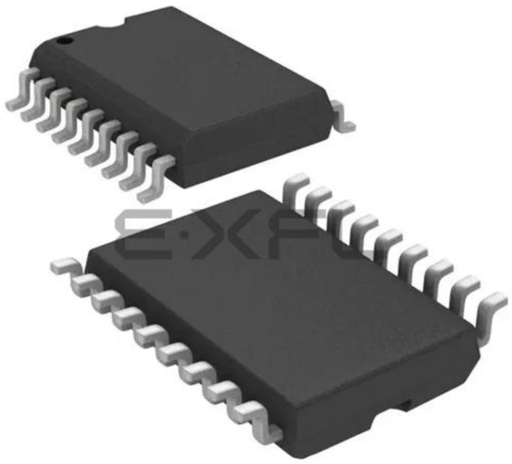


Welcome to E-XFL.COM

What is "Embedded - Microcontrollers"?

"Embedded - Microcontrollers" refer to small, integrated circuits designed to perform specific tasks within larger systems. These microcontrollers are essentially compact computers on a single chip, containing a processor core, memory, and programmable input/output peripherals. They are called "embedded" because they are embedded within electronic devices to control various functions, rather than serving as standalone computers. Microcontrollers are crucial in modern electronics, providing the intelligence and control needed for a wide range of applications.

Applications of "Embedded - Microcontrollers"

Details	
Product Status	Active
Core Processor	PIC
Core Size	8-Bit
Speed	20MHz
Connectivity	-
Peripherals	Brown-out Detect/Reset, POR, WDT
Number of I/O	13
Program Memory Size	3.5KB (2K x 14)
Program Memory Type	OTP
EEPROM Size	128 x 8
RAM Size	128 x 8
Voltage - Supply (Vcc/Vdd)	3V ~ 5.5V
Data Converters	-
Oscillator Type	External
Operating Temperature	0°C ~ 70°C (TA)
Mounting Type	Surface Mount
Package / Case	18-SOIC (0.295", 7.50mm Width)
Supplier Device Package	18-SOIC
Purchase URL	https://www.e-xfl.com/product-detail/microchip-technology/pic16ce625-20-so

1.0 GENERAL DESCRIPTION

The PIC16CE62X are 18 and 20-Pin EPROM-based members of the versatile PIC® family of low-cost, high-performance, CMOS, fully-static, 8-bit microcontrollers with EEPROM data memory.

All PIC® microcontrollers employ an advanced RISC architecture. The PIC16CE62X family has enhanced core features, eight-level deep stack, and multiple internal and external interrupt sources. The separate instruction and data buses of the Harvard architecture allow a 14-bit wide instruction word with separate 8-bit wide data. The two-stage instruction pipeline allows all instructions to execute in a single-cycle, except for program branches (which require two cycles). A total of 35 instructions (reduced instruction set) are available. Additionally, a large register set gives some of the architectural innovations used to achieve a very high performance.

PIC16CE62X microcontrollers typically achieve a 2:1 code compression and a 4:1 speed improvement over other 8-bit microcontrollers in their class.

The PIC16CE623 and PIC16CE624 have 96 bytes of RAM. The PIC16CE625 has 128 bytes of RAM. Each microcontroller contains a 128x8 EEPROM memory array for storing non-volatile information, such as calibration data or security codes. This memory has an endurance of 1,000,000 erase/write cycles and a retention of 40 plus years.

Each device has 13 I/O pins and an 8-bit timer/counter with an 8-bit programmable prescaler. In addition, the PIC16CE62X adds two analog comparators with a programmable on-chip voltage reference module. The comparator module is ideally suited for applications requiring a low-cost analog interface (e.g., battery chargers, threshold detectors, white goods controllers, etc).

PIC16CE62X devices have special features to reduce external components, thus reducing system cost, enhancing system reliability and reducing power consumption. There are four oscillator options, of which the single pin RC oscillator provides a low-cost solution, the LP oscillator minimizes power consumption, XT is a standard crystal, and the HS is for High Speed crystals. The SLEEP (power-down) mode offers power savings. The user can wake-up the chip from SLEEP through several external and internal interrupts and reset.

A highly reliable Watchdog Timer with its own on-chip RC oscillator provides protection against software lock- up.

A UV-erasable CERDIP-packaged version is ideal for code development, while the cost-effective One-Time Programmable (OTP) version is suitable for production in any volume.

Table 1-1 shows the features of the PIC16CE62X mid-range microcontroller families.

A simplified block diagram of the PIC16CE62X is shown in Figure 3-1.

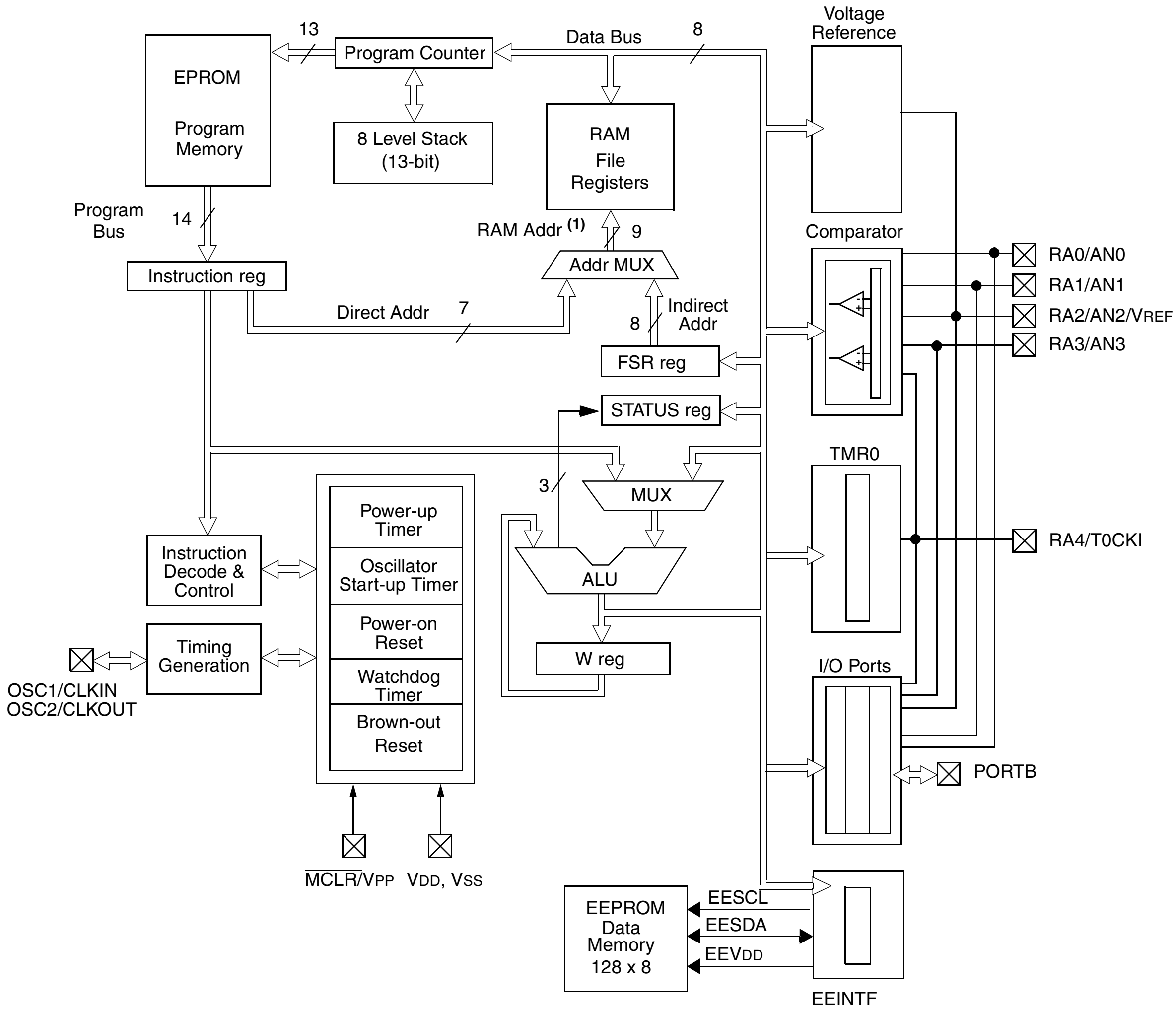
The PIC16CE62X series fits perfectly in applications ranging from multi-pocket battery chargers to low-power remote sensors. The EPROM technology makes customization of application programs (detection levels, pulse generation, timers, etc.) extremely fast and convenient. The small footprint packages make this microcontroller series perfect for all applications with space limitations. Low-cost, low-power, high-performance, ease of use and I/O flexibility make the PIC16CE62X very versatile.

1.1 Development Support

The PIC16CE62X family is supported by a full-featured macro assembler, a software simulator, an in-circuit emulator, a low-cost development programmer and a full-featured programmer. A “C” compiler is also available.

