

*CUSTOMER PROCUREMENT SPECIFICATION*

# Z86C03/C06

## CMOS Z8® 8-BIT CCP™

### CONSUMER CONTROLLER PROCESSORS

---

**FEATURES**

<b>Part</b>	<b>ROM</b>	<b>RAM</b>	<b>Speed</b>	
Z86C03	512 bytes	60	8 MHz	■ Software-Enabled Watch-Dog Timer
Z86C06	1 Kbyte	124	12 MHz	■ Power-On Reset Timer
				■ Two Standby Modes: STOP and HALT
■ 18-Pin Package (DIP, SOIC)				■ Two Comparators with Programmable Interrupt Polarity
■ 3.0 to 5.5 Volt Operating Range				■ 14 Input/Output Lines (Two with Comparator Inputs)
■ Operating Temperature: -40°C to +105°C				■ On-Chip Oscillator that Accepts a Crystal, Ceramic Resonator, LC, RC, or External Clock Drive.
■ Fast Instruction Pointer: 1.5 μs @ 8 MHz (C03); 1.0 μs @ 12 MHz (C06)				■ Serial Peripheral Interface (SPI) (Z86C06 Only)
■ Multiple Expanded Register File Control Registers and Two SPI Registers (Z86C06 only)				■ Software Programmable Low EMI Mode
■ One/Two Programmable 8-Bit Counter/Timers, Each with a 6-Bit Programmable Prescaler				■ ROM Protect Option
■ Six Vectored, Priority Interrupts from Six Different Sources				■ Auto Latches

---

**GENERAL DESCRIPTION**

The Z86C03/C06 CCP™ (Consumer Controller Processors) are members of Zilog's the Z8® single-chip microcontroller family with enhanced wake-up circuitry, programmable watch-dog timers and low noise/EMI options. These enhancements result in a more efficient, cost-effective design and provide the user with increased design flexibility over the standard Z8 microcontroller core. With 512 and 1K bytes of ROM and 60 and 124 bytes of general-purpose RAM, respectively, these low cost, low power consumption CMOS microcontrollers offer fast execution, efficient use of memory, sophisticated interrupts, input/output bit manipulation capabilities, and easy hardware/software system expansion.

The Z86C03/C06 CCP architecture is characterized by Zilog's 8-bit microcontroller core with the addition of an Expanded Register File to allow easy access to register mapped peripheral and I/O circuits. The Z86C03/C06 offers a flexible I/O scheme, an efficient register and address space structure, and a number of ancillary features that are useful in many consumer, automotive, and industrial applications.

For applications demanding powerful I/O capabilities, the Z86C03/C06 provides 14 pins dedicated to input and output. These lines are grouped into two ports and are configurable under software control to provide timing, status signals, or parallel I/O.

## GENERAL DESCRIPTION (Continued)

Three basic address spaces are available to support this wide range of configurations: Program Memory, Register File, and Expanded Register File. The Register File is composed of 61/125 bytes of General-Purpose Registers, two I/O Port registers, and 12/14 Control and Status registers. The Expanded Register File consists of three control registers in the Z86C03, and four control registers, a SPI Receive Buffer, and a SPI compare register in the Z86C06.

With powerful peripheral features such, as on-board comparators, counter/timer(s), Watch-Dog Timer (WDT), and Serial Peripheral Interface (SPI) (C06 only), the Z86C03/

