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What is "Embedded - Microcontrollers"?

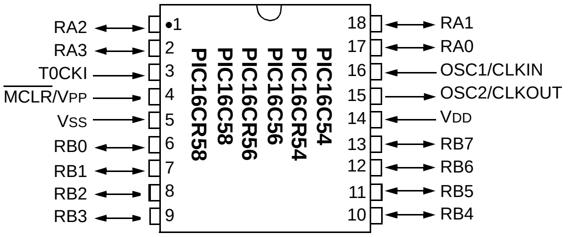
"Embedded - Microcontrollers" refer to small, integrated circuits designed to perform specific tasks within larger systems. These microcontrollers are essentially compact computers on a single chip, containing a processor core, memory, and programmable input/output peripherals. They are called "embedded" 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"

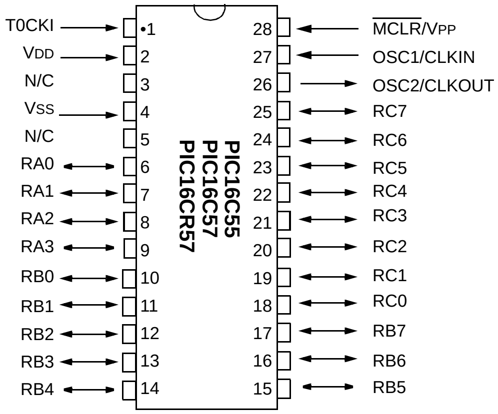
Details	
Product Status	Active
Core Processor	PIC
Core Size	8-Bit
Speed	10MHz
Connectivity	-
Peripherals	POR, WDT
Number of I/O	12
Program Memory Size	1.5KB (1K x 12)
Program Memory Type	OTP
EEPROM Size	-
RAM Size	25 x 8
Voltage - Supply (Vcc/Vdd)	4.5V ~ 5.5V
Data Converters	-
Oscillator Type	External
Operating Temperature	0°C ~ 70°C (TA)
Mounting Type	Surface Mount
Package / Case	20-SSOP (0.209", 5.30mm Width)
Supplier Device Package	20-SSOP
Purchase URL	https://www.e-xfl.com/product-detail/microchip-technology/pic16c56-10-ss

