Customer Procurement Specification

Z86C03/C06

CMOS Z8® 8-Bit CCP™ Consumer Controller Processors

FEATURES

Part	ROM	RAM	Speed
Z86C03	512 bytes	60	8 MHz
Z86C06	1 Kbyte	124	12 MHz

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

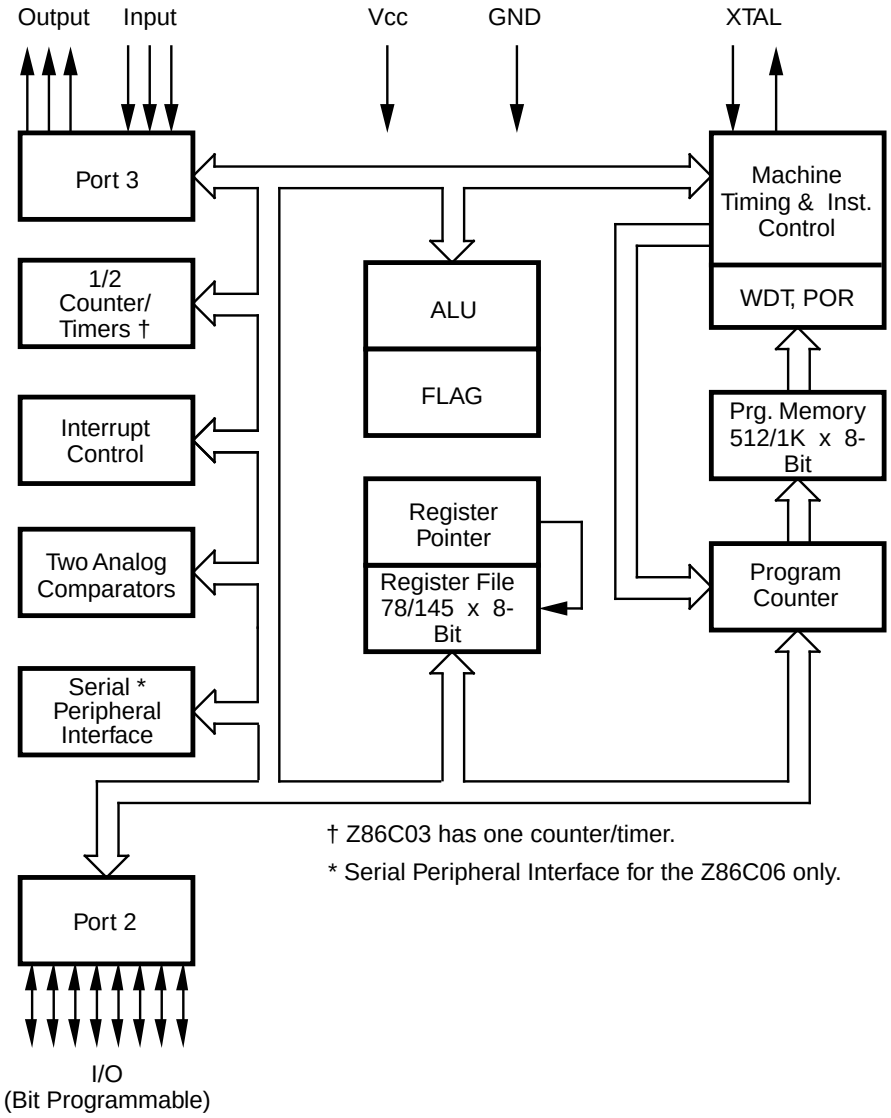

Figure 1. Z86C03/C06 Functional Block Diagram

PIN DESCRIPTION

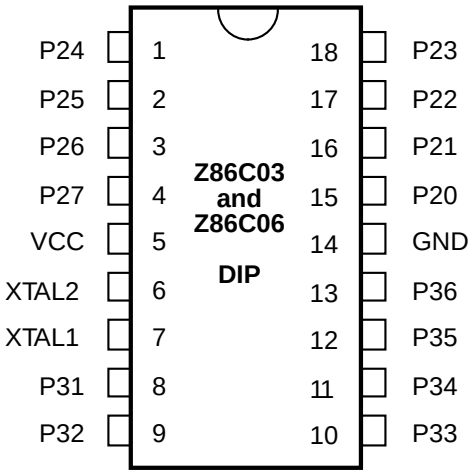

Table 1. 18-Pin DIP and SOIC Pin Identification

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

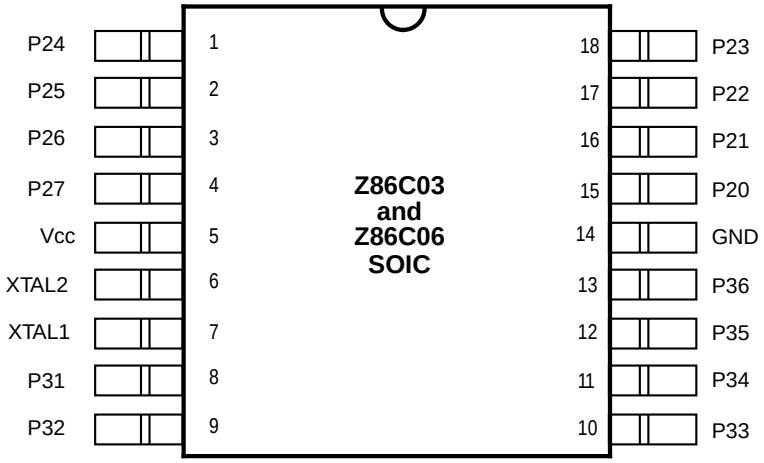

Figure 3. 18-Pin SOIC Pin Configuration

ABSOLUTE MAXIMUM RATINGS

Symbol	Description	Min	Max	Units
V_{CC}	Supply Voltage*	–0.3	+7.0	V
V_{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 µA 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.

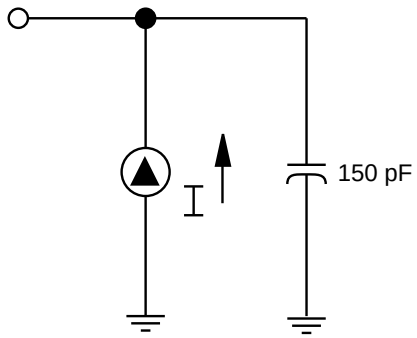

Figure 4. Test Load Configuration

CAPACITANCE

T_A = 25° C, V_{CC} = GND = 0V, 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} = 3.0V to 5.5V

DC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	V_{CC} Note [3]	T_A = 0°C to +70°C Min	Max	Typical @ 25°C	Units	Conditions	Notes
