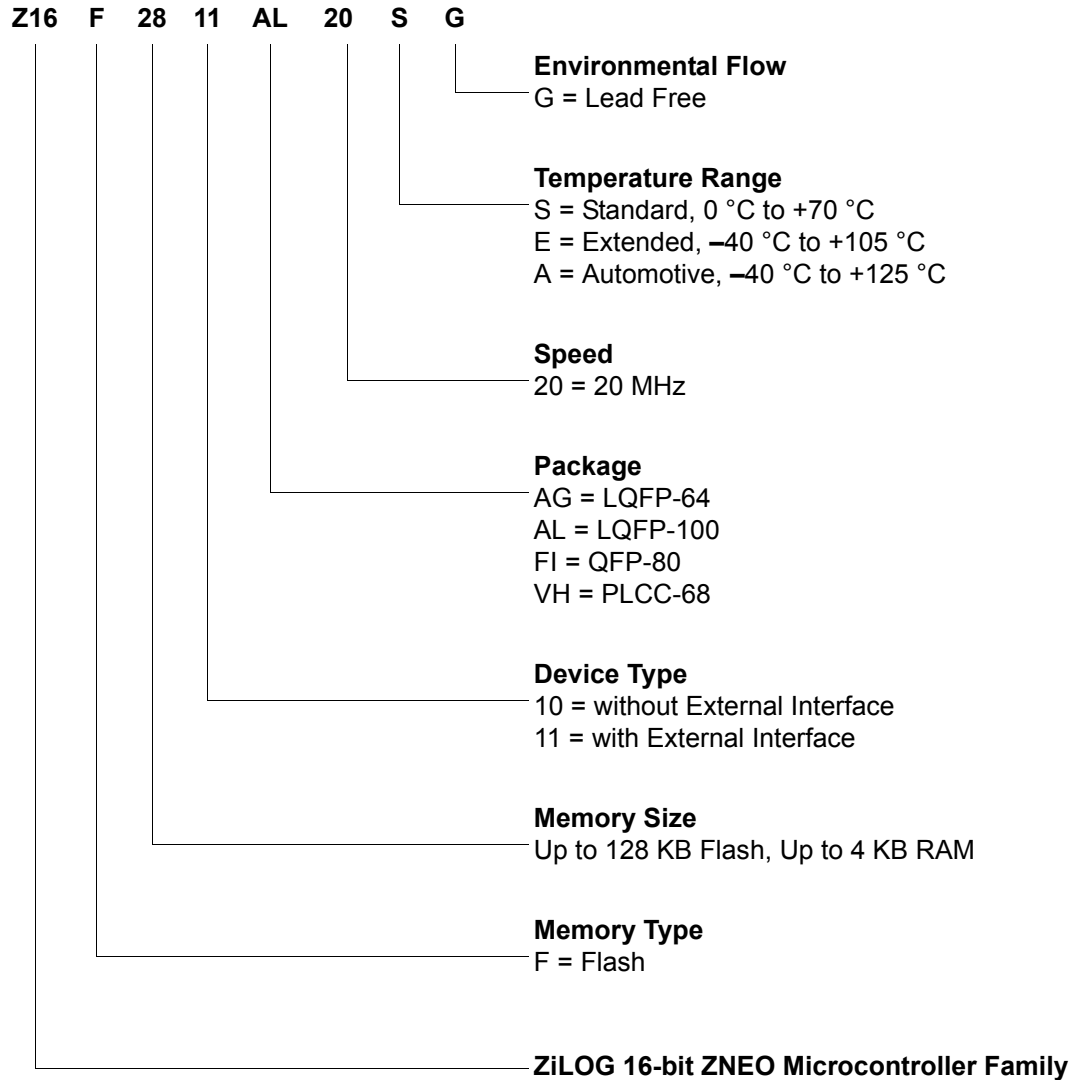


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Z16F3211FI20AG	32	2	Yes	60	1	3	12	1	2	1	80-pin QFP

#### ZNEO Z16F Series Development Tools

Z16F2800100ZCOG	ZNEO Z16F Series Development Kit
ZUSBSC00100ZACG	USB Smart Cable Accessory Kit

## Part Number Suffix Designations



Note: The packages are not available for all memory sizes. See [Ordering Information](#) for the packages available as per your requirements.



The product brief contains an overview of the silicon feature set and operating parameters and should not be considered as the final specification. See the product specification for the actual feature set and operating parameters for this product.

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