Pin Diagrams

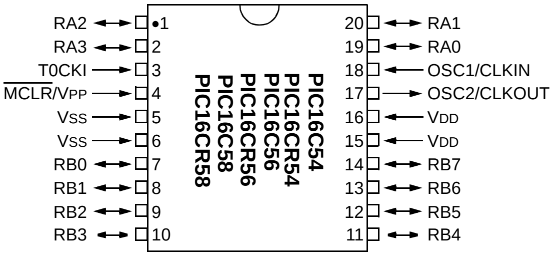
PDIP, SOIC, Windowed CERDIP



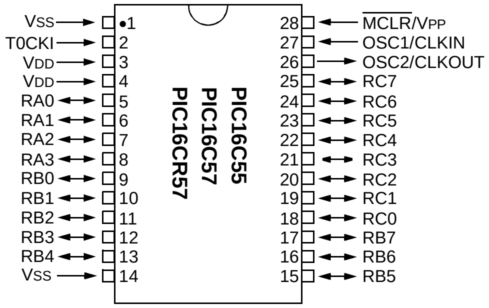
PDIP, SOIC, Windowed CERDIP



SSOP



SSOP



Device Differences

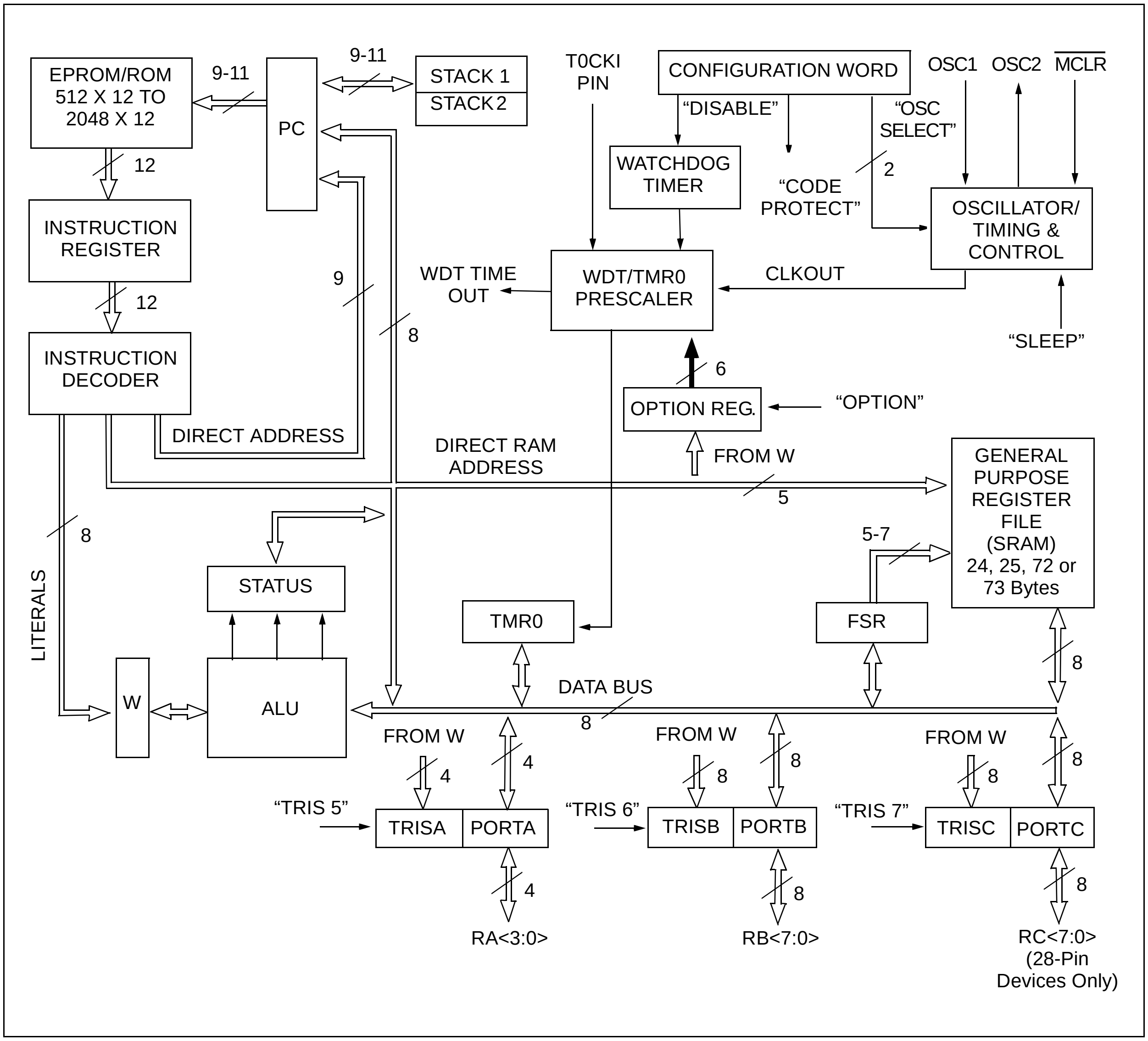
Device	Voltage Range	Oscillator Selection (Program)	Oscillator	Process Technology (Microns)	ROM Equivalent	MCLR Filter
PIC16C54	2.5-6.25	Factory	See **Note 1**	1.2	PIC16CR54A	No
PIC16C54A	2.0-6.25	User	See **Note 1**	0.9	—	No
PIC16C54C	2.5-5.5	User	See **Note 1**	0.7	PIC16CR54C	Yes
PIC16C55	2.5-6.25	Factory	See **Note 1**	1.7	—	No
PIC16C55A	2.5-5.5	User	See **Note 1**	0.7	—	Yes
PIC16C56	2.5-6.25	Factory	See **Note 1**	1.7	—	No
PIC16C56A	2.5-5.5	User	See **Note 1**	0.7	PIC16CR56A	Yes
PIC16C57	2.5-6.25	Factory	See **Note 1**	1.2	—	No
PIC16C57C	2.5-5.5	User	See **Note 1**	0.7	PIC16CR57C	Yes
PIC16C58B	2.5-5.5	User	See **Note 1**	0.7	PIC16CR58B	Yes
PIC16CR54A	2.5-6.25	Factory	See **Note 1**	1.2	N/A	Yes
PIC16CR54C	2.5-5.5	Factory	See **Note 1**	0.7	N/A	Yes
PIC16CR56A	2.5-5.5	Factory	See **Note 1**	0.7	N/A	Yes
PIC16CR57C	2.5-5.5	Factory	See **Note 1**	0.7	N/A	Yes
PIC16CR58B	2.5-5.5	Factory	See **Note 1**	0.7	N/A	Yes