	Max Input Voltage	3.3V		7		V	$I_{IN} \leq 250\mu A$	[7]
		5.0V		7		V	$I_{IN} \leq 250\mu A$	[7]
V_{CH}	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_{CL}	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_{IH}	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_{IL}	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 EMI 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 EMI 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}=+4.0 mA	[12]
		5.0V		0.4	0.1	V	I_{OL}=+4.0 mA	[12]
V_{OL2}	Output Low Voltage	3.3V		1.0	0.4	V	I_{OL}=6mA, 3 Pin Max	[12]
		5.0V		1.0	0.5	V	I_{OL}=+12mA, 3 Pin Max	[12]
V_{OFFSET}	Comparator Input Offset Voltage	3.3V		25	10	mV		
		5.0V		25	10	mV		
I_{IL}	Input Leakage (Input bias current of comparator)	3.3V	-1.0	1.0		µA	V_{IN}=OV,V_{CC}	[8]
		5.0V	-1.0	1.0		µA	V_{IN}=OV,V_{CC}	[8]
I_{OL}	Output Leakage	3.3V	-1.0	1.0		µA	V_{IN}=OV,V_{CC}	
		5.0V	-1.0	1.0		µA	V_{IN}=OV,V_{CC}	
I_{CC}	Supply Current	3.3V		6	3.0	mA	@8MHz	[4,5][9]
		5.0V		11.0	6.0	mA	@8MHz	[4,5][9]
		3.3V		8.0	4.5	mA	@12MHz	[4,5][9]
		5.0V		15	9.0	mA	@12MHz	[4,5][9]

DC ELECTRICAL CHARACTERISTICS (Continued)