FIGURE 3-1: BLOCK DIAGRAM

Device	Program Memory	Data Memory (RAM)	EEPROM DATA MEMORY
PIC16CE623	512 x 14	96 x 8	128 x 8
PIC16CE624	1K x 14	96 x 8	128 x 8
PIC16CE625	2K x 14	128 x 8	128 x 8



Note 1: Higher order bits are from the STATUS register.

FIGURE 5-3: BLOCK DIAGRAM OF RA3 PIN

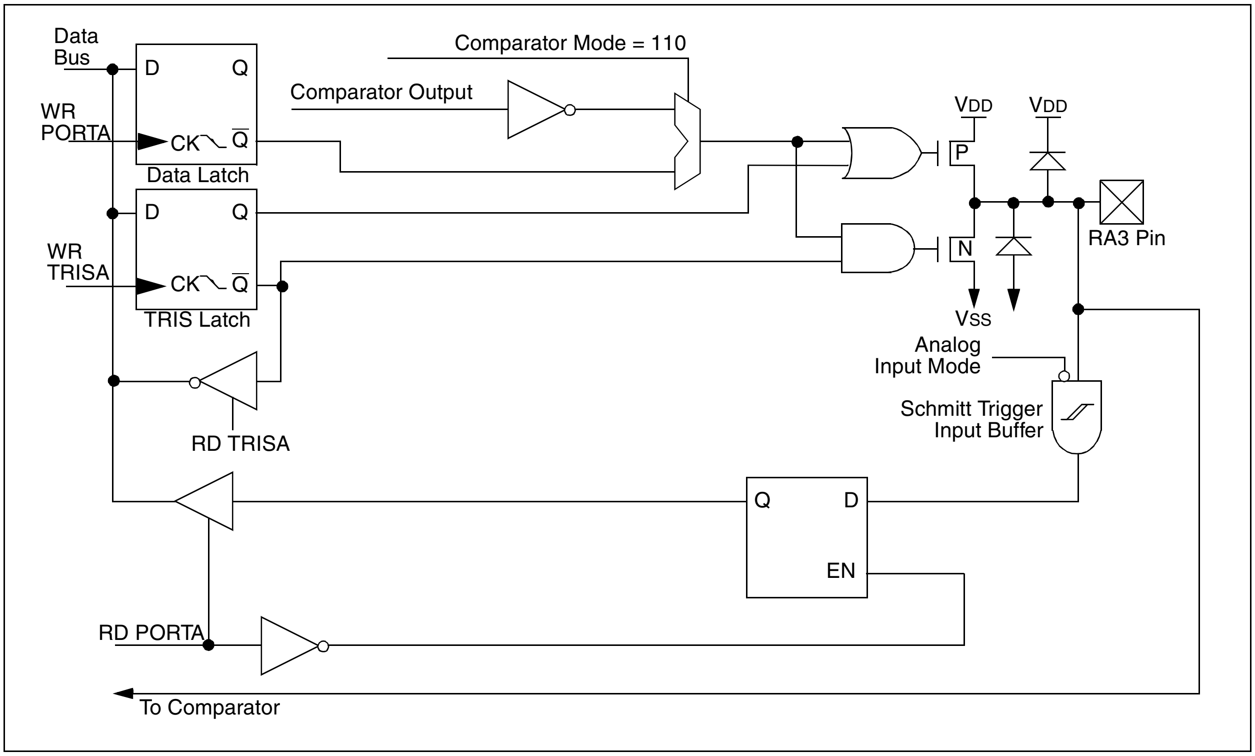


FIGURE 5-4: BLOCK DIAGRAM OF RA4 PIN

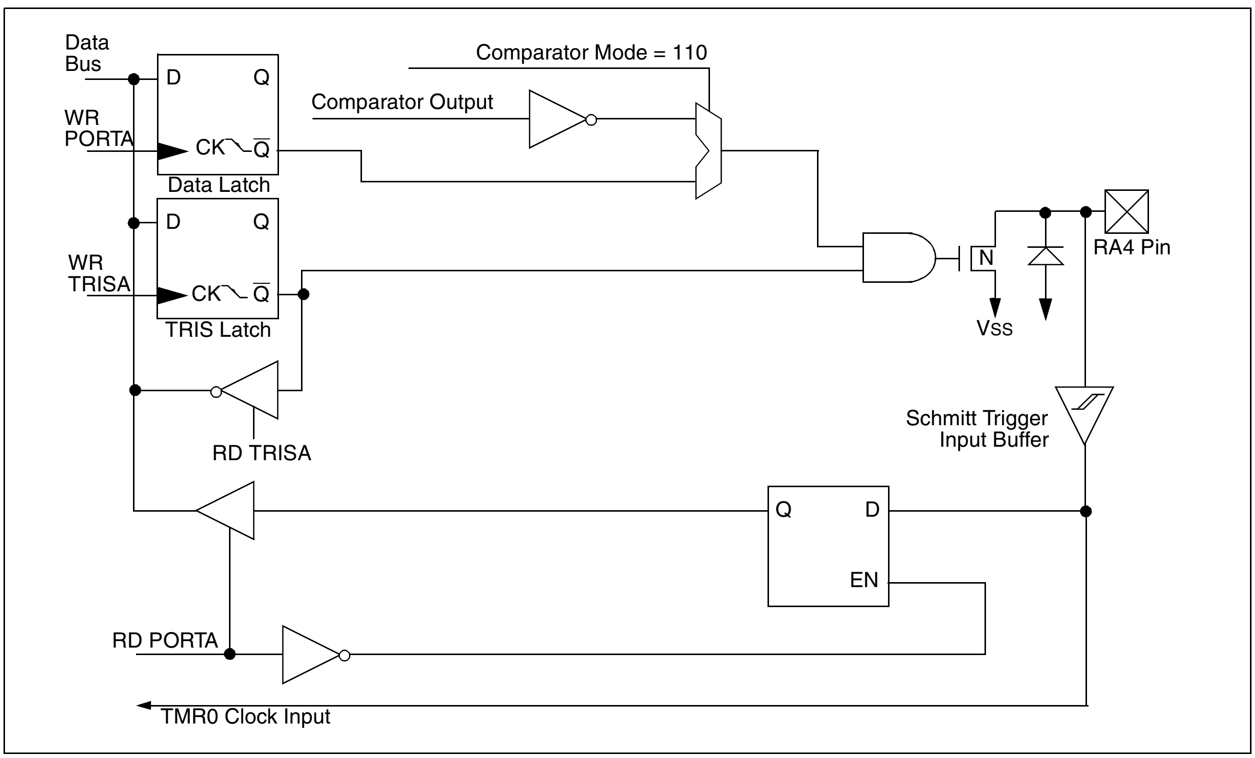


FIGURE 6-7: CURRENT ADDRESS READ

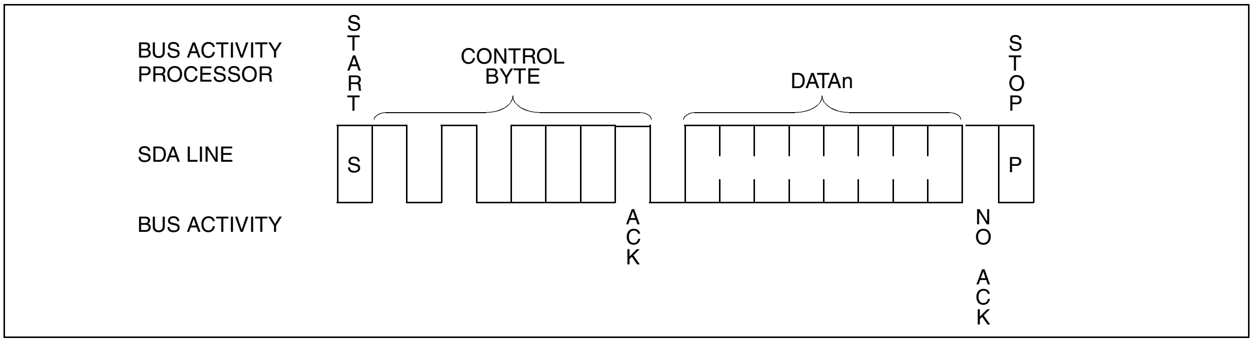


FIGURE 6-8: RANDOM READ

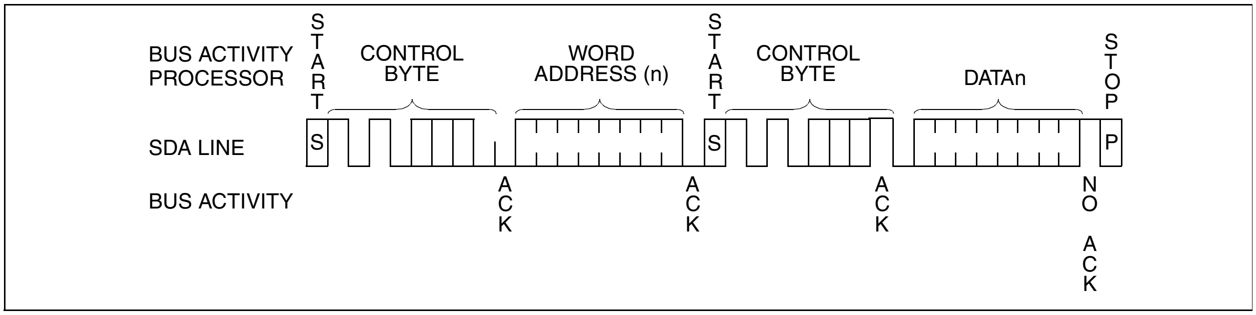


FIGURE 6-9: SEQUENTIAL READ

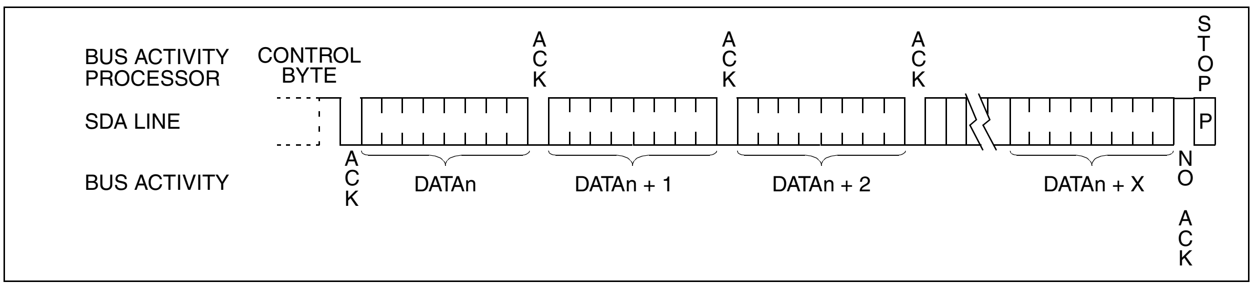


FIGURE 7-3: TIMER0 TIMING: INTERNAL CLOCK/PRESCALE 1:2

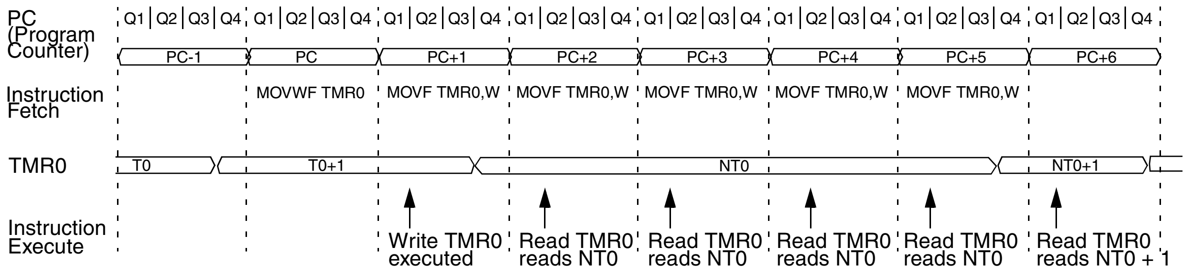
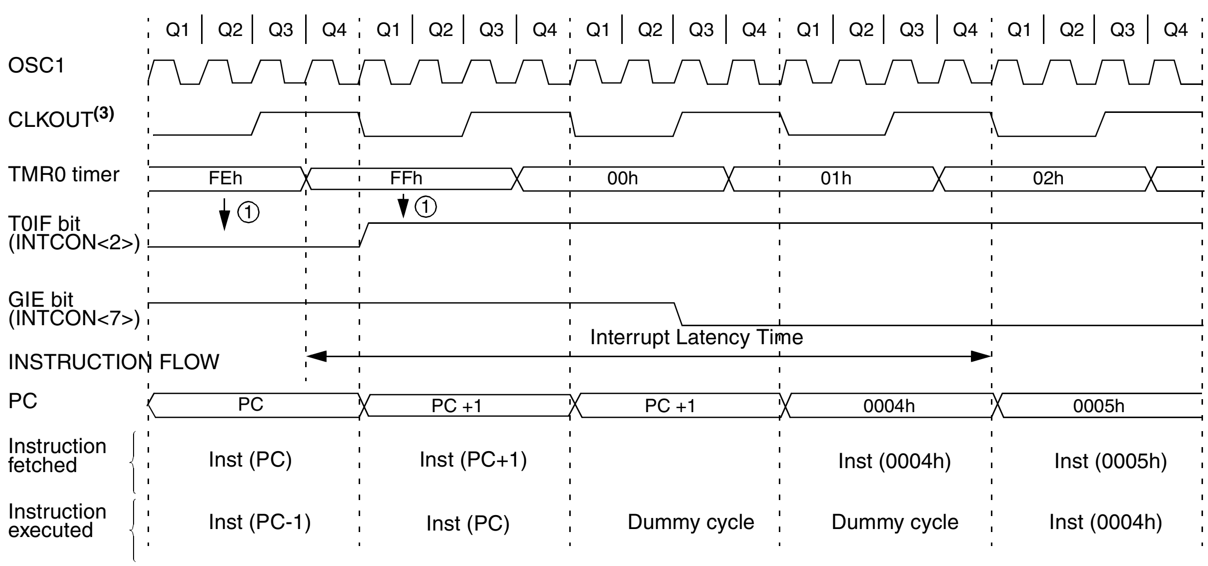


FIGURE 7-4: TIMER0 INTERRUPT TIMING



Note 1: T0IF interrupt flag is sampled here (every Q1).
2: Interrupt latency = 3TCY, where TCY = instruction cycle time.
3: CLKOUT is available only in RC oscillator mode.

8.1 Comparator Configuration

There are eight modes of operation for the comparators. The CMCON register is used to select the mode. Figure 8-1 shows the eight possible modes. The TRISA register controls the data direction of the comparator pins for each mode. If the comparator mode is changed, the comparator output level may not be valid for the specified mode change delay shown in Table 13-1.

Note:	Comparator interrupts should be disabled during a comparator mode change, otherwise a false interrupt may occur.