Note 1: If you change from this device to another device, please verify oscillator characteristics in your application.

Note: The table shown above shows the generic names of the PIC16C5X devices. For device varieties, please refer to Section 2.0.

NOTES:

FIGURE 3-1: PIC16C5X SERIES BLOCK DIAGRAM



3.1 Clocking Scheme/Instruction Cycle

The clock input (OSC1/CLKIN pin) is internally divided by four to generate four non-overlapping quadrature clocks, namely Q1, Q2, Q3 and Q4. Internally, the program counter is incremented every Q1 and the instruction is fetched from program memory and latched into the instruction register in Q4. It is decoded and executed during the following Q1 through Q4. The clocks and instruction execution flow are shown in Figure 3-2 and Example 3-1.

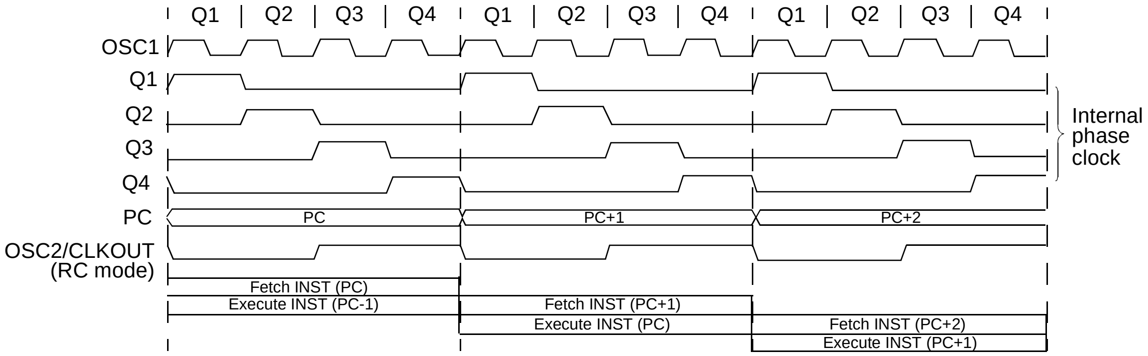
3.2 Instruction Flow/Pipelining

An Instruction Cycle consists of four Q cycles (Q1, Q2, Q3 and Q4). The instruction fetch and execute are pipelined such that fetch takes one instruction cycle, while decode and execute takes another instruction cycle. However, due to the pipelining, each instruction effectively executes in one cycle. If an instruction causes the program counter to change (e.g., `GOTO`), then two cycles are required to complete the instruction (Example 3-1).

A fetch cycle begins with the program counter (PC) incrementing in Q1.

In the execution cycle, the fetched instruction is latched into the Instruction Register in cycle Q1. This instruction is then decoded and executed during the Q2, Q3 and Q4 cycles. Data memory is read during Q2 (operand read) and written during Q4 (destination write).

FIGURE 3-2: CLOCK/INSTRUCTION CYCLE



EXAMPLE 3-1: INSTRUCTION PIPELINE FLOW

1. `MOVLW H'55'`	Fetch 1	Execute 1				
2. `MOVWF PORTB`		Fetch 2	Execute 2			
3. `CALL  SUB_1`			Fetch 3	Execute 3		
4. `BSF   PORTA, BIT3`				Fetch 4	Flush	
					Fetch SUB_1	Execute SUB_1

All instructions are single cycle, except for any program branches. These take two cycles since the fetch instruction is “flushed” from the pipeline, while the new instruction is being fetched and then executed.