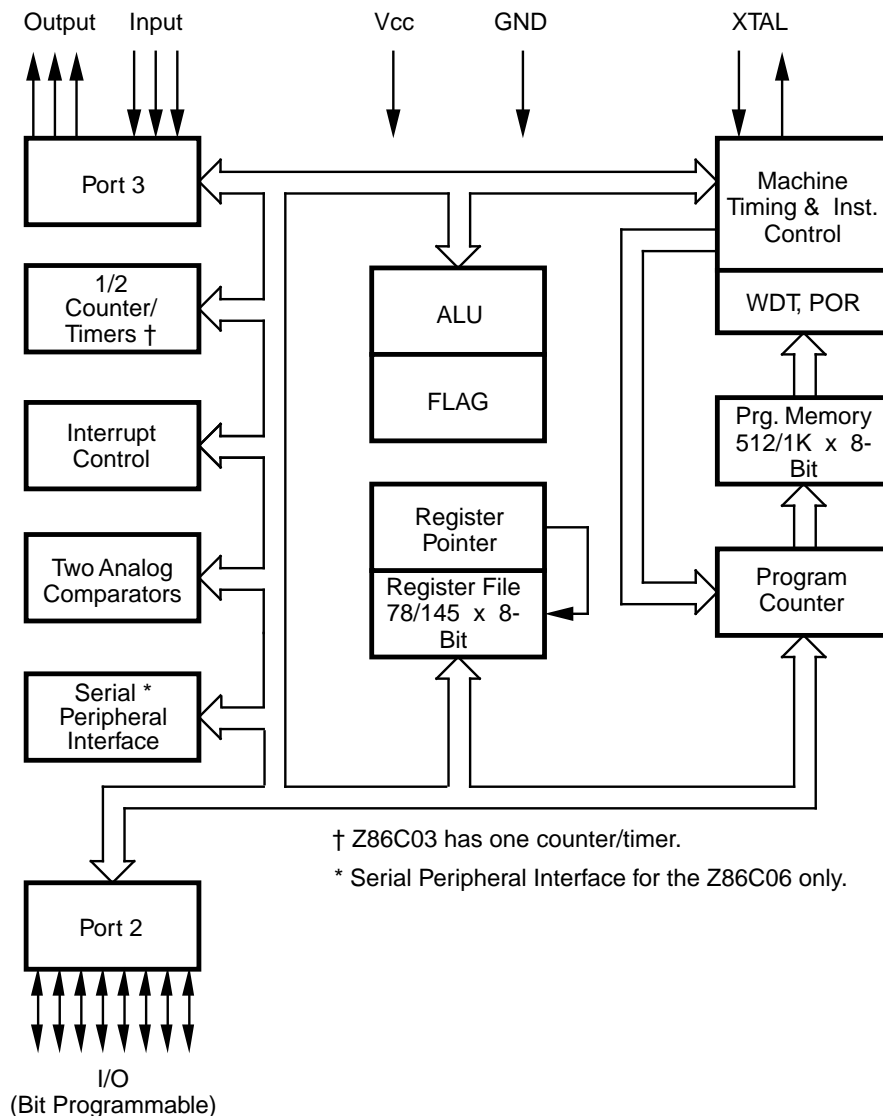
C06 meets the needs of a variety of sophisticated controller applications (Figure 1).

### 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).

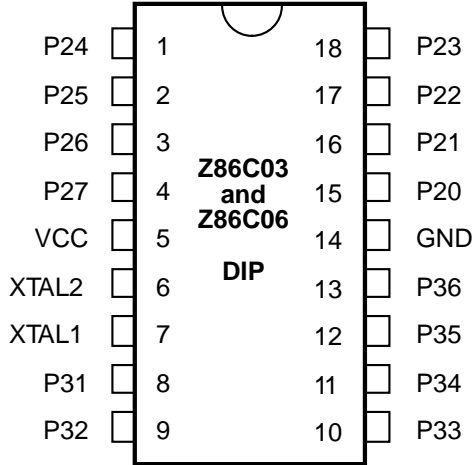
Power connections follow conventional descriptions below:

Connection	Circuit	Device
Power Ground	V <sub>CC</sub> GND	V <sub>DD</sub> V <sub>SS</sub>



