

CUSTOMER PROCUREMENT SPECIFICATION

Z86C03/C06

CMOS Z8® 8-Bit CCP™

CONSUMER CONTROLLER PROCESSORS

FEATURES

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

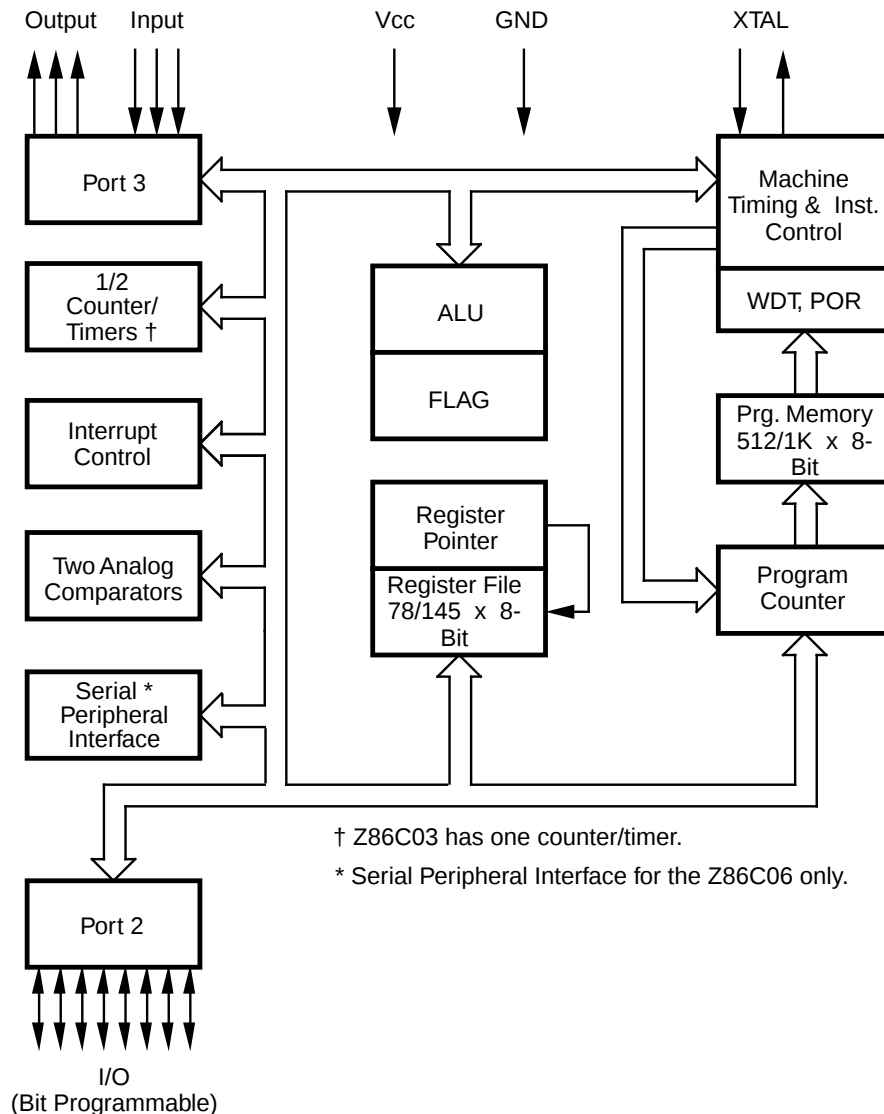


Figure 1. Z86C03/C06 Functional Block Diagram

PIN DESCRIPTION

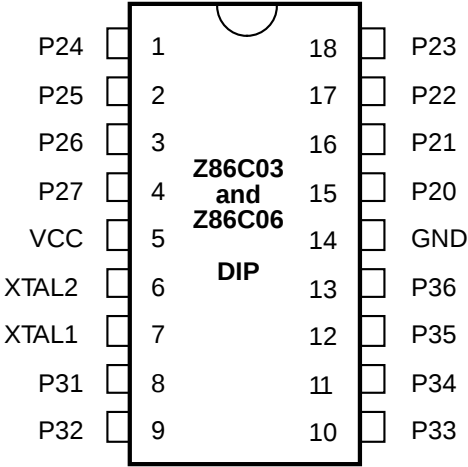


Table 1. 18-Pin DIP and SOIC Pin Identification

No	Symbol	Function	Direction
1-4	P24-27	Port 2, pins 4, 5, 6, 7	In/Output
5	V _{CC}	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