FIGURE 8-1: COMPARATOR I/O OPERATING MODES

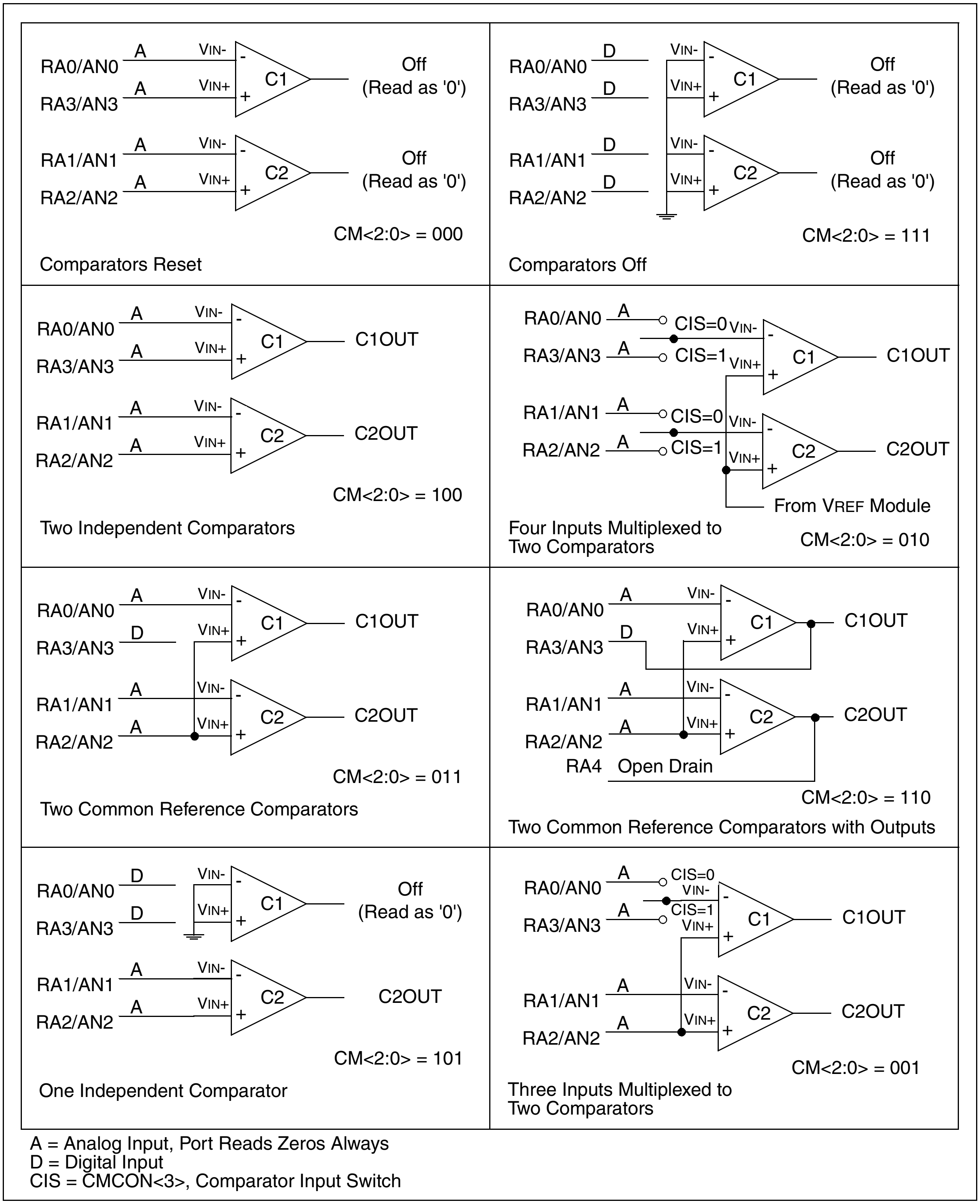


TABLE 8-1: REGISTERS ASSOCIATED WITH COMPARATOR MODULE

Address	Name	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	Value on: POR	Value on All Other Resets
1Fh	CMCON	C2OUT	C1OUT	—	—	CIS	CM2	CM1	CM0	`00-- 0000`	`00-- 0000`
9Fh	VRCON	VREN	VROE	VRR	—	VR3	VR2	VR1	VR0	`000- 0000`	`000- 0000`
0Bh	INTCON	GIE	PEIE	T0IE	INTE	RBIE	T0IF	INTF	RBIF	`0000 000x`	`0000 000u`
0Ch	PIR1	—	CMIF	—	—	—	—	—	—	`-0-- ----`	`-0-- ----`
8Ch	PIE1	—	CMIE	—	—	—	—	—	—	`-0-- ----`	`-0-- ----`
85h	TRISA	—	—	—	TRISA4	TRISA3	TRISA2	TRISA1	TRISA0	`---1 1111`	`---1 1111`

Legend: - = Unimplemented, read as "0", `x` = Unknown, `u` = unchanged

10.2.3 EXTERNAL CRYSTAL OSCILLATOR CIRCUIT

Either a prepackaged oscillator can be used or a simple oscillator circuit with TTL gates can be built. Prepackaged oscillators provide a wide operating range and better stability. A well-designed crystal oscillator will provide good performance with TTL gates. Two types of crystal oscillator circuits can be used; one with series resonance or one with parallel resonance.

Figure 10-3 shows implementation of a parallel resonant oscillator circuit. The circuit is designed to use the fundamental frequency of the crystal. The 74AS04 inverter performs the 180° phase shift that a parallel oscillator requires. The 4.7 kΩ resistor provides the negative feedback for stability. The 10 kΩ potentiometers bias the 74AS04 in the linear region. This could be used for external oscillator designs.

FIGURE 10-3: EXTERNAL PARALLEL RESONANT CRYSTAL OSCILLATOR CIRCUIT

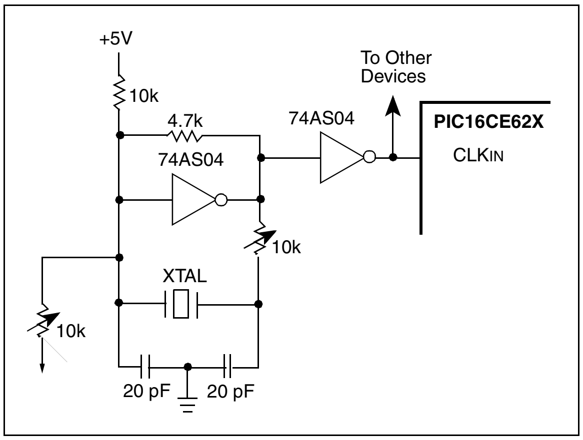
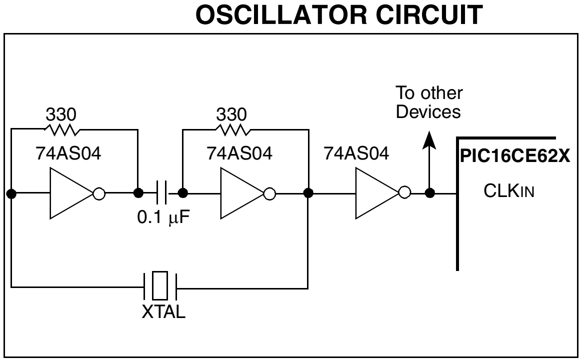


Figure 10-4 shows a series resonant oscillator circuit. This circuit is also designed to use the fundamental frequency of the crystal. The inverter performs a 180° phase shift in a series resonant oscillator circuit. The 330 kΩ resistors provide the negative feedback to bias the inverters in their linear region.

FIGURE 10-4: EXTERNAL SERIES RESONANT CRYSTAL OSCILLATOR CIRCUIT



10.2.4 RC OSCILLATOR

For timing insensitive applications the “RC” device option offers additional cost savings. The RC oscillator frequency is a function of the supply voltage, the resistor (Rext) and capacitor (Cext) values, and the operating temperature. In addition to this, the oscillator frequency will vary from unit to unit due to normal process parameter variation. Furthermore, the difference in lead frame capacitance between package types will also affect the oscillation frequency, especially for low Cext values. The user also needs to take into account variation due to tolerance of external R and C components used. Figure 10-5 shows how the R/C combination is connected to the PIC16CE62X. For Rext values below 2.2 kΩ, the oscillator operation may become unstable, or stop completely. For very high Rext values (i.e., 1 MΩ), the oscillator becomes sensitive to noise, humidity and leakage. Thus, we recommend to keep Rext between 3 kΩ and 100 kΩ.

Although the oscillator will operate with no external capacitor (Cext = 0 pF), we recommend using values above 20 pF for noise and stability reasons. With no or small external capacitance, the oscillation frequency can vary dramatically due to changes in external capacitances, such as PCB trace capacitance or package lead frame capacitance.

See Section 14.0 for RC frequency variation from part to part due to normal process variation. The variation is larger for larger R (since leakage current variation will affect RC frequency more for large R) and for smaller C (since variation of input capacitance will affect RC frequency more).

See Section 14.0 for variation of oscillator frequency due to VDD for given Rext/Cext values, as well as frequency variation due to operating temperature for given R, C, and VDD values.

The oscillator frequency, divided by 4, is available on the OSC2/CLKOUT pin and can be used for test purposes or to synchronize other logic (Figure 3-2 for waveform).