**Figure 1. Z86C03/C06 Functional Block Diagram**

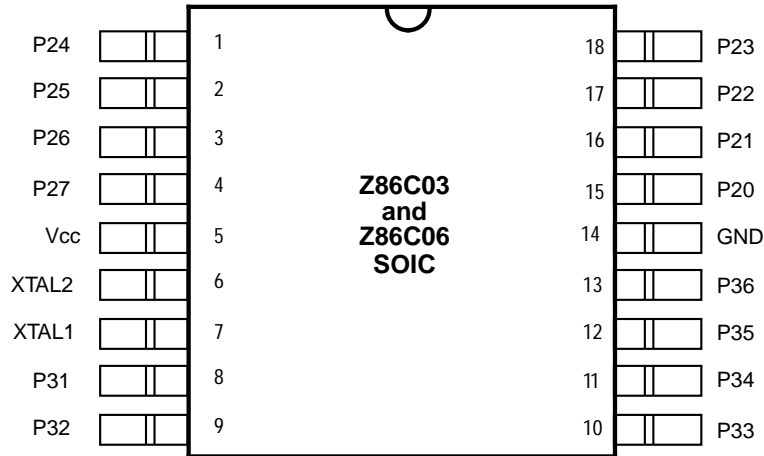
**PIN DESCRIPTION**



**Table 1. 18-Pin DIP and SOIC Pin Identification**

No	Symbol	Function	Direction
1-4	P24-27	Port 2, pins 4, 5, 6, 7	In/Output
5	V <sub>CC</sub>	Power Supply	
6	XTAL2	Crystal Oscillator Clock	Output
7	XTAL1	Crystal Oscillator Clock	Input
8-10	P31-33	Port 3, pins 1, 2, 3	Fixed Input
11-13	P34-36	Port 3, pins 4, 5, 6	Fixed Output
14	GND	Ground	
15-18	P20-23	Port 2, pins 0, 1, 2, 3	In/Output

**Figure 2. 18-Pin DIP Pin Configuration**



**Figure 3. 18-Pin SOIC Pin Configuration**

## ABSOLUTE MAXIMUM RATINGS

Symbol	Description	Min	Max	Units
$V_{CC}$	Supply Voltage*	-0.3	+7.0	V
$V_{IHM}$	Max Input Voltage**		12	V
$T_{STG}$	Storage Temp	-65	+150	°C
$T_A$	Oper Ambient Temp	†		°C

**Notes:**

- \* Voltage on all pins with respect to GND.
- \*\* Applies to Port pins only and must limit current going into or out of Port pins to 250  $\mu$ A maximum.
- † See Ordering Information

Stresses 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 periods 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.

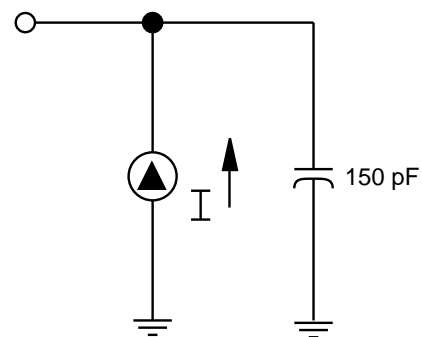
### CAPACITANCE

$T_A = 25^\circ$  C,  $V_{CC} = \text{GND} = 0\text{V}$ ,  $f = 1.0$  MHz, unmeasured pins returned to GND.

Parameter	Min	Max
Input Capacitance	0	12 pF
Output Capacitance	0	20 pF
I/O Capacitance	0	25 pF

