PRELIMINARY
CUSTOMER PROCUREMENT SPECIFICATION

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.

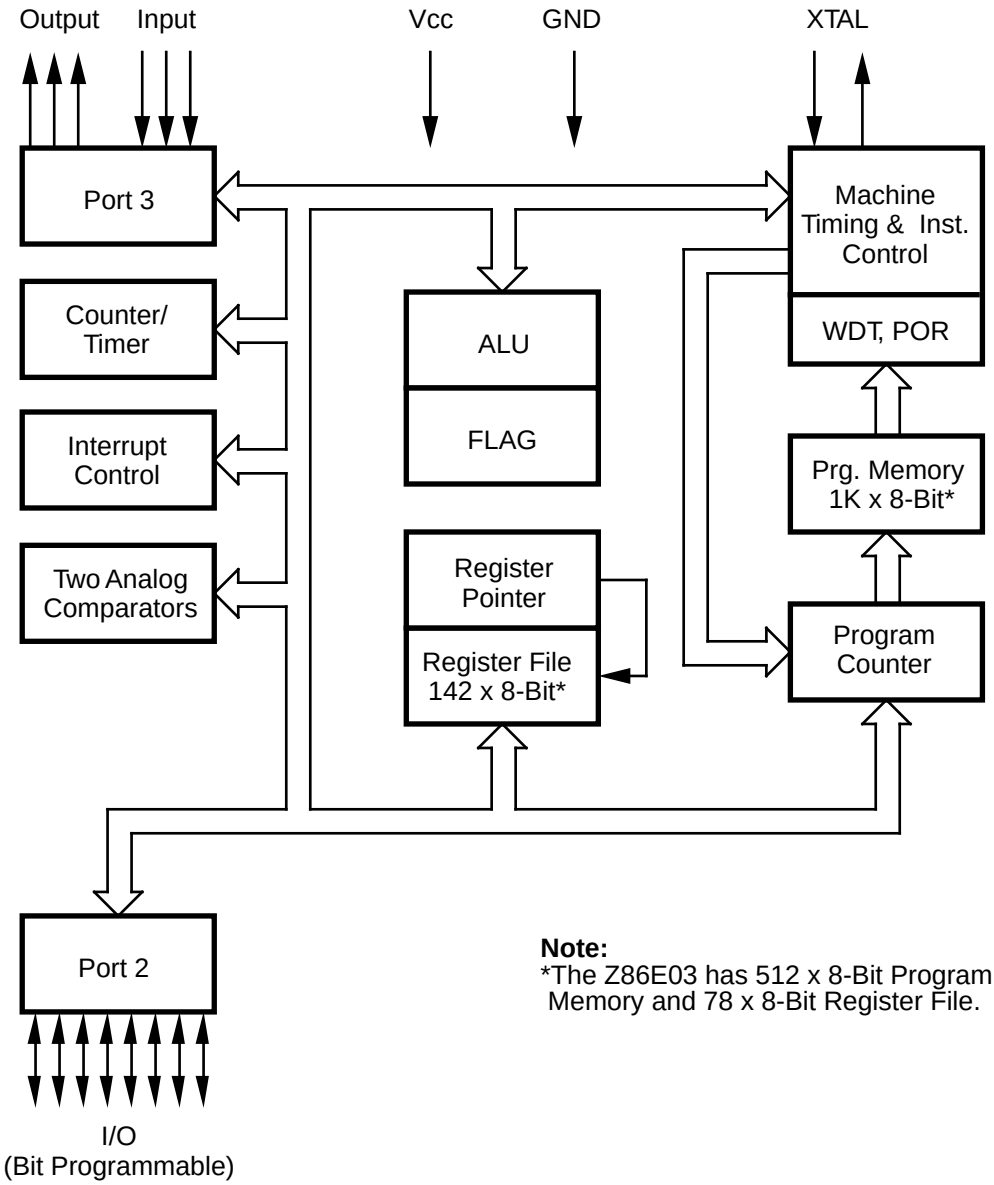
For applications demanding powerful I/O capabilities, the Z86E03/E06's dedicated input and output lines are grouped into two ports, and are configurable under software control to provide timing, status signals, or parallel I/O.