4.3 External Crystal Oscillator Circuit

Either a prepackaged oscillator or a simple oscillator circuit with TTL gates can be used as an external crystal oscillator circuit. 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 parallel resonance, or one with series resonance.

Figure 4-3 shows an implementation example of a parallel resonant oscillator circuit. The circuit is designed to use the fundamental frequency of the crystal. The 74AS04 inverter performs the 180-degree 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 circuit could be used for external oscillator designs.

FIGURE 4-3: EXAMPLE OF EXTERNAL PARALLEL RESONANT CRYSTAL OSCILLATOR CIRCUIT (USING XT, HS OR LP OSCILLATOR MODE)

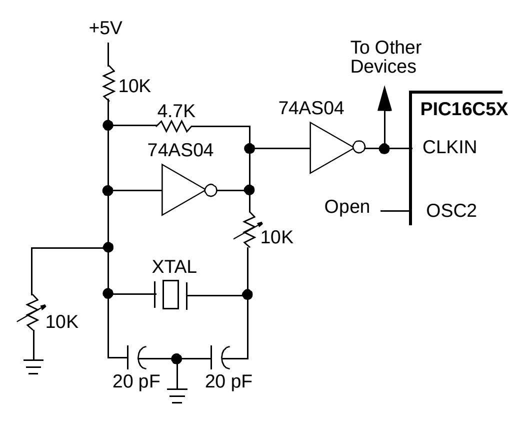
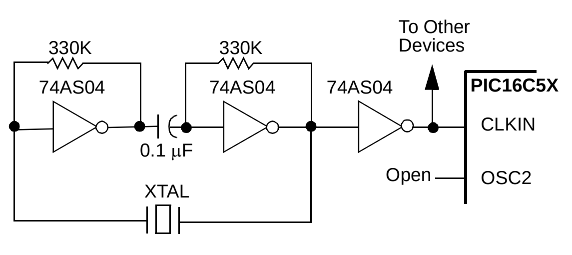


Figure 4-4 shows a series resonant oscillator circuit. This circuit is also designed to use the fundamental frequency of the crystal. The inverter performs a 180-degree phase shift in a series resonant oscillator circuit. The 330 kΩ resistors provide the negative feedback to bias the inverters in their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

FIGURE 4-4: EXAMPLE OF EXTERNAL SERIES RESONANT CRYSTAL OSCILLATOR CIRCUIT (USING XT, HS OR LP OSCILLATOR MODE)



6.5 Program Counter

As a program instruction is executed, the Program Counter (PC) will contain the address of the next program instruction to be executed. The PC value is increased by one, every instruction cycle, unless an instruction changes the PC.

For a `GOTO` instruction, bits 8:0 of the PC are provided by the `GOTO` instruction word. The PC Latch (PCL) is mapped to PC<7:0> (Figure 6-7, Figure 6-8 and Figure 6-9).

For the PIC16C56, PIC16CR56, PIC16C57, PIC16CR57, PIC16C58 and PIC16CR58, a page number must be supplied as well. Bit5 and bit6 of the STATUS Register provide page information to bit9 and bit10 of the PC (Figure 6-8 and Figure 6-9).

For a `CALL` instruction, or any instruction where the PCL is the destination, bits 7:0 of the PC again are provided by the instruction word. However, PC<8> does not come from the instruction word, but is always cleared (Figure 6-7 and Figure 6-8).

Instructions where the PCL is the destination, or modify PCL instructions, include `MOVWF PCL`, `ADDWF PCL`, and `BSF PCL,5`.

For the PIC16C56, PIC16CR56, PIC16C57, PIC16CR57, PIC16C58 and PIC16CR58, a page number again must be supplied. Bit5 and bit6 of the STATUS Register provide page information to bit9 and bit10 of the PC (Figure 6-8 and Figure 6-9).

Note:	Because PC<8> is cleared in the `CALL` instruction, or any modify PCL instruction, all subroutine calls or computed jumps are limited to the first 256 locations of any program memory page (512 words long).

FIGURE 6-7: LOADING OF PC BRANCH INSTRUCTIONS - PIC16C54, PIC16CR54, PIC16C55