### $V_{CC}$ SPECIFICATION

$V_{CC} = 3.0\text{V}$  to  $5.5\text{V}$



**Figure 4. Test Load Configuration**

**DC ELECTRICAL CHARACTERISTICS**

Symbol	Parameter	V <sub>CC</sub> Note [3]	T <sub>A</sub> = 0°C to +70°C		Typical @ 25°C	Units	Conditions	Notes
			Min	Max				
	Max Input Voltage	33V		7		V	I <sub>IN</sub> ≤ 250μA	[7]
		50V		7		V	I <sub>IN</sub> ≤ 250μA	[7]
V <sub>GH</sub>	Clock Input High Voltage	33V	0.9V <sub>CC</sub>	V <sub>CC</sub> +0.3	2.4	V	Driven by External Clock Generator	
		50V	0.9V <sub>CC</sub>	V <sub>CC</sub> +0.3	3.9	V	Driven by External Clock Generator	
V <sub>GL</sub>	Clock Input Low Voltage	33V	V <sub>SS</sub> -0.3	0.2V <sub>CC</sub>	1.6	V	Driven by External Clock Generator	
		50V	V <sub>SS</sub> -0.3	0.2V <sub>CC</sub>	2.7	V	Driven by External Clock Generator	
V <sub>H</sub>	Input High Voltage	33V	0.7V <sub>CC</sub>	V <sub>CC</sub> +0.3	1.8	V		
		50V	0.7V <sub>CC</sub>	V <sub>CC</sub> +0.3	2.8	V		
V <sub>L</sub>	Input Low Voltage	33V	V <sub>SS</sub> -0.3	0.2V <sub>CC</sub>	1.0	V		
		50V	V <sub>SS</sub> -0.3	0.2V <sub>CC</sub>	1.5	V		
V <sub>GH</sub>	Output High Voltage (Low EMIMode)	33V	V <sub>CC</sub> -0.4		3.1	V	I <sub>OH</sub> = -500μA	
		50V	V <sub>CC</sub> -0.4		4.8	V	I <sub>OH</sub> = -500μA	
V <sub>GL</sub>	Output Low Voltage (Low EMIMode)	33V		0.8	0.35	V	I <sub>OL</sub> = +1.0mA	
		50V		0.4	0.18	V	I <sub>OL</sub> = +1.0mA	
V <sub>GH1</sub>	Output High Voltage	33V	V <sub>CC</sub> -0.4		3.1	V	I <sub>OH</sub> = -2.0mA	[12]
		50V	V <sub>CC</sub> -0.4		4.8	V	I <sub>OH</sub> = -2.0mA	[12]
V <sub>GL1</sub>	Output Low Voltage	33V		0.8	0.2	V	I <sub>OL</sub> = +4.0mA	[12]
		50V		0.4	0.1	V	I <sub>OL</sub> = +4.0mA	[12]
V <sub>GL2</sub>	Output Low Voltage	33V		1.0	0.4	V	I <sub>OL</sub> = 6mA, 3PinMax	[12]
		50V		1.0	0.5	V	I <sub>OL</sub> = +12mA, 3PinMax	[12]
V <sub>GHSET</sub>	Comparator Input Offset Voltage	33V		25	10	mV		
		50V		25	10	mV		
I <sub>L</sub>	Input Leakage (Input bias current of comparator)	33V	-1.0	1.0		μA	V <sub>IN</sub> = 0V, V <sub>CC</sub>	[8]
		50V	-1.0	1.0		μA	V <sub>IN</sub> = 0V, V <sub>CC</sub>	[8]
I <sub>L</sub>	Output Leakage	33V	-1.0	1.0		μA	V <sub>IN</sub> = 0V, V <sub>CC</sub>	
		50V	-1.0	1.0		μA	V <sub>IN</sub> = 0V, V <sub>CC</sub>	
I <sub>CC</sub>	Supply Current	33V		6	3.0	nA	@ 8MHz	[4,5] [9]
		50V		11.0	6.0	nA	@ 8MHz	[4,5] [9]
		33V		8.0	4.5	nA	@ 12MHz	[4,5] [9]
		50V		15	9.0	nA	@ 12MHz	[4,5] [9]

