



Z86E03/E06

CMOS Z8® OTP MICROCONTROLLERS

FEATURES

Part	ROM (Kbytes)	RAM* (Kbytes)	SPI	Speed (MHz)
Z86E03	512	61	No	8
Z86E06	1	125	Yes	12

*General-Purpose

- 18-Pin DIP, WIN, and SOIC Packages
- 4.5- to 5.5-Volt Operating Range
- 0°C to +70°C Temperature Range

- Low-Power Consumption
- Expanded Register File (ERF)
- 14 Input/Output Lines
- Serial Peripheral Interface (SPI) (Z86E06 Only)
- Software Watch-Dog Timer (WDT)
- Power-On Reset (POR)

GENERAL DESCRIPTION

The Z86E03/E06 are One-Time Programmable (OTP) members of the Z8® microcontroller family allowing easy software development, debug, and prototyping for small production runs that are not economically desirable with a masked ROM version.

Three address spaces, the Program Memory, Register File, and Expanded Register File (ERF), support a wide range of memory configurations. Through the ERF, the designer has access to four additional control registers that provide extra peripheral devices, I/O ports, register addresses, an SPI receive buffer and SPI compare register.

For applications demanding powerful I/O capabilities, the Z86E03/E06's dedicated input and output lines are grouped into two ports, and are configurable under software control to provide timing, status signals, or parallel I/O.

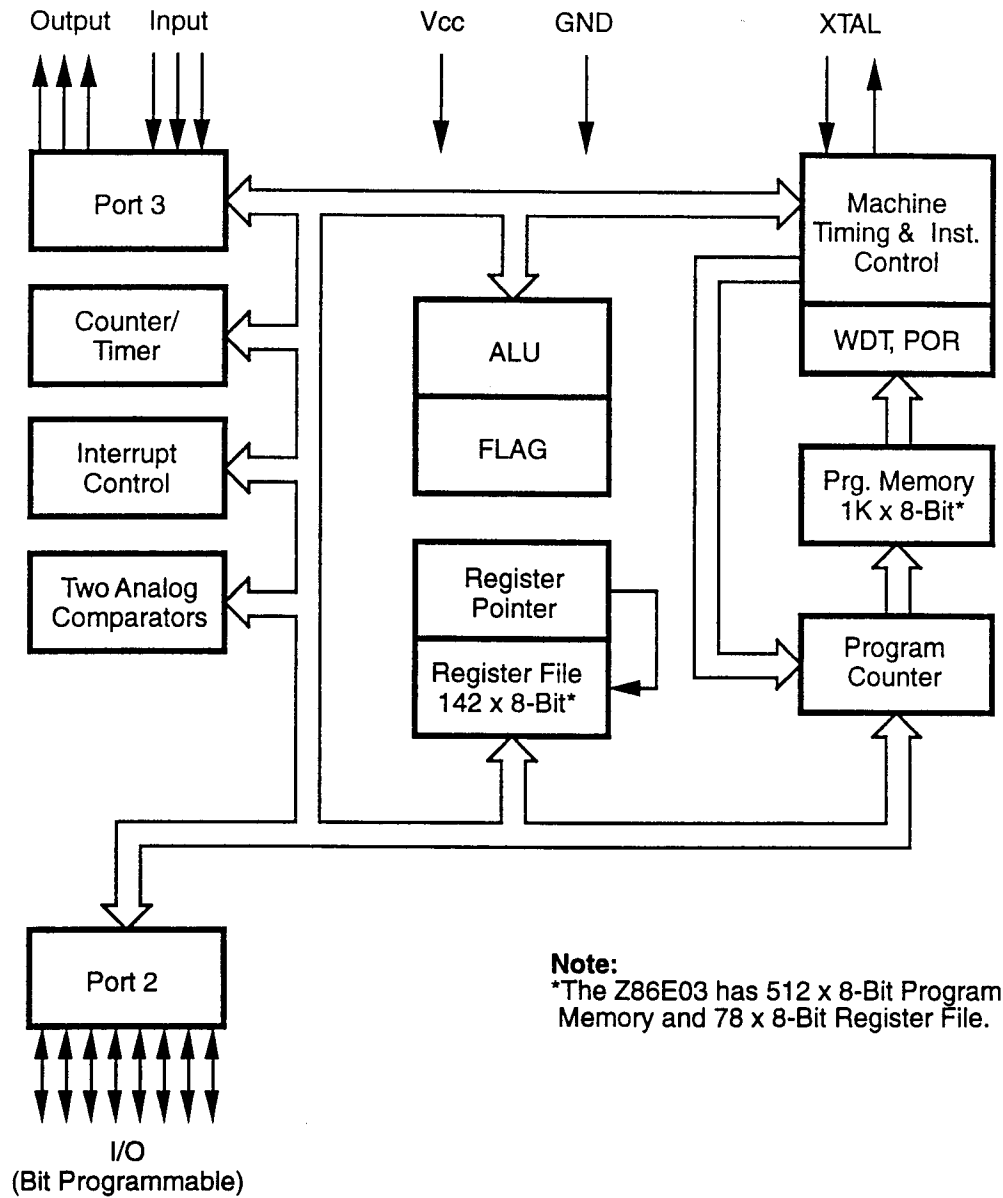
Notes:

All Signals with a preceding front slash, "/", are active Low, e.g.: B/W (WORD is active Low); /B/W (BYTE is active Low, only).

Power connections follow conventional descriptions below:

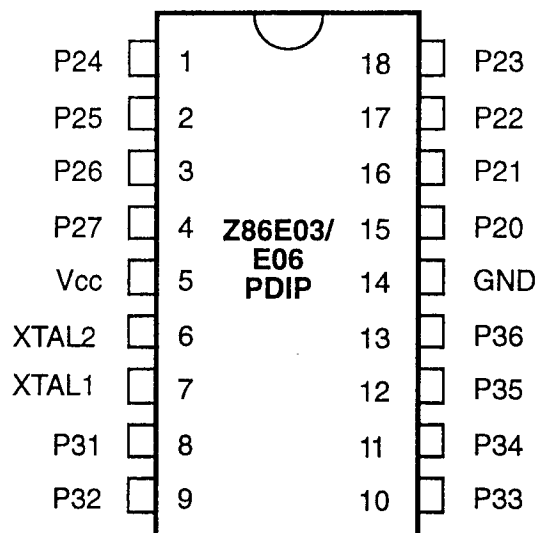
Connection	Circuit	Device
Power Ground	V_{CC} GND	V_{DD} V_{SS}

GENERAL DESCRIPTION (Continued)

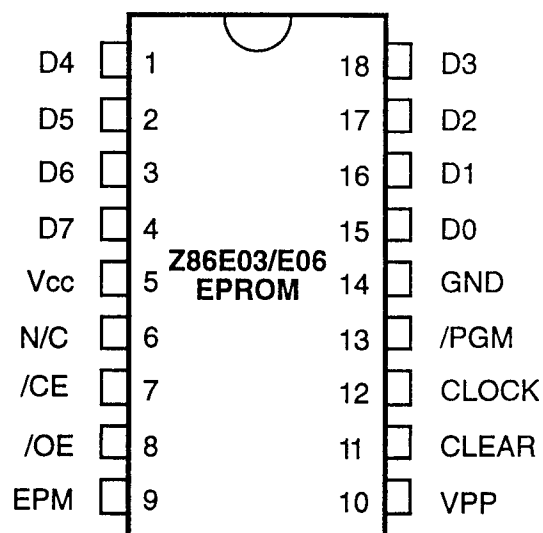


Functional Block Diagram

GENERAL DESCRIPTION (Continued)