FIGURE 10-5: RC OSCILLATOR MODE

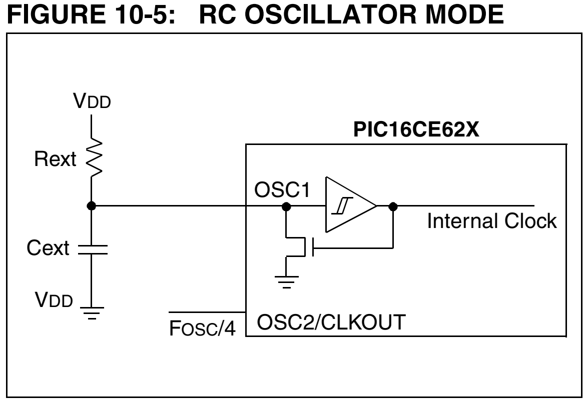


FIGURE 10-8: TIME-OUT SEQUENCE ON POWER-UP ($\overline{MCLR}$ NOT TIED TO V_{DD}): CASE 1

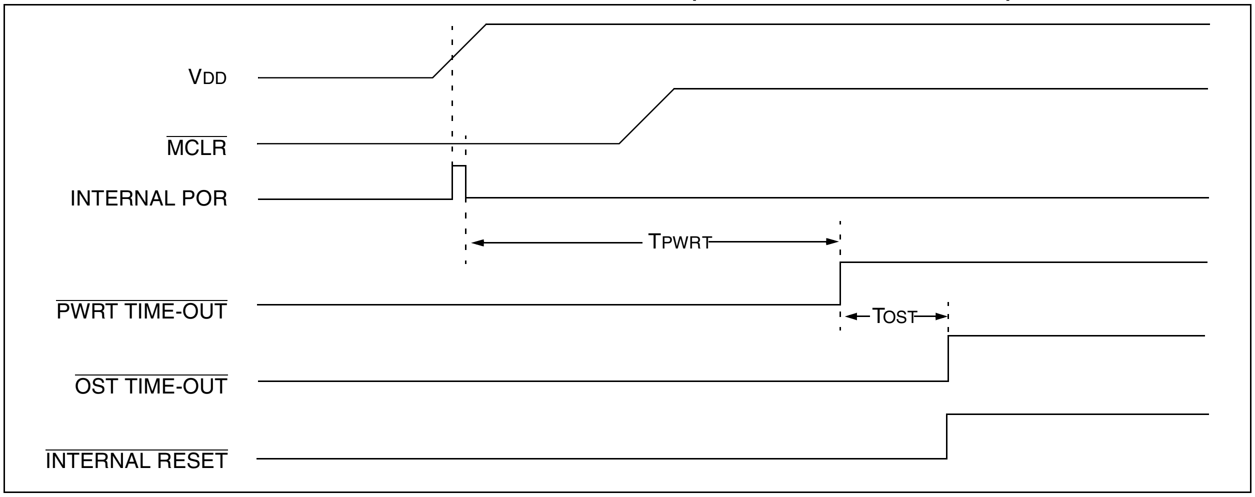


FIGURE 10-9: TIME-OUT SEQUENCE ON POWER-UP ($\overline{MCLR}$ NOT TIED TO V_{DD}): CASE 2

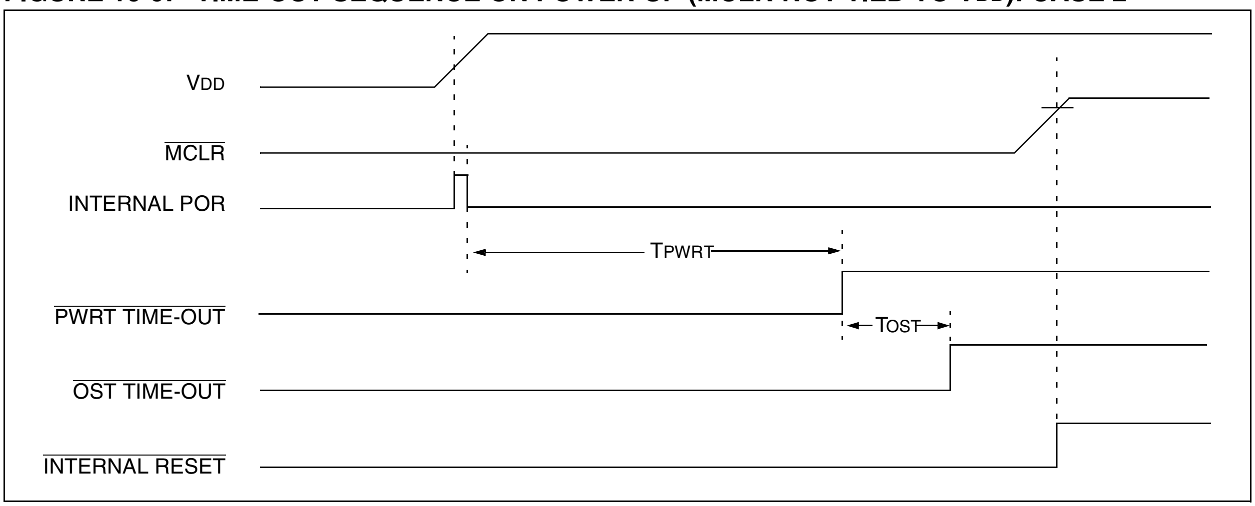
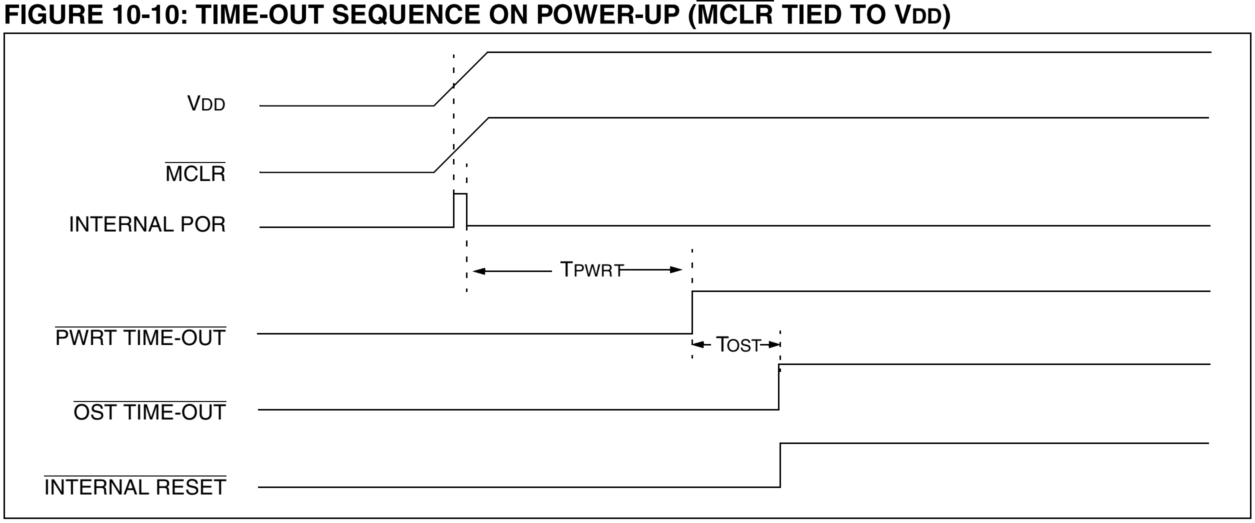


FIGURE 10-10: TIME-OUT SEQUENCE ON POWER-UP ($\overline{MCLR}$ TIED TO V_{DD})



10.5.1 RB0/INT INTERRUPT

External interrupt on RB0/INT pin is edge triggered; either rising if INTEDG bit (OPTION<6>) is set, or falling, if INTEDG bit is clear. When a valid edge appears on the RB0/INT pin, the INTF bit (INTCON<1>) is set. This interrupt can be disabled by clearing the INTE control bit (INTCON<4>). The INTF bit must be cleared in software in the interrupt service routine before re-enabling this interrupt. The RB0/INT interrupt can wake-up the processor from SLEEP, if the INTE bit was set prior to going into SLEEP. The status of the GIE bit decides whether or not the processor branches to the interrupt vector following wake-up. See Section 10.8 for details on SLEEP and Figure 10-19 for timing of wake-up from SLEEP through RB0/INT interrupt.

10.5.2 TMR0 INTERRUPT

An overflow (FFh $\rightarrow$ 00h) in the TMR0 register will set the T0IF (INTCON<2>) bit. The interrupt can be enabled/disabled by setting/clearing T0IE (INTCON<5>) bit. For operation of the Timer0 module, see Section 7.0.

10.5.3 PORTB INTERRUPT

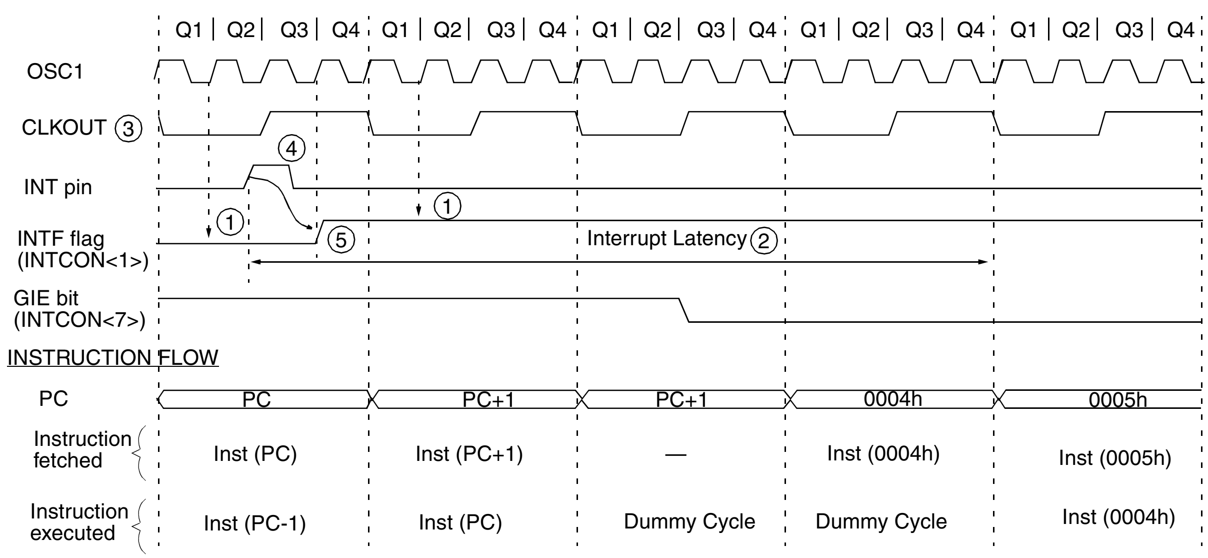
An input change on PORTB <7:4> sets the RBIF (INTCON<0>) bit. The interrupt can be enabled/disabled by setting/clearing the RBIE (INTCON<4>) bit. For operation of PORTB (Section 5.2).

Note:	If a change on the I/O pin should occur when the read operation is being executed (start of the Q2 cycle), then the RBIF interrupt flag may not get set.