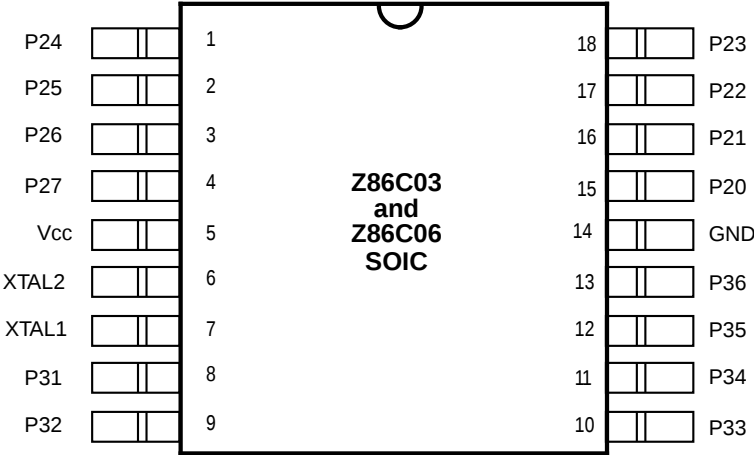


Figure 3. 18-Pin SOIC Pin Configuration

ABSOLUTE MAXIMUM RATINGS

Symbol	Description	Min	Max	Units
V_{CC}	Supply Voltage*	-0.3	+7.0	V
V_{IH}	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 μ 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

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

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

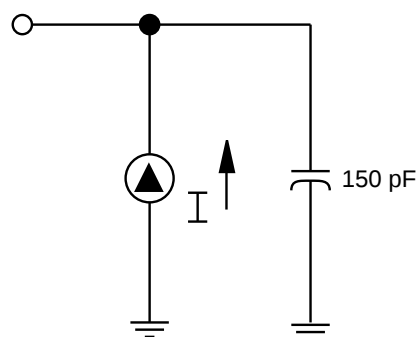


Figure 4. Test Load Configuration

DC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	V _{CC} Note [3]	T _A = 0°C to +70°C		Typical @ 25°C	Units	Conditions	Notes
			Min	Max				
	Max Input Voltage	3.3V		7		V	I _{IN} ≤ 250μA	[7]
		5.0V		7		V	I _{IN} ≤ 250μA	[7]
V _{GH}	Clock Input High Voltage	3.3V	0.9V _{CC}	V _{CC} +0.3	2.4	V	Driven by External Clock Generator	
		5.0V	0.9V _{CC}	V _{CC} +0.3	3.9	V	Driven by External Clock Generator	
V _{GL}	Clock Input Low Voltage	3.3V	V _{SS} -0.3	0.2V _{CC}	1.6	V	Driven by External Clock Generator	
		5.0V	V _{SS} -0.3	0.2V _{CC}	2.7	V	Driven by External Clock Generator	
V _H	Input High Voltage	3.3V	0.7V _{CC}	V _{CC} +0.3	1.8	V		
		5.0V	0.7V _{CC}	V _{CC} +0.3	2.8	V		
V _L	Input Low Voltage	3.3V	V _{SS} -0.3	0.2V _{CC}	1.0	V		
		5.0V	V _{SS} -0.3	0.2V _{CC}	1.5	V		
V _{OH}	Output High Voltage (Low EM I Mode)	3.3V	V _{CC} -0.4		3.1	V	I _{OH} = -500μA	
		5.0V	V _{CC} -0.4		4.8	V	I _{OH} = -500μA	
V _{OL}	Output Low Voltage (Low EM I Mode)	3.3V		0.8	0.35	V	I _{OL} = +1.0mA	
		5.0V		0.4	0.18	V	I _{OL} = +1.0mA	
V _{OH1}	Output High Voltage	3.3V	V _{CC} -0.4		3.1	V	I _{OH} = -2.0mA	[12]
		5.0V	V _{CC} -0.4		4.8	V	I _{OH} = -2.0mA	[12]
V _{OL1}	Output Low Voltage	3.3V		0.8	0.2	V	I _{OL} = +4.0mA	[12]
		5.0V		0.4	0.1	V	I _{OL} = +4.0mA	[12]
V _{OL2}	Output Low Voltage	3.3V		1.0	0.4	V	I _{OL} = 6mA, 3PinMax	[12]
		5.0V		1.0	0.5	V	I _{OL} = +12mA, 3PinMax	[12]
V _{OHSET}	Comparator Input Offset Voltage	3.3V		25	10	mV		
		5.0V		25	10	mV		
I _L	Input Leakage (Input bias current of comparator)	3.3V	-1.0	1.0		μA	V _{IN} = 0V, V _{CC}	[8]
		5.0V	-1.0	1.0		μA	V _{IN} = 0V, V _{CC}	[8]
I _{OL}	Output Leakage	3.3V	-1.0	1.0		μA	V _{IN} = 0V, V _{CC}	
		5.0V	-1.0	1.0		μA	V _{IN} = 0V, V _{CC}	
I _{CC}	Supply Current	3.3V		6	3.0	nA	@ 8MHz	[4,5][9]
		5.0V		11.0	6.0	nA	@ 8MHz	[4,5][9]
		3.3V		8.0	4.5	nA	@ 12MHz	[4,5][9]
		5.0V		15	9.0	nA	@ 12MHz	[4,5][9]