**18-Pin DIP/WIN
Pin Configuration**

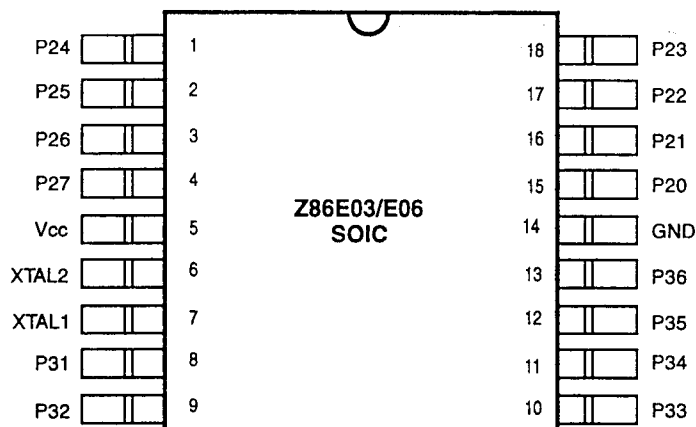


**18-Pin EPROM Mode
Pin Configuration**

18-Pin Identification

Pin #	Symbol	Function	Direction
1-4	P24-P27	Port 2, Pins 4,5,6,7	Input/Output
5	V _{cc}	Power Supply	
6	XTAL2	Crystal Oscillator Clock	Output
7	XTAL1	Crystal Oscillator Clock	Input
8-10	P31-P33	Port 3, Pins 1,2,3	Fixed Input
11-13	P34-P36	Port 3, Pins 4,5,6	Fixed Output
14	GND	Ground	
15-18	P20-23	Port 2, Pins 0,1,2,3	Input/Output

GENERAL DESCRIPTION (Continued)



**18-Pin SOIC
Pin Configuration**

ABSOLUTE MAXIMUM RATINGS

Symbol	Description	Min	Max	Units
V_{CC}	Supply Voltage*	-0.3	+7.0	V
V_{IN}	Input Voltage**	-0.3	$V_{CC} + 0.3$	V
T_{STG}	Storage Temp	-65	+150	C
T_A	Oper Ambient Temp †			C

Notes:

* Voltage on V_{CC} with respect to V_{SS} .

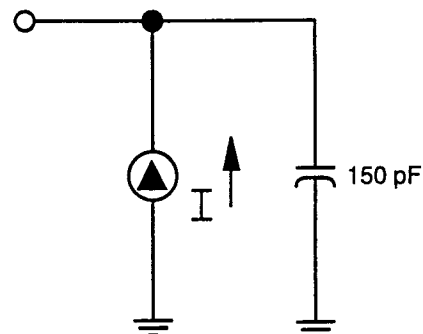
† See Ordering Information

** Voltages on all pins with respect to V_{SS} without current limitations.

Stress greater than those listed under Absolute Maximum Ratings may cause permanent damage to the device. This is a stress rating only; operation of the device at any condition above those indicated in the operational sections of these specifications is not implied. Exposure to absolute maximum rating conditions for extended period may affect device reliability.

STANDARD TEST CONDITIONS

The characteristics listed below apply for standard test conditions as noted. All voltages are referenced to ground. Positive current flows into the referenced pin (Test Load Configuration).



Test Load Configuration

DC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	V _{CC} Note [3]	T _A = 0°C to 70°C (4.5V to 5.5V)		Typical @ 25°C	Units	Conditions	Notes
			Min	Max				
	Max Input Voltage	5.0V		12		V	I _{IN} ≤ 250 μA	[8]
V _{CH}	Clock Input High Voltage	5.0V	0.9 V _{CC}	V _{CC} +0.3	2.7	V	Driven by External Clock Generator	
V _{CL}	Clock Input Low Voltage	5.0V	V _{SS} -0.3	0.2 V _{CC}	1.7	V	Driven by External Clock Generator	
V _{IH}	Input High Voltage	5.0V	0.7 V _{CC}	V _{CC} +0.3	2.5	V		
V _{IL}	Input Low Voltage	5.0V	V _{SS} -0.3	0.2 V _{CC}	1.6	V		
V _{OH}	Output High Voltage (Low EMI Mode)	5.0V	V _{CC} -0.4		4.9	V	I _{OH} = -2.0 mA	[10]
		5.0V	V _{CC} -0.4		4.9	V	I _{OH} = -0.5 mA	
V _{OL1}	Output Low Voltage (Low EMI Mode)	5.0V		0.4	0.1	V	I _{OL} = +4.0 mA	[10]
		5.0V		0.4	0.1	V	I _{OL} = +1.0 mA	
V _{OL2}	Output Low Voltage	5.0V		1.0	0.3	V	I _{OL} = +12 mA,	[10]
V _{OFFSET}	Comparator Input	5.0V		±10	±5	mV		
V _{ICR}	Input Common Mode Voltage Range	5.0V	0V	V _{CC} -1.5v				[7]
I _{IL}	Input Leakage	5.0V	-1.0	1.0		μA	V _{IN} = 0V, V _{CC}	
I _{OL}	Output Leakage	5.0V	-1.0	1.0		μA	V _{IN} = 0V, V _{CC}	
I _{CC}	Supply Current	5.0V		11.0	8.0	mA	@ 8 MHz	[4, 5, 12]
		5.0V		15	11	mA	@ 12 MHz	[4, 5, 13]
I _{OB}	Input Bias Current	5.0V		300		nA		[7]
I _{IO}	Input Offset Current	5.0V		±150		nA		[7]