10.5.4 COMPARATOR INTERRUPT

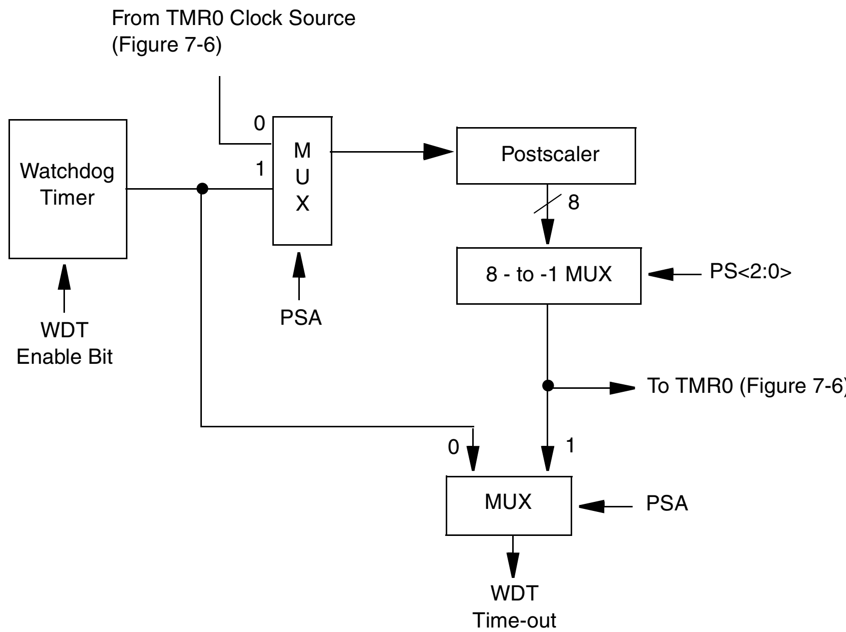
See Section 8.6 for complete description of comparator interrupts.

FIGURE 10-16: INT PIN INTERRUPT TIMING



Note **1:** INTF flag is sampled here (every Q1).
2: Interrupt latency = 3-4 Tcy where TCY = instruction cycle time.
Latency is the same whether Inst (PC) is a single cycle or a 2-cycle instruction.
3: CLKOUT is available only in RC oscillator mode.
4: For minimum width of INT pulse, refer to AC specs.
5: INTF is enabled to be set anytime during the Q4-Q1 cycles.

FIGURE 10-17: WATCHDOG TIMER BLOCK DIAGRAM



Note: T0SE, T0CS, PSA, PS<2:0> are bits in the OPTION register.

FIGURE 10-18: SUMMARY OF WATCHDOG TIMER REGISTERS

Address	Name	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
2007h	Config. bits	—	BOREN	CP1	CP0	$\overline{\text{PWRTE}}$	WDTE	FOSC1	FOSC0
81h	OPTION	$\overline{\text{RBPU}}$	INTEDG	T0CS	T0SE	PSA	PS2	PS1	PS0

Legend: – = Unimplemented location, read as “0”, + = Reserved for future use

Note: Shaded cells are not used by the Watchdog Timer.

IORWF	Inclusive OR W with f
Syntax:	[*label*] IORWF f,d
Operands:	$0 \leq f \leq 127$ $d \in [0,1]$
Operation:	(W) .OR. (f) $\rightarrow$ (dest)
Status Affected:	Z
Encoding:	`00` `0100` `dfff` `ffff`
Description:	Inclusive OR the W register with register 'f'. If 'd' is 0, the result is placed in the W register. If 'd' is 1, the result is placed back in register 'f'.
Words:	1
Cycles:	1
Example	`IORWF RESULT, 0` Before Instruction RESULT = 0x13 W = 0x91 After Instruction RESULT = 0x13 W = 0x93 Z = 1

MOVF	Move f
Syntax:	[*label*] MOVF f,d
Operands:	$0 \leq f \leq 127$ $d \in [0,1]$
Operation:	(f) $\rightarrow$ (dest)
Status Affected:	Z
Encoding:	`00` `1000` `dfff` `ffff`
Description:	The contents of register f are moved to a destination dependant upon the status of d. If d = 0, destination is W register. If d = 1, the destination is file register f itself. d = 1 is useful to test a file register since status flag Z is affected.
Words:	1
Cycles:	1
Example	`MOVF FSR, 0` After Instruction W = value in FSR register Z = 1

MOVLW	Move Literal to W
Syntax:	[*label*] MOVLW k
Operands:	$0 \leq k \leq 255$
Operation:	k $\rightarrow$ (W)
Status Affected:	None
Encoding:	`11` `00xx` `kkkk` `kkkk`
Description:	The eight bit literal 'k' is loaded into W register. The don't cares will assemble as 0's.
Words:	1
Cycles:	1
Example	`MOVLW 0x5A` After Instruction W = 0x5A

MOVWF	Move W to f
Syntax:	[*label*] MOVWF f
Operands:	$0 \leq f \leq 127$
Operation:	(W) $\rightarrow$ (f)
Status Affected:	None
Encoding:	`00` `0000` `1fff` `ffff`
Description:	Move data from W register to register 'f'.
Words:	1
Cycles:	1
Example	`MOVWF OPTION` Before Instruction OPTION = 0xFF W = 0x4F After Instruction OPTION = 0x4F W = 0x4F

SWAPF **Swap Nibbles in f**

Syntax: [*label*] SWAPF f,d

Operands: $0 \leq f \leq 127$
$d \in [0,1]$

Operation: (f<3:0>) → (dest<7:4>),
(f<7:4>) → (dest<3:0>)

Status Affected: None

Encoding:

`00`	`1110`	`dfff`	`ffff`

Description: The upper and lower nibbles of register 'f' are exchanged. If 'd' is 0, the result is placed in W register. If 'd' is 1, the result is placed in register 'f'.

Words: 1

Cycles: 1

Example `SWAPF REG, 0`

Before Instruction

REG1 = 0xA5

After Instruction

REG1 = 0xA5
W = 0x5A

TRIS **Load TRIS Register**

Syntax: [*label*] TRIS f

Operands: $5 \leq f \leq 7$

Operation: (W) → TRIS register f;

Status Affected: None

Encoding:

`00`	`0000`	`0110`	`0fff`

Description: The instruction is supported for code compatibility with the PIC16C5X products. Since TRIS registers are readable and writable, the user can directly address them.

Words: 1

Cycles: 1

Example

To maintain upward compatibility with future PIC® MCU products, do not use this instruction.

XORLW **Exclusive OR Literal with W**

Syntax: [*label*] XORLW k

Operands: $0 \leq k \leq 255$

Operation: (W) .XOR. k → (W)

Status Affected: Z

Encoding:

`11`	`1010`	`kkkk`	`kkkk`

Description: The contents of the W register are XOR'ed with the eight bit literal 'k'. The result is placed in the W register.

Words: 1

Cycles: 1

Example: `XORLW 0xAF`

Before Instruction

W = 0xB5

After Instruction

W = 0x1A

XORWF **Exclusive OR W with f**

Syntax: [*label*] XORWF f,d

Operands: $0 \leq f \leq 127$
$d \in [0,1]$

Operation: (W) .XOR. (f) → (dest)

Status Affected: Z

Encoding:

`00`	`0110`	`dfff`	`ffff`

Description: Exclusive OR the contents of the W register with register 'f'. If 'd' is 0, the result is stored in the W register. If 'd' is 1, the result is stored back in register 'f'.

Words: 1

Cycles: 1

Example `XORWF REG 1`

Before Instruction

REG = 0xAF
W = 0xB5

After Instruction

REG = 0x1A
W = 0xB5

13.2 DC CHARACTERISTICS: PIC16LCE62X-04 (Commercial, Industrial)

DC CHARACTERISTICS			**Standard Operating Conditions (unless otherwise stated)** Operating temperature –40°C ≤ T_A ≤ +85°C for industrial and 0°C ≤ T_A ≤ +70°C for commercial and –40°C ≤ T_A ≤ +125°C for extended				
Param No.	**Sym**	**Characteristic**	**Min**	**Typ†**	**Max**	**Units**	**Conditions**
D001	V_{DD}	Supply Voltage	2.5	–	5.5	V	See Figure 13-1 through Figure 13-3
D002	V_{DR}	RAM Data Retention Voltage (Note 1)	–	1.5*	–	V	Device in SLEEP mode
D003	V_{POR}	V_{DD} start voltage to ensure Power-on Reset	–	V_{SS}	–	V	See section on power-on reset for details
D004	S_{VDD}	V_{DD} rise rate to ensure Power-on Reset	.05*	–	–	V/ms	See section on power-on reset for details
D005	V_{BOR}	Brown-out Detect Voltage	3.7	4.0	4.35	V	BOREN configuration bit is cleared
D010	I_{DD}	Supply Current (Note 2)	– – –	1.2 – 35	2.0 1.1 70	mA mA μA	F_{OSC} = 4 MHz, V_{DD} = 5.5V, WDT disabled, XT osc mode, (Note 4)* F_{OSC} = 4 MHz, V_{DD} = 2.5V, WDT disabled, XT osc mode, (Note 4) F_{OSC} = 32 kHz, V_{DD} = 2.5V, WDT disabled, LP osc mode
D020	I_{PD}	Power Down Current (Note 3)	– – – –	– – – –	2.0 2.2 9.0 15	μA μA μA μA	V_{DD} = 2.5V V_{DD} = 3.0V* V_{DD} = 5.5V V_{DD} = 5.5V Extended
D022	ΔI_{WDT}	WDT Current (Note 5)	–	6.0	10 12	μA μA	V_{DD}=4.0V (125°C)
D022A	ΔI_{BOR}	Brown-out Reset Current (Note 5)	–	75	125	μA	$\overline{BOD}$ enabled, V_{DD} = 5.0V
D023	ΔI_{COMP}	Comparator Current for each Comparator (Note 5)	–	30	60	μA	V_{DD} = 4.0V
D023A	ΔI_{VREF}	V_{REF} Current (Note 5)	–	80	135	μA	V_{DD} = 4.0V
	ΔI_{EE} Write	Operating Current	–		3	mA	V_{CC} = 5.5V, SCL = 400 kHz
	ΔI_{EE} Read	Operating Current	–		1	mA	
	ΔI_{EE}	Standby Current	–		30	μA	V_{CC} = 3.0V, EE V_{DD} = V_{CC}
	ΔI_{EE}	Standby Current	–		100	μA	V_{CC} = 3.0V, EE V_{DD} = V_{CC}
1A	F_{OSC}	LP Oscillator Operating Frequency RC Oscillator Operating Frequency XT Oscillator Operating Frequency HS Oscillator Operating Frequency	0 0 0 0	— — — —	200 4 4 20	kHz MHz MHz MHz	All temperatures All temperatures All temperatures All temperatures

* These parameters are characterized but not tested.