DC ELECTRICAL CHARACTERISTICS (Continued)

Symbol	Parameter	V _{CC} Note [3]	T _A = 0°C to +70°C		T _A = -40°C to +105°C		Typical @ 25°C	Units	Conditions	Notes
			Min	Max	Min	Max				
I _{CC1}	Standby Current	33V		3.0		3.0	0.7	nA	HALTModeV _{IN} =OV, [4,5][10] V _{CC} @8MHz	
		50V		5		5	1.5	nA	HALTModeV _{IN} =OV, [4,5][10][1] V _{CC} @8MHz	
		33V		4.5		4.5	1.0	nA	HALTModeV _{IN} =OV, [4,5][10] V _{CC} @12MHz	
		50V		7.0		7.0	2.0	nA	HALTModeV _{IN} =OV, [4,5][10] V _{CC} @12MHz	
		33V		1.4		1.4	0.6	nA	ClockDivideby16 @8MHz	[4,5][10]
		50V		3.5		3.5	1.3	nA	ClockDivideby16 @8MHz	[4,5][10]
		33V		2.0		2.0	0.7	nA	ClockDivideby16 @12MHz	[4,5][10]
		50V		4.5		4.5	1.5	nA	ClockDivideby16 @12MHz	[4,5][10]
I _{CC2}	Standby Current	33V		10		20	1.0	µA	STOPModeV _{IN} =OV, [6][10] V _{CC} WDTisnotRunning	
		50V		10		20	3.0	µA	STOPModeV _{IN} =OV, [6][10] V _{CC} WDTisnotRunning	
		33V		350		360	180	µA	STOPModeV _{IN} =OV, [6][9] V _{CC} WDTisRunning	
		50V		865		875	400	µA	STOPModeV _{IN} =OV, [6][9] V _{CC} WDTisRunning	
I _{NL}	AutoLatchLow Current	33V		7.0		14.0	4.0	µA	OV<V _{IN} <V _{CC}	
		50V		20.0		30.0	13	µA	OV<V _{IN} <V _{CC}	
I _{NH}	AutoLatchHigh Current	33V		-4.0		-8.0	-3	µA	OV<V _{IN} <V _{CC}	
		50V		-9.0		-16.0	-7	µA	OV<V _{IN} <V _{CC}	
T _{POR}	PowerOnReset	33V	7	24	6	25	13	ms		
		50V	3	13	2	14	6.5	ms		
V _{BO}	V _{CC} BrownOut Voltage		1.50	2.65	1.2	2.95	2.4	V	2MHzmaxInt.CLKFreq.[13]	
V _{IR}	ComparatorInput CommonMode VoltageRange			V _{CC} -1.5		V _{CC} -1.5		V		

Notes:

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

- [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_{BO} voltage increases as the temperature decreases.