DC ELECTRICAL CHARACTERISTICS (Continued)

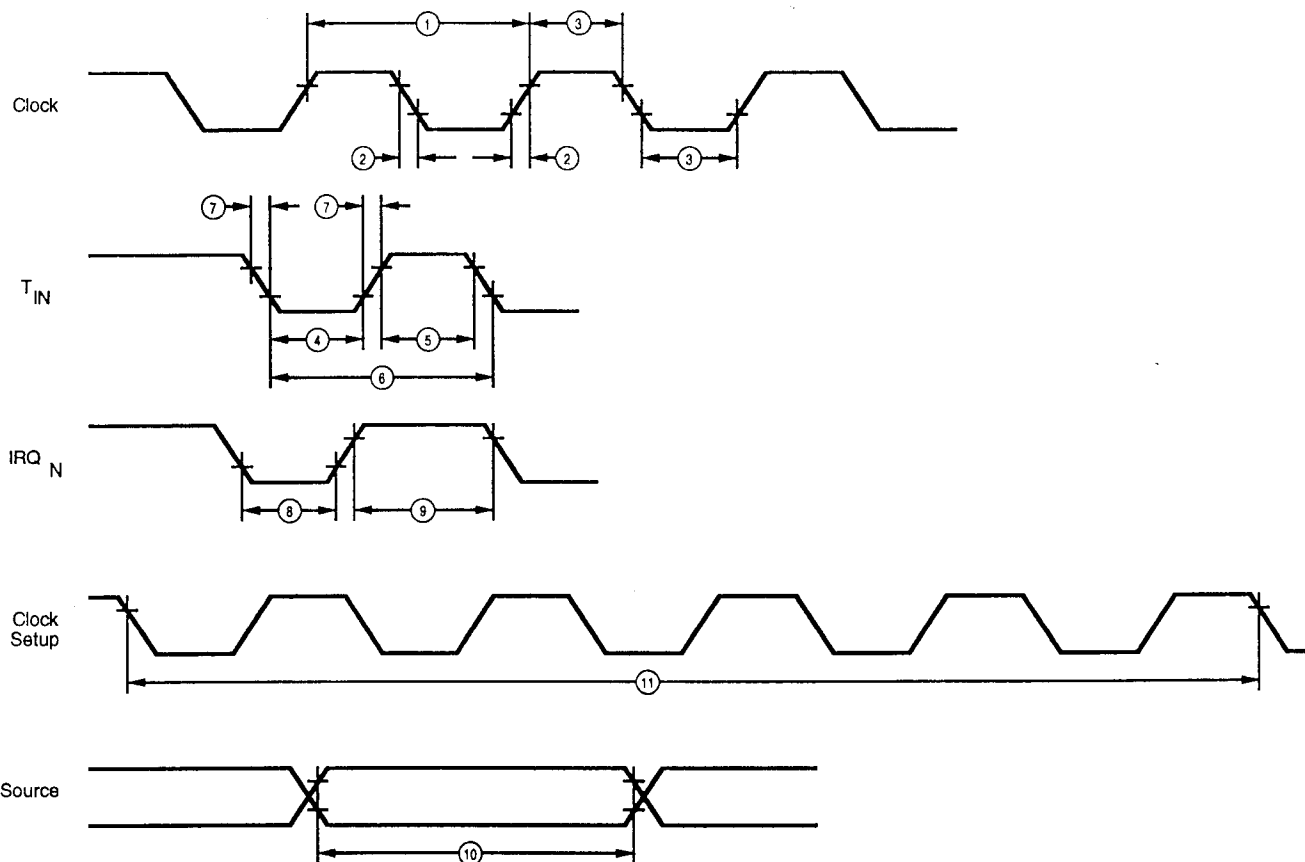
Symbol	Parameter	V _{CC} Note [3]	T _A = 0°C to 70°C (4.5V to 5.5V)		Typical @ 25°C	Units	Conditions	Notes
			Min	Max				
I _{CC1}	Standby Current	5.0V		5	3.0	mA	HALT Mode V _{IN} = 0V, V _{CC} @ 8 MHz	[4, 5, 12]
		5.0V		7.0	4.0	mA	HALT Mode V _{IN} = 0V, V _{CC} @ 12 MHz	[4, 5, 13]
		5.0V		3.5	2.0	mA	Clock Divide by 16 @ 8 MHz	[4, 5, 13]
		5.0V		4.5	2.5	mA	Clock Divide by 16 @ 12 MHz	[4, 5, 13]
		5.0V		1.0		mA	HALT Mode @ 12 MHz	[4, 5, 11, 13]
I _{CC2}	Standby Current	5.0V		10	1.6	µA	STOP Mode V _{IN} = 0V, V _{CC} WDT is not Running	[6, 9]
		5.0V			50	µA	STOP Mode V _{IN} = 0V, V _{CC} WDT is Running	[6, 9]
I _{ALL}	Auto Latch Low Current	5.0V		30	19	µA	0V < V _{IN} < V _{CC}	
I _{ALH}	Auto Latch High Current	5.0V		-20	-11	µA	0V < V _{IN} < V _{CC}	
T _{POR}	Power On Reset	5.0V	3	13	5	ms		
V _{POR}	V _{CC} Low Voltage		2.2	2.8	2.5	V		[3]