Symbol	Parameter	V_{CC} Note [3]	T_A = 0°C to +70°C Min	Max	T_A = –40°C to +105°C Min	Max	Typical @ 25°C	Units	Conditions	Notes
I_{CC1}	Standby Current	3.3V		3.0		3.0	0.7	mA	HALT Mode V_{IN}=OV, V_{CC}@8MHz	[4,5][10]
		5.0V		5		5	1.5	mA	HALT Mode V_{IN}=OV, V_{CC}@8MHz	[4,5][10][1]
		3.3V		4.5		4.5	1.0	mA	HALT Mode V_{IN}=OV, V_{CC}@12MHz	[4,5][10]
		5.0V		7.0		7.0	2.0	mA	HALT Mode V_{IN}=OV, V_{CC}@12MHz	[4,5][10]
		3.3V		1.4		1.4	0.6	mA	Clock Divide by 16 @8MHz	[4,5][10]
		5.0V		3.5		3.5	1.3	mA	Clock Divide by 16 @8MHz	[4,5][10]
		3.3V		2.0		2.0	0.7	mA	Clock Divide by 16 @12MHz	[4,5][10]
		5.0V		4.5		4.5	1.5	mA	Clock Divide by 16 @12MHz	[4,5][10]
I_{CC2}	Standby Current	3.3V		10		20	1.0	µA	STOP Mode V_{IN}=OV, V_{CC} WDT is not Running	[6][10]
		5.0V		10		20	3.0	µA	STOP Mode V_{IN}=OV, V_{CC} WDT is not Running	[6][10]
		3.3V		350		360	180	µA	STOP Mode V_{IN}=OV, V_{CC} WDT is Running	[6][9]
		5.0V		865		875	400	µA	STOP Mode V_{IN}=OV, V_{CC} WDT is Running	[6][9]
I_{ALL}	Auto Latch Low Current	3.3V		7.0		14.0	4.0	µA	$OV<V_{IN}<V_{CC}$	
		5.0V		20.0		30.0	13	µA	$OV<V_{IN}<V_{CC}$	
I_{ALH}	Auto Latch High Current	3.3V		-4.0		–8.0	-3	µA	$OV<V_{IN}<V_{CC}$	
		5.0V		-9.0		–16.0	-7	µA	$OV<V_{IN}<V_{CC}$	
T_{POR}	Power On Reset	3.3V	7	24	6	25	13	ms		
		5.0V	3	13	2	14	6.5	ms		
V_{BO}	V_{CC} Brown Out Voltage		1.50	2.65	1.2	2.95	2.4	V	2MHz max Int. CLK Freq.	[13]
V_{CR}	Comparator Input Common Mode Voltage Range			V_{CC}-1.5		V_{CC}-1.5		V		

Notes:

[1] I_{CC1}

	Typ	Max	Unit	Freq
Clock Driven	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 comparitor 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