† Data in "Typ" column is at 5.0V, 25°C, unless otherwise stated. These parameters are for design guidance only and are not tested.

Note 1: This is the limit to which V_{DD} can be lowered in SLEEP mode without losing RAM data.

2: The supply current is mainly a function of the operating voltage and frequency. Other factors such as I/O pin loading and switching rate, oscillator type, internal code execution pattern, and temperature also have an impact on the current consumption.
The test conditions for all I_{DD} measurements in active operation mode are:
OSC1 = external square wave, from rail to rail; all I/O pins tri-stated, pulled to V_{DD},
$\overline{MCLR}$ = V_{DD}; WDT enabled/disabled as specified.

3: The power down current in SLEEP mode does not depend on the oscillator type. Power down current is measured with the part in SLEEP mode, with all I/O pins in hi-impedance state and tied to V_{DD} or V_{SS}.

4: For RC osc configuration, current through Rext is not included. The current through the resistor can be estimated by the formula Ir = V_{DD}/2Rext (mA) with Rext in kΩ.

5: The Δ current is the additional current consumed when this peripheral is enabled. This current should be added to the base I_{DD} or I_{PD} measurement.

6: Commercial temperature range only.

13.5 Timing Diagrams and Specifications

FIGURE 13-5: EXTERNAL CLOCK TIMING

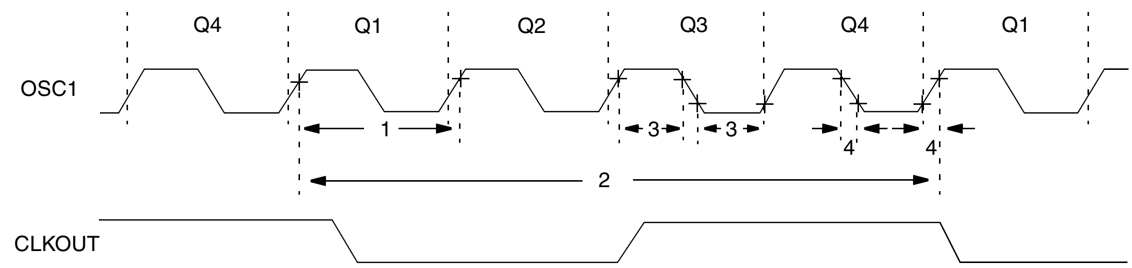


TABLE 13-3: EXTERNAL CLOCK TIMING REQUIREMENTS

Parameter No.	Sym	Characteristic	Min	Typ†	Max	Units	Conditions
1A	Fosc	**External CLKIN Frequency (Note 1)**	DC	—	4	MHz	XT and RC osc mode, VDD=5.0V
			DC	—	20	MHz	HS osc mode
			DC	—	200	kHz	LP osc mode
		Oscillator Frequency (Note 1)	DC	—	4	MHz	RC osc mode, VDD=5.0V
			0.1	—	4	MHz	XT osc mode
			1	—	20	MHz	HS osc mode
			DC	–	200	kHz	LP osc mode
1	Tosc	**External CLKIN Period (Note 1)**	250	—	—	ns	XT and RC osc mode
			50	—	—	ns	HS osc mode
			5	—	—	μs	LP osc mode
		Oscillator Period (Note 1)	250	—	—	ns	RC osc mode
			250	—	10,000	ns	XT osc mode
			50	—	1,000	ns	HS osc mode
			5	—	—	μs	LP osc mode
2	TCY	**Instruction Cycle Time (Note 1)**	200	—	DC	ns	TCY=FOSC/4
3*	TosL, TosH	External Clock in (OSC1) High or Low Time	100*	—	—	ns	XT oscillator, TOSC L/H duty cycle
			2*	—	—	μs	LP oscillator, TOSC L/H duty cycle
			20*	—	—	ns	HS oscillator, TOSC L/H duty cycle
4*	TosR, TosF	External Clock in (OSC1) Rise or Fall Time	25*	—	—	ns	XT oscillator
			50*	—	—	ns	LP oscillator
			15*	—	—	ns	HS oscillator

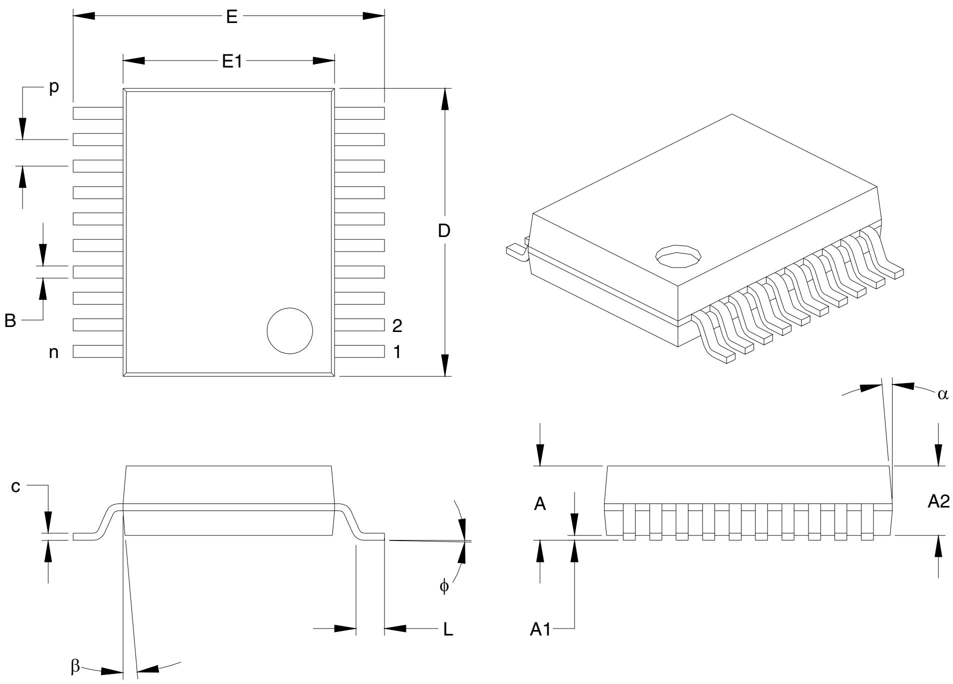
* These parameters are characterized but not tested.

† Data in "Typ" column is at 5.0V, 25°C unless otherwise stated. These parameters are for design guidance only and are not tested.

Note 1: Instruction cycle period (TCY) equals four times the input oscillator time-base period. All specified values are based on characterization data for that particular oscillator type under standard operating conditions with the device executing code. Exceeding these specified limits may result in an unstable oscillator operation and/or higher than expected current consumption. All devices are tested to operate at "min." values with an external clock applied to the OSC1 pin.
When an external clock input is used, the "Max." cycle time limit is "DC" (no clock) for all devices.