Notes:

- [1] I_{CC1}

	Typ	Max	Unit	Freq
Clock Driven	3.0	5.0	mA	8 MHz
Crystal or Ceramic Resonator	0.3	5.0	mA	8 MHz
- [2] V_{SS} = 0V = GND
- [3] The V_{POR} increases as the temperature decreases.
- [4] All outputs unloaded, I/O pins floating, inputs at rail.
- [5] C_{L1} = C_{L2} = 100 pF
- [6] Same as note [4] except inputs at V_{CC}.
- [7] For analog comparator inputs when analog comparators are enabled.
- [8] Excludes clock pins and Port 3 inputs.
- [9] Clock must be forced low when XTAL1 is clock driven and XTAL2 is floating.
- [10] Standard mode (not low EMI mode).
- [11] Low EMI oscillator enabled.
- [12] Z86E03.
- [13] Z86E06.

AC ELECTRICAL CHARACTERISTICS



Additional Timing

AC ELECTRICAL CHARACTERISTICS

No	Symbol	Parameter	V _{cc} Note[3]	T _A = 0°C To +70°C				Units	Notes
				8 MHz (E03)		12 MHz (E06)			
				Min	Max	Min	Max		
1	TpC	Input Clock Period	5.0V	125	DC	83	DC	ns	[1,7,8]
2	TrC,TfC	Clock Input Rise	5.0V		25		15	ns	[1,7,8]
3	TwC	Input Clock Width	5.0V	62		41		ns	[1,7,8]
4	TwTinL	Timer Input Low Width	5.0V	70		70		ns	[1,7,8]
5	TwTinH	Timer Input High Width	5.0V	5TpC		5TpC			[1,7,8]

AC ELECTRICAL CHARACTERISTICS (Continued)