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:

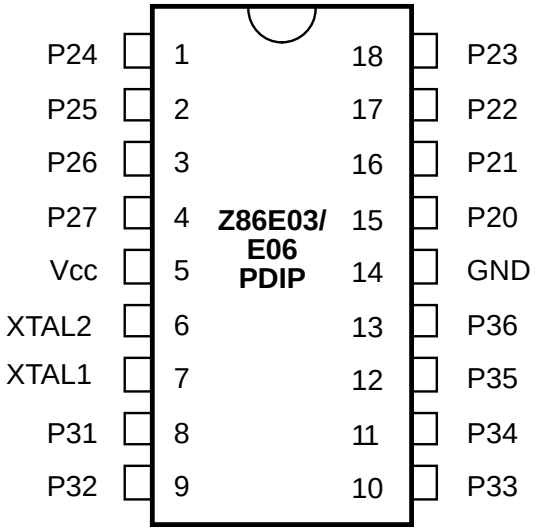
Connection	Circuit	Device
Power	V_{CC}	V_{DD}
Ground	GND	V_{SS}

GENERAL DESCRIPTION (Continued)

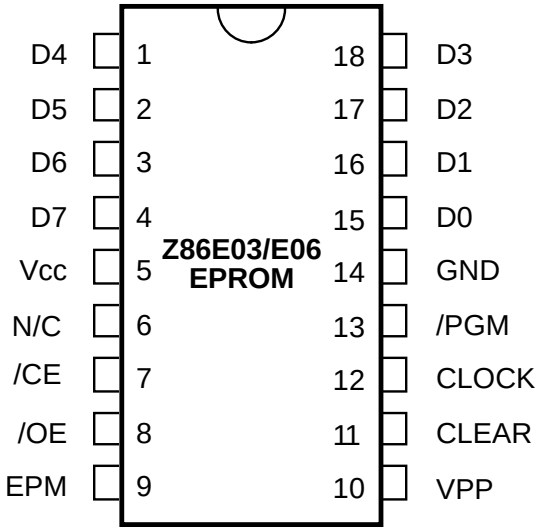


Functional Block Diagram

GENERAL DESCRIPTION (Continued)



18-Pin DIP/WIN
Pin Configuration

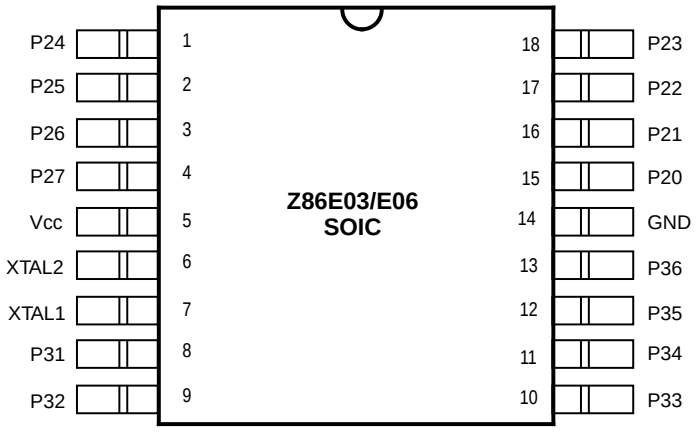


18-Pin EPROM Mode
Pin Configuration

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

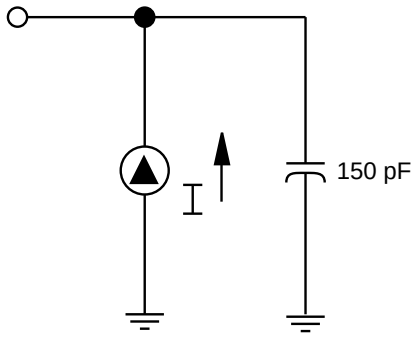
Symbol	Description	Min	Max	Units
V_{CC}	Supply Voltage*	–0.3	+7.0	V
V_{IN}	Input Voltage**	–0.3	V_{CC} + 0.3	V
T_{STG}	Storage Temp	–65	+150	C
T_A	Oper Ambient Temp	†		C

Notes:
* Voltage on Vcc with respect to Vss.
† See Ordering Information
** Voltages on all pins with respect to Vss 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) Min	Max	Typical @ 25°C	Units	Conditions	Notes
	Max Input Voltage	5.0V		12		V	$I_{IN} \leq 250$ 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 5.0V	V_{CC}–0.4 V_{CC}–0.4		4.9 4.9	V V	I_{OH}= –2.0 mA I_{OH}= –0.5 mA	[10]
V_{OL1}	Output Low Voltage (Low EMI Mode)	5.0V 5.0V		0.4 0.4	0.1 0.1	V V	I_{OL}=+4.0 mA I_{OL}=+1.0 mA	[10]
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	OV	V_{CC}–1.5v				[7]
I_{IL}	Input Leakage	5.0V	–1.0	1.0		µA	V_{IN} = OV, V_{CC}	
I_{OL}	Output Leakage	5.0V	–1.0	1.0		µA	V_{IN} = OV, V_{CC}	
I_{CC}	Supply Current	5.0V 5.0V		11.0 15	8.0 11	mA mA	@ 8 MHz @ 12 MHz	[4, 5, 12] [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) Min	Max	Typical @ 25°C	Units	Conditions	Notes
I_{CC1}	Standby Current	5.0V		5	3.0	mA	HALT Mode V_{IN} = OV, V_{CC}@ 8 MHz	[4, 5, 12]
		5.0V		7.0	4.0	mA	HALT Mode V_{IN} = OV, 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} = OV, V_{CC} WDT is not Running	[6, 9]
		5.0V			50	µA	STOP Mode V_{IN} = OV, V_{CC} WDT is Running	[6, 9]
I_{ALL}	Auto Latch Low Current	5.0V		30	19	µA	$OV < V_{IN} < V_{CC}$	
I_{ALH}	Auto Latch High Current	5.0V		–20	–11	µA	$OV < V_{IN} < V_{CC}$	
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]