20-Lead Plastic Shrink Small Outline (SS) – 209 mil, 5.30 mm (SSOP)

Note: For the most current package drawings, please see the Microchip Packaging Specification located at http://www.microchip.com/packaging



Units		INCHES*			MILLIMETERS		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		20			20	
Pitch	p		.026			0.66	
Overall Height	A	.068	.073	.078	1.73	1.85	1.98
Molded Package Thickness	A2	.064	.068	.072	1.63	1.73	1.83
Standoff	A1	.002	.006	.010	0.05	0.15	0.25
Overall Width	E	.299	.309	.322	7.59	7.85	8.18
Molded Package Width	E1	.201	.207	.212	5.11	5.25	5.38
Overall Length	D	.278	.284	.289	7.06	7.20	7.34
Foot Length	L	.022	.030	.037	0.56	0.75	0.94
Lead Thickness	c	.004	.007	.010	0.10	0.18	0.25
Foot Angle	φ	0	4	8	0.00	101.60	203.20
Lead Width	B	.010	.013	.015	0.25	0.32	0.38
Mold Draft Angle Top	α	0	5	10	0	5	10
Mold Draft Angle Bottom	β	0	5	10	0	5	10

*Controlling Parameter

Notes:

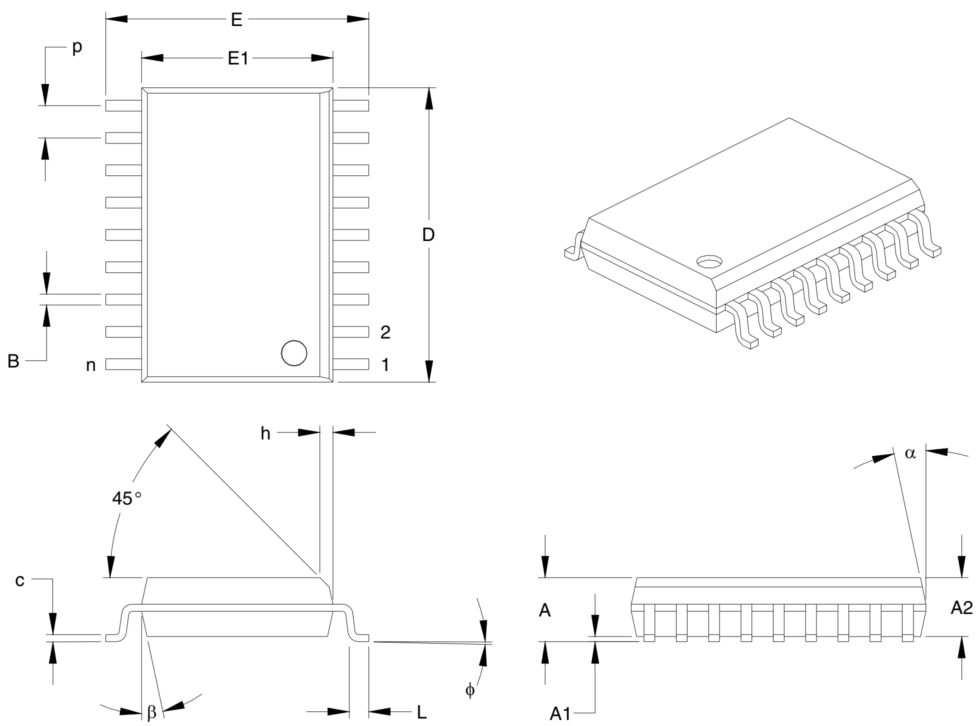
Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .010” (0.254mm) per side.

JEDEC Equivalent: MO-150

Drawing No. C04-072

18-Lead Plastic Small Outline (SO) – Wide, 300 mil (SOIC)

Note: For the most current package drawings, please see the Microchip Packaging Specification located at http://www.microchip.com/packaging



	Units	INCHES*			MILLIMETERS		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		18			18	
Pitch	p		.050			1.27	
Overall Height	A	.093	.099	.104	2.36	2.50	2.64
Molded Package Thickness	A2	.088	.091	.094	2.24	2.31	2.39
Standoff	A1	.004	.008	.012	0.10	0.20	0.30
Overall Width	E	.394	.407	.420	10.01	10.34	10.67
Molded Package Width	E1	.291	.295	.299	7.39	7.49	7.59
Overall Length	D	.446	.454	.462	11.33	11.53	11.73
Chamfer Distance	h	.010	.020	.029	0.25	0.50	0.74
Foot Length	L	.016	.033	.050	0.41	0.84	1.27
Foot Angle	φ	0	4	8	0	4	8
Lead Thickness	c	.009	.011	.012	0.23	0.27	0.30
Lead Width	B	.014	.017	.020	0.36	0.42	0.51
Mold Draft Angle Top	α	0	12	15	0	12	15
Mold Draft Angle Bottom	β	0	12	15	0	12	15

*Controlling Parameter

Notes:

Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .010” (0.254mm) per side.

JEDEC Equivalent: MS-013

Drawing No. C04-051

APPENDIX A: CODE FOR ACCESSING EEPROM DATA MEMORY

Please check our web site at www.microchip.com for code availability.

APPENDIX B:REVISION HISTORY

Revision D (January 2013)

Added a note to each package outline drawing.

NOTES:

Worldwide Sales and Service

AMERICAS

Corporate Office
2355 West Chandler Blvd.
Chandler, AZ 85224-6199
Tel: 480-792-7200
Fax: 480-792-7277
Technical Support:
http://www.microchip.com/support
Web Address:
www.microchip.com

Atlanta
Duluth, GA
Tel: 678-957-9614
Fax: 678-957-1455

Boston
Westborough, MA
Tel: 774-760-0087
Fax: 774-760-0088

Chicago
Itasca, IL
Tel: 630-285-0071
Fax: 630-285-0075

Cleveland
Independence, OH
Tel: 216-447-0464
Fax: 216-447-0643

Dallas
Addison, TX
Tel: 972-818-7423
Fax: 972-818-2924

Detroit
Farmington Hills, MI
Tel: 248-538-2250
Fax: 248-538-2260

Indianapolis
Noblesville, IN
Tel: 317-773-8323
Fax: 317-773-5453

Los Angeles
Mission Viejo, CA
Tel: 949-462-9523
Fax: 949-462-9608

Santa Clara
Santa Clara, CA
Tel: 408-961-6444
Fax: 408-961-6445

Toronto
Mississauga, Ontario, Canada
Tel: 905-673-0699
Fax: 905-673-6509

ASIA/PACIFIC

Asia Pacific Office
Suites 3707-14, 37th Floor
Tower 6, The Gateway
Harbour City, Kowloon
Hong Kong
Tel: 852-2401-1200
Fax: 852-2401-3431

Australia - Sydney
Tel: 61-2-9868-6733
Fax: 61-2-9868-6755

China - Beijing
Tel: 86-10-8569-7000
Fax: 86-10-8528-2104

China - Chengdu
Tel: 86-28-8665-5511
Fax: 86-28-8665-7889

China - Chongqing
Tel: 86-23-8980-9588
Fax: 86-23-8980-9500

China - Hangzhou
Tel: 86-571-2819-3187
Fax: 86-571-2819-3189

China - Hong Kong SAR
Tel: 852-2943-5100
Fax: 852-2401-3431

China - Nanjing
Tel: 86-25-8473-2460
Fax: 86-25-8473-2470

China - Qingdao
Tel: 86-532-8502-7355
Fax: 86-532-8502-7205

China - Shanghai
Tel: 86-21-5407-5533
Fax: 86-21-5407-5066

China - Shenyang
Tel: 86-24-2334-2829
Fax: 86-24-2334-2393

China - Shenzhen
Tel: 86-755-8864-2200
Fax: 86-755-8203-1760

China - Wuhan
Tel: 86-27-5980-5300
Fax: 86-27-5980-5118

China - Xian
Tel: 86-29-8833-7252
Fax: 86-29-8833-7256

China - Xiamen
Tel: 86-592-2388138
Fax: 86-592-2388130

China - Zhuhai
Tel: 86-756-3210040
Fax: 86-756-3210049

ASIA/PACIFIC

India - Bangalore
Tel: 91-80-3090-4444
Fax: 91-80-3090-4123

India - New Delhi
Tel: 91-11-4160-8631
Fax: 91-11-4160-8632

India - Pune
Tel: 91-20-2566-1512
Fax: 91-20-2566-1513

Japan - Osaka
Tel: 81-6-6152-7160
Fax: 81-6-6152-9310

Japan - Tokyo
Tel: 81-3-6880- 3770
Fax: 81-3-6880-3771

Korea - Daegu
Tel: 82-53-744-4301
Fax: 82-53-744-4302

Korea - Seoul
Tel: 82-2-554-7200
Fax: 82-2-558-5932 or 82-2-558-5934

Malaysia - Kuala Lumpur
Tel: 60-3-6201-9857
Fax: 60-3-6201-9859

Malaysia - Penang
Tel: 60-4-227-8870
Fax: 60-4-227-4068

Philippines - Manila
Tel: 63-2-634-9065
Fax: 63-2-634-9069

Singapore
Tel: 65-6334-8870
Fax: 65-6334-8850

Taiwan - Hsin Chu
Tel: 886-3-5778-366
Fax: 886-3-5770-955

Taiwan - Kaohsiung
Tel: 886-7-213-7828
Fax: 886-7-330-9305

Taiwan - Taipei
Tel: 886-2-2508-8600
Fax: 886-2-2508-0102

Thailand - Bangkok
Tel: 66-2-694-1351
Fax: 66-2-694-1350

EUROPE

Austria - Wels
Tel: 43-7242-2244-39
Fax: 43-7242-2244-393

Denmark - Copenhagen
Tel: 45-4450-2828
Fax: 45-4485-2829

France - Paris
Tel: 33-1-69-53-63-20
Fax: 33-1-69-30-90-79

Germany - Munich
Tel: 49-89-627-144-0
Fax: 49-89-627-144-44

Italy - Milan
Tel: 39-0331-742611
Fax: 39-0331-466781

Netherlands - Drunen
Tel: 31-416-690399
Fax: 31-416-690340

Spain - Madrid
Tel: 34-91-708-08-90
Fax: 34-91-708-08-91

UK - Wokingham
Tel: 44-118-921-5869
Fax: 44-118-921-5820

11/29/12