No	Symbol	Parameter	V _{cc} Note[3]	T _A = 0°C To +70°C		Units	Notes
				8 MHz (E03)	12 MHz (E06)		
				Min	Max		
6	TpTin	Timer Input Period	5.0V	8TpC	8TpC		[1,7,8]
7	TrTin, TtTin	Timer Input Rise and Fall Timer	5.0V		100	ns	[1,7]
8	TwIL	Int. Request Input Low Time	5.0V	70	70	ns	[1,2,7]
9	TwIH	Int. Request Input High Time	5.0V	5TpC	5TpC		[1,8,10]
10	Twsm	STOP Mode Recovery Width Spec	5.0V	20	20	ns	[1]
11	Tost	Oscillator Startup Time	5.0V	5TpC	5TpC	ms	[1,4,9]
12	Twdt	Watch-Dog Timer Refresh Time	5.0V	6	6	ms	D1 = 0 [5,6]
			5.0V	12	12	ms	D1 = 0 [5,6]
			5.0V	25	25	ms	D1 = 1 [5,6]
			5.0V	100	100	ms	D1 = 1 [5,6]

Notes:

- [1] Timing Reference uses 0.7 V_{cc} for a logic 1 and 0.2 V_{cc} for a logic 0.
- [2] Interrupt request through Port 3 (P33-P31).
- [3] V_{cc} = 4.5V to 5.5V.
- [4] SMR-D5 = 0, POR delay is off.
- [5] Reg. WDTMR.
- [6] Internal RC oscillator only.
- [7] SMR D1 = 0.
- [8] Maximum frequency for internal system clock is 4 MHz when using SCLK = external clock.
- [9] For RC and LC oscillator and for clock driven oscillator.
- [10] SMR-D5 = 1, STOP mode recovery delay is on.

LIMITATIONS

1. The device does not function down to 3.0V, as per the Product Specification, and does not function below 4.0V.
2. The Permanent WDT Option will disable the WDT function, instead of enabling the WDT function permanently.
3. I_{ALL} maximum limit is 30 μA instead of 20 μA .
4. I_{ALH} maximum limit is -20 μA instead of -9 μA .
5. There is no Low-Voltage Protection (V_{LV}).
6. The temperature specified is 0°C to 70°C and not -40°C to 105°C.

Low Margin:

Customer is advised that this product does not meet Zilog's internal guardbanded test policies for the specification requested and is supplied on an exception basis. Customer is cautioned that delivery may be uncertain and that, in addition to all other limitations on Zilog liability

stated on the front and back of the acknowledgement, Zilog makes no claim as to quality and reliability under the CPS. The product remains subject to standard warranty for replacement due to defects in materials and workmanship.

Pre-Characterization Product:

The product represented by this CPS is newly introduced and Zilog has not completed the full characterization of the product. The CPS states what Zilog knows about this product at this time, but additional features or non-con-

formance with some aspects of the CPS may be found, either by Zilog or its customers in the course of further application and characterization work. In addition, Zilog cautions that delivery may be uncertain at times, due to start-up yield issues.

© 1994 by Zilog, Inc. All rights reserved. No part of this document may be copied or reproduced in any form or by any means without the prior written consent of Zilog, Inc. The information in this document is subject to change without notice. Devices sold by Zilog, Inc. are covered by warranty and patent indemnification provisions appearing in Zilog, Inc. Terms and Conditions of Sale only. Zilog, Inc. makes no warranty, express, statutory, implied or by description, regarding the information set forth herein or regarding the freedom of the described devices from intellectual property infringement. Zilog, Inc. makes no warranty of merchantability or fitness for any purpose. Zilog, Inc. shall not be responsible for any errors that may appear in this document. Zilog, Inc. makes no commitment to update or keep current the information contained in this document.

Zilog's products are not authorized for use as critical components in life support devices or systems unless a specific written agreement pertaining to such intended use is executed between the customer and Zilog prior to use. Life support devices or systems are those which are intended for surgical implantation into the body, or which sustains life whose failure to perform, when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in significant injury to the user.

Zilog, Inc. 210 East Hacienda Ave.
Campbell, CA 95008-6600
Telephone (408) 370-8000
Telex 910-338-7621
FAX 408 370-8056
Internet: <http://www.zilog.com>

Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

[ZiLOG:](#)

[Z86E0308SSC](#) [Z86E0308PSG](#) [Z86E0308SSG](#) [Z86E0612SSG](#) [Z86E0612PSG](#)