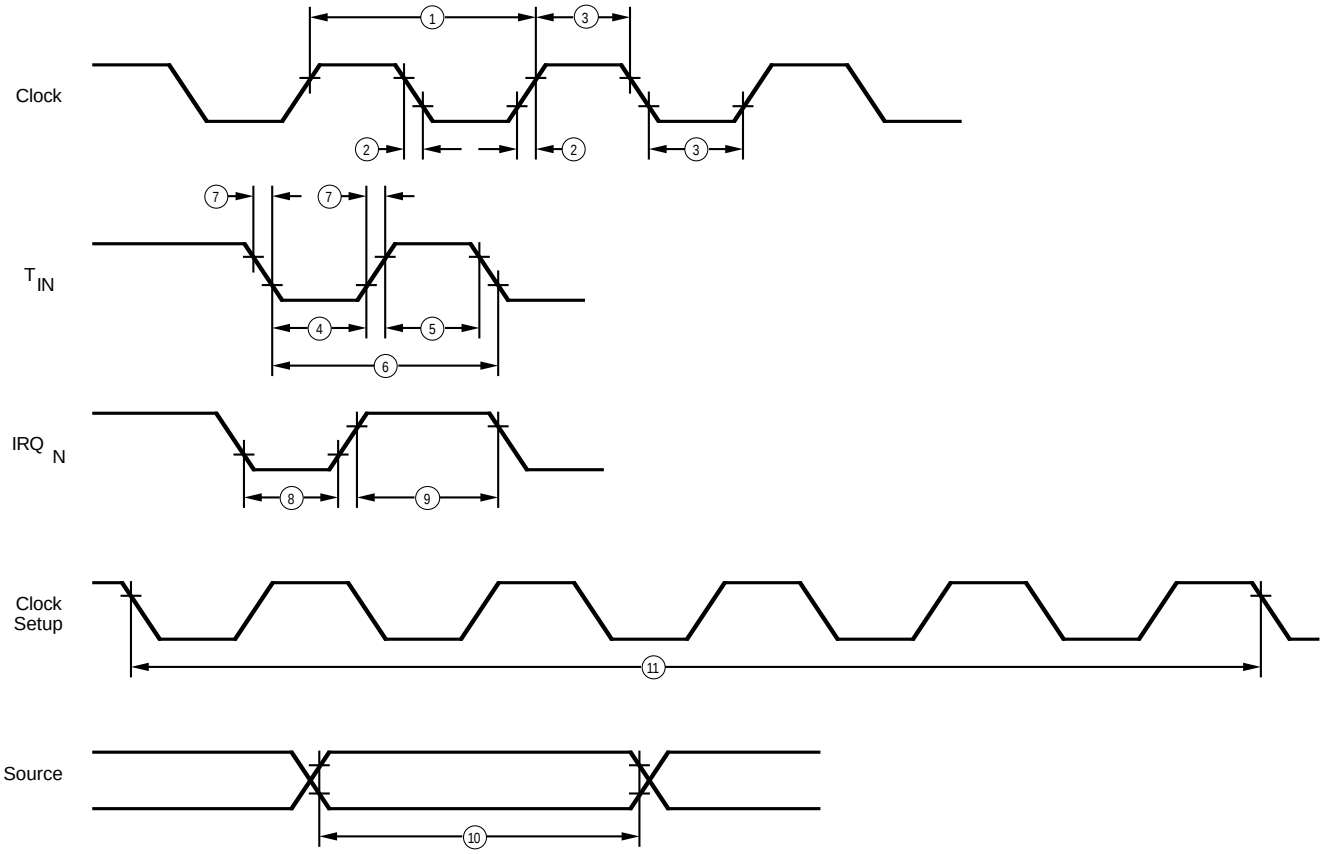
Notes:

[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

				T_A = 0°C To +70°C 8 MHz (E03)		12 MHz (E06)			
No	Symbol	Parameter	V_{CC} Note[3]	Min	Max	Min	Max	Units	Notes
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)

				T_A = 0°C To +70°C					
				8 MHz (E03)		12 MHz (E06)			
No	Symbol	Parameter	V_{CC} Note[3]	Min	Max	Min	Max	Units	Notes
6	TpTin	Timer Input Period	5.0V	8TpC		8TpC			[1,7,8]
7	TrTin, TtTin	Timer Input Rise and Fall Timer	5.0V		100		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.

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