**DC ELECTRICAL CHARACTERISTICS** (Continued)

Symbol	Parameter	V <sub>CC</sub> Note [3]	T <sub>A</sub> = 0°C to +70°C		T <sub>A</sub> = -40°C to +105°C		Typical @ 25°C	Units	Conditions	Notes
			Min	Max	Min	Max				
I <sub>CC1</sub>	Standby Current	33V		3.0		3.0	0.7	nA	HALTModeV <sub>IN</sub> =OV, [4,5][10] V <sub>CC</sub> @8MHz	
		50V		5		5	1.5	nA	HALTModeV <sub>IN</sub> =OV, [4,5][10][1] V <sub>CC</sub> @8MHz	
		33V		4.5		4.5	1.0	nA	HALTModeV <sub>IN</sub> =OV, [4,5][10] V <sub>CC</sub> @12MHz	
		50V		7.0		7.0	2.0	nA	HALTModeV <sub>IN</sub> =OV, [4,5][10] V <sub>CC</sub> @12MHz	
		33V		1.4		1.4	0.6	nA	ClockDivideby 16 @8MHz	[4,5][10]
		50V		3.5		3.5	1.3	nA	ClockDivideby 16 @8MHz	[4,5][10]
		33V		2.0		2.0	0.7	nA	ClockDivideby 16 @12MHz	[4,5][10]
		50V		4.5		4.5	1.5	nA	ClockDivideby 16 @12MHz	[4,5][10]
I <sub>CC2</sub>	Standby Current	33V		10		20	1.0	µA	STOPModeV <sub>IN</sub> =OV, [6][10] V <sub>CC</sub> WDTisnotRunning	
		50V		10		20	3.0	µA	STOPModeV <sub>IN</sub> =OV, [6][10] V <sub>CC</sub> WDTisnotRunning	
		33V		350		360	180	µA	STOPModeV <sub>IN</sub> =OV, [6][9] V <sub>CC</sub> WDTisRunning	
		50V		865		875	400	µA	STOPModeV <sub>IN</sub> =OV, [6][9] V <sub>CC</sub> WDTisRunning	
I <sub>NL</sub>	AutoLatchLow Current	33V		7.0		14.0	4.0	µA	OV<V <sub>IN</sub> <V <sub>CC</sub>	
		50V		20.0		30.0	13	µA	OV<V <sub>IN</sub> <V <sub>CC</sub>	
I <sub>NH</sub>	AutoLatchHigh Current	33V		-4.0		-8.0	-3	µA	OV<V <sub>IN</sub> <V <sub>CC</sub>	
		50V		-9.0		-16.0	-7	µA	OV<V <sub>IN</sub> <V <sub>CC</sub>	
T <sub>FR</sub>	PowerOnReset	33V	7	24	6	25	13	ms		
		50V	3	13	2	14	6.5	ms		
V <sub>BO</sub>	V <sub>CC</sub> BrownOut Voltage		1.50	2.65	1.2	2.95	2.4	V	2MHzmaxInt.CLKFreq.[13]	
V <sub>IR</sub>	ComparatorInput CommonMode VoltageRange			V <sub>CC</sub> -1.5		V <sub>CC</sub> -1.5		V		

**Notes:**

- [1] I<sub>CC1</sub>  
Clock Driven  
Crystal or Ceramic Resonator
- | Typ | Max | Unit | Freq  |
|-----|-----|------|-------|
| 0.3 | 5.0 | mA   | 8 MHz |
| 3.0 | 5.0 | mA   | 8 MHz |
- [2] V<sub>SS</sub> = 0V = GND  
[3] 5.0V ± 0.5V, 3.0V ± 0.3V.  
[4] All outputs unloaded, I/O pins floating, inputs at rail.  
[5] C<sub>L1</sub> = C<sub>L2</sub> = 47 pF  
[6] Same as note [4] except inputs at V<sub>CC</sub>.

- [7] The input current must be limited to a maximum of 250 µA or less.  
[8] Input bias current for comparator inputs P31, P32, P33.  
[9] Internal on-board RC is driving WDT.  
[10] WDT is not running.  
[11] System clock is external XTAL frequency divided by 2.  
[12] Standard mode (not Low EMI Mode).  
[13] The V<sub>BO</sub> voltage increases as the temperature decreases.