AC ELECTRICAL CHARACTERISTICS

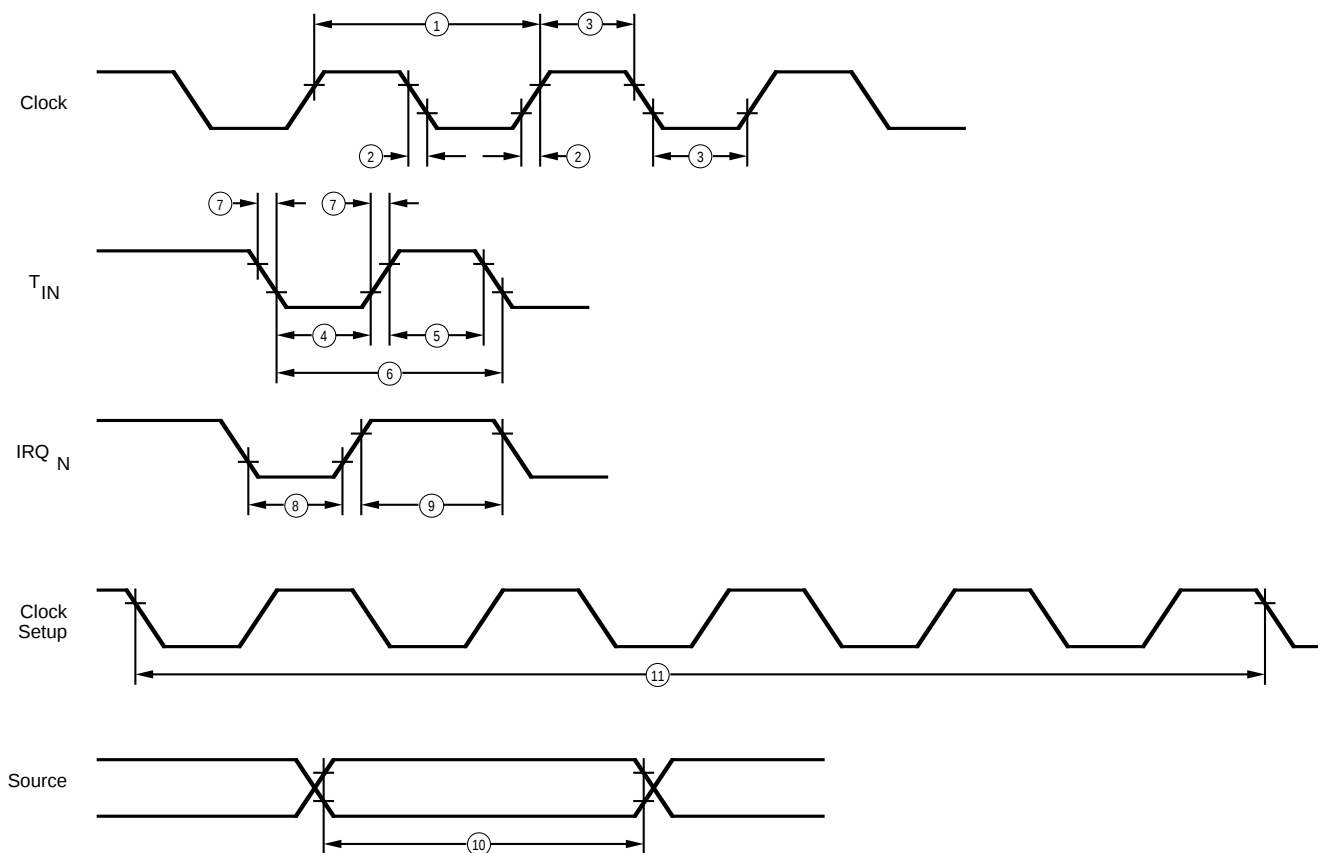


Figure 5. Additional Timing

AC ELECTRICAL CHARACTERISTICS

No	Symbol	Parameter	V _{CC} Note[3]	T _A = 0°C To +70°C				T _A = -40°C To +105°C				Units	Notes
				8 MHz		12 MHz		8 MHz		12 MHz			
				Min	Max	Min	Max	Min	Max	Min	Max		
1	TpC	InputClockPeriod	33V	125	DC	83	DC	125	DC	83	DC	ns	[1]
			50V	125	DC	83	DC	125	DC	83	DC	ns	[1]
2	TiC,TfC	ClockInputRise and Fall Times	33V		25		15		25		15	ns	[1]
			50V		25		15		25		15	ns	[1]
3	TwC	InputClockWidth	33V	37		26		37		26		ns	[1]
			50V	37		26		37		26		ns	[1]
4	TwTnL	TimerInputLowWidth	33V	100		100		100		100		ns	[1]
			50V	70		70		70		70		ns	[1]
5	TwTnH	TimerInputHighWidth	33V	5TpC		5TpC		5TpC		5TpC			[1][7]
			50V	5TpC		5TpC		5TpC		5TpC			[1][7]

AC ELECTRICAL CHARACTERISTICS (Continued)

No	Symbol	Parameter	V _{CC}	T _A = 0°C To +70°C				T _A = -40°C To +105°C				Units	Notes
			Note[3]	8MHz		12MHz		8MHz		12MHz			
				Min	Max	Min	Max	Min	Max	Min	Max		
6	TpTin	TimerInputPeriod	33V	8TpC		8TpC		8TpC		8TpC			[1][7]
			50V	8TpC		8TpC		8TpC		8TpC			[1][7]
7	TrTin, 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	Twsn	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_{CC} for a logic 1 and 0.1 V_{CC} 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.

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