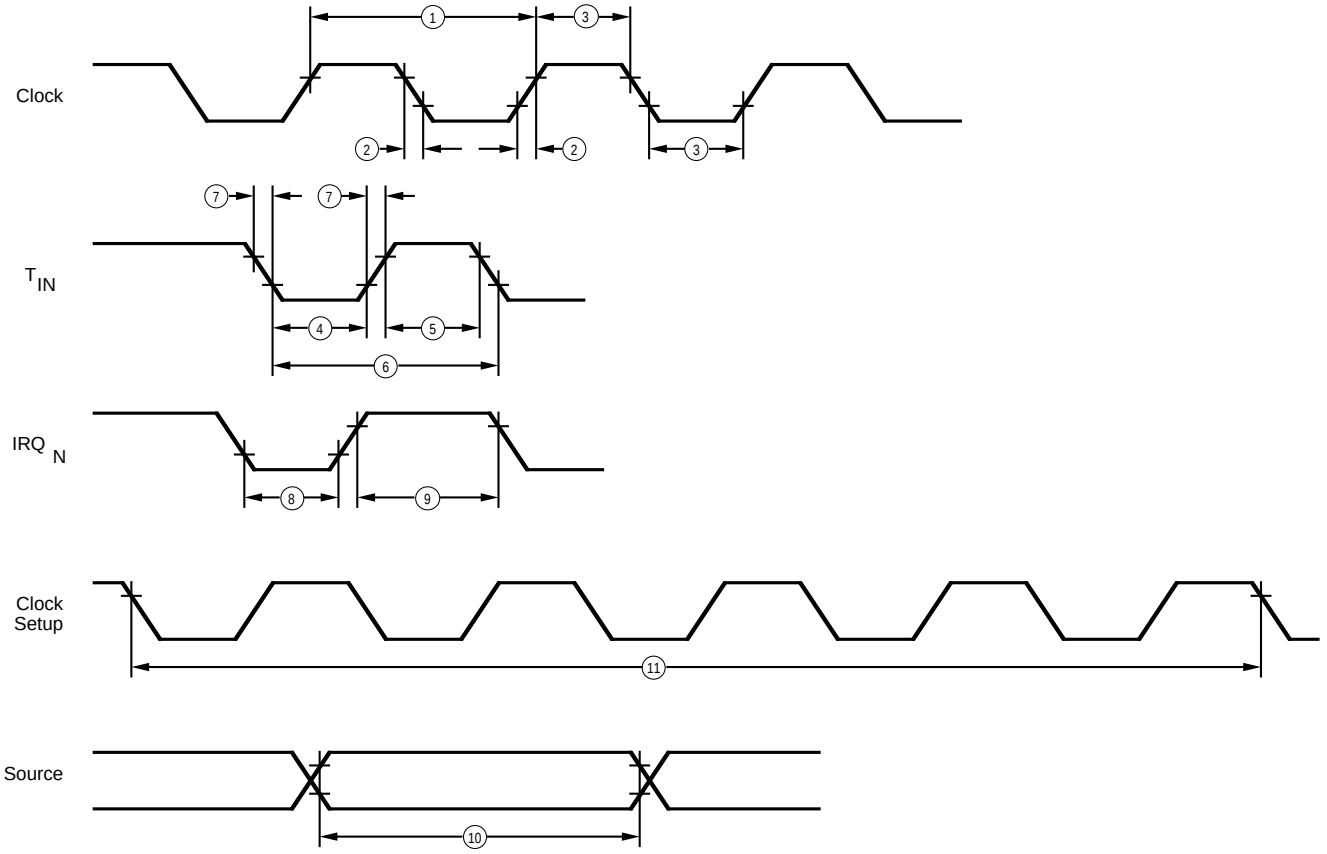

Figure 5. Additional Timing

AC ELECTRICAL CHARACTERISTICS

No	Symbol	Parameter	V_{CC} Note[3]	T_A = 0°C To +70°C 8 MHz Min	8 MHz Max	12 MHz Min	12 MHz Max	T_A = -40°C To +105°C 8 MHz Min	8 MHz Max	12 MHz Min	12 MHz Max	Units	Notes
1	TpC	Input Clock Period	3.3V	125	DC	83	DC	125	DC	83	DC	ns	[1]
			5.0V	125	DC	83	DC	125	DC	83	DC	ns	[1]
2	TiC,TfC	Clock Input Rise and Fall Times	3.3V		25		15		25		15	ns	[1]
			5.0V		25		15		25		15	ns	[1]
3	TwC	Input Clock Width	3.3V	37		26		37		26		ns	[1]
			5.0V	37		26		37		26		ns	[1]
4	TwTinL	Timer Input Low Width	3.3V	100		100		100		100		ns	[1]
			5.0V	70		70		70		70		ns	[1]
5	TwTinH	Timer Input High Width	3.3V	5TpC		5TpC		5TpC		5TpC			[1][7]
			5.0V	5TpC		5TpC		5TpC		5TpC			[1][7]

AC ELECTRICAL CHARACTERISTICS (Continued)

No	Symbol	Parameter	V_{CC} Note[3]	T_A = 0°C To +70°C				T_A = -40°C To +105°C				Units	Notes
				8MHz		12MHz		8MHz		12MHz			
				Min	Max	Min	Max	Min	Max	Min	Max		
6	TpTin	Timer Input Period	3.3V	8TpC		8TpC		8TpC		8TpC			[1][7]
			5.0V	8TpC		8TpC		8TpC		8TpC			[1][7]
7	TrTin, TfTin	Timer Input Rise and Fall Timer	3.3V		100		100		100		100	ns	[1]
			5.0V		100		100		100		100	ns	[1]
8	TwIL	Int. Request Input Low Time	3.3V	100		100		100		100		ns	[1,2]
			5.0V	70		70		70		70		ns	[1,2]
9	TwIH	Int. Request Input High Time	3.3V	5TpC		5TpC		5TpC		5TpC			[1,2][7]
			5.0V	5TpC		5TpC		5TpC		5TpC			[1,2][7]
10	Twsm	STOP Mode Recovery Width Spec	3.3V	12		12		12		12		ns	
			5.0V	12		12		12		12		ns	
11	Tost	Oscillator Startup Time	3.3V		5TpC		5TpC		5TpC		5TpC		Reg. [4]
			5.0V		5TpC		5TpC		5TpC		5TpC	ns	
12	Twdt	Watchdog Timer Refresh Time	3.3V	15		15		12		12			[5]
			5.0V	5		5		3		3		ms	D0=0 [6] D1=0 [6]
			3.3V	30		30		25		25		ms	D0=1 [6]
			5.0V	16		16		12		12		ms	D1=0 [6]
			3.3V	60		60		50		50		ms	D0=0 [6]
			5.0V	30		30		25		25		ms	D1=1 [6]
			3.3V	250		250		200		200		ms	D0=1 [6]
			5.0V	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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