## AC ELECTRICAL CHARACTERISTICS

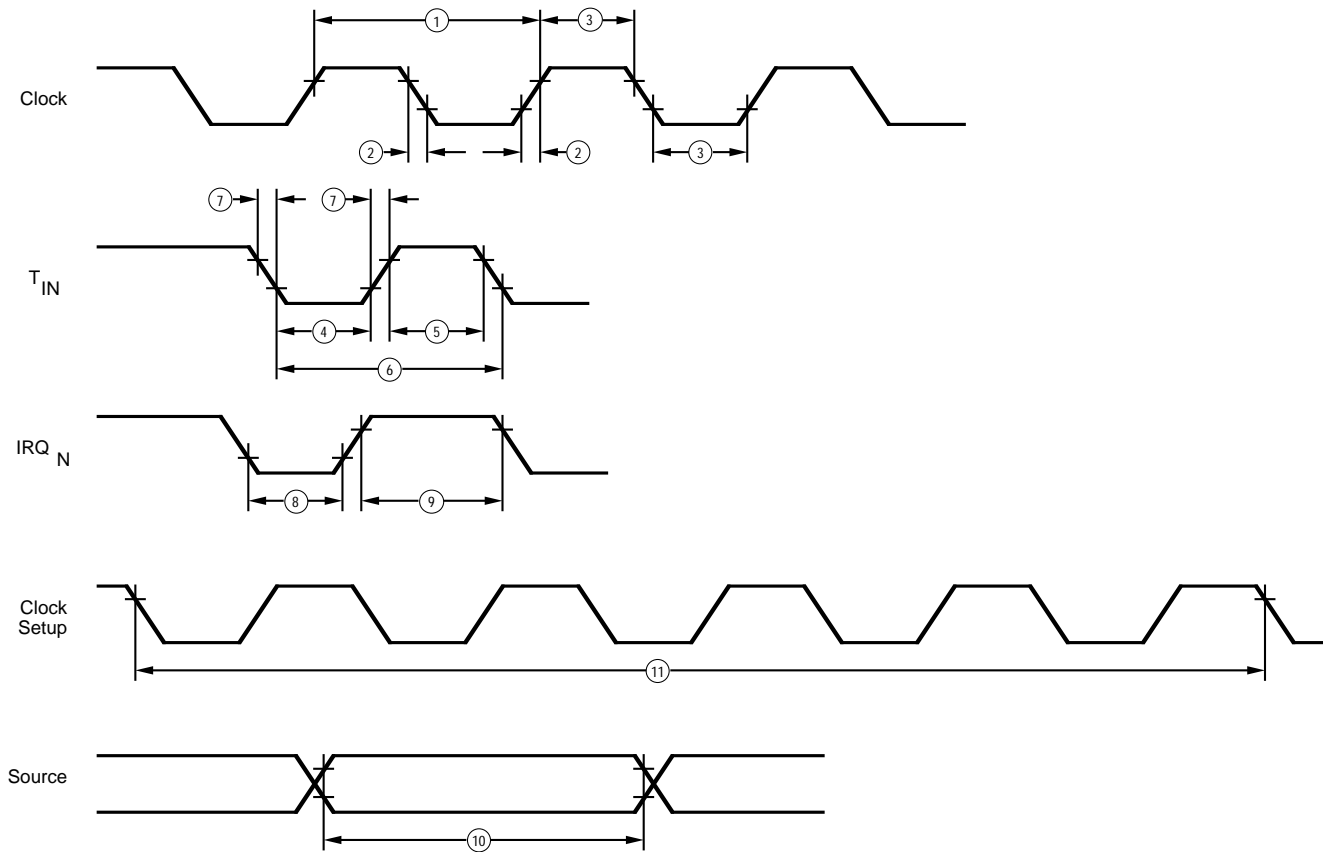


Figure 5. Additional Timing

## AC ELECTRICAL CHARACTERISTICS

No	Symbol	Parameter	V <sub>CC</sub> Note[3]	T <sub>A</sub> = 0°C To +70°C				T <sub>A</sub> = -40°C To +105°C				Units	Notes
				8 MHz		12 MHz		8 MHz		12 MHz			
				Min	Max	Min	Max	Min	Max	Min	Max		
1	T <sub>pC</sub>	InputClockPeriod	3.3V 5.0V	125 125	DC DC	83 83	DC DC	125 125	DC DC	83 83	DC DC	ns	[1] [1]
2	T <sub>rC</sub> , T <sub>fC</sub>	ClockInputRise andFallTimes	3.3V 5.0V	25 25		15 15		25 25		15 15		ns	[1] [1]
3	T <sub>wC</sub>	InputClockWidth	3.3V 5.0V	37 37		26 26		37 37		26 26		ns	[1] [1]
4	T <sub>wInL</sub>	TimerInputLowWidth	3.3V 5.0V	100 70		100 70		100 70		100 70		ns	[1] [1]
5	T <sub>wInH</sub>	TimerInputHighWidth	3.3V 5.0V	5T <sub>pC</sub> 5T <sub>pC</sub>		5T <sub>pC</sub> 5T <sub>pC</sub>		5T <sub>pC</sub> 5T <sub>pC</sub>		5T <sub>pC</sub> 5T <sub>pC</sub>			[1][7] [1][7]

**AC ELECTRICAL CHARACTERISTICS** (Continued)

No	Symbol	Parameter	V <sub>CC</sub> Note[3]	T <sub>A</sub> = 0°C To +70°C				T <sub>A</sub> = -40°C To +105°C				Units	Notes
				8MHz		12MHz		8MHz		12MHz			
				Min	Max	Min	Max	Min	Max	Min	Max		
6	TpTin	TimerInputPeriod	33V	8TpC	8TpC	8TpC	8TpC	8TpC	8TpC		[1][7]		
			50V	8TpC	8TpC	8TpC	8TpC	8TpC	8TpC		[1][7]		
7	TfTin, TfTin	TimerInputRise andFallTimer	33V		100		100		100		100	ns	[1]
			50V		100		100		100		100	ns	[1]
8	TwL	Int.RequestInput LowTime	33V	100		100		100		100		ns	[1,2]
			50V	70		70		70		70		ns	[1,2]
9	TwH	Int.RequestInput HighTime	33V	5TpC		5TpC		5TpC		5TpC			[1,2][7]
			50V	5TpC		5TpC		5TpC		5TpC			[1,2][7]
10	Twsm	STOPModeRecovery WidthSpec	33V	12		12		12		12		ns	
			50V	12		12		12		12		ns	
11	Tost	OscillatorStartupTime	33V		5TpC		5TpC		5TpC		5TpC		Reg. [4]
			50V		5TpC		5TpC		5TpC		5TpC	ns	
12	Twdt	WatchdogTimer RefreshTime	33V	15		15		12		12			[5]
			50V	5		5		3		3		ms	D0=0[6] D1=0[6]
			33V	30		30		25		25		ms	D0=1[6]
			50V	16		16		12		12		ms	D1=0[6]
			33V	60		60		50		50		ms	D0=0[6]
			50V	30		30		25		25		ms	D1=1[6]
			33V	250		250		200		200		ms	D0=1[6]
50V	120		120		100		100		ms	D1=1[6]			

**Notes:**

- [1] Timing Reference uses 0.9 V<sub>CC</sub> for a logic 1 and 0.1 V<sub>CC</sub> for a logic 0.
- [2] Interrupt request via Port 3 (P31-P33)
- [3] 5.0V ± 0.5V, 3.3V ± 0.3V
- [4] SMR-D5 = 0 (Stop mode delay off)
- [5] Reg. WDTMR
- [6] Internal RC Oscillator only.
- [7] System clock is XTAL frequency divided by 2.



---

© 1996 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  
FAX 408 370-8056  
Internet: <http://www.zilog.com>

This datasheet has been download from:

[www.datasheetcatalog.com](http://www.datasheetcatalog.com)

Datasheets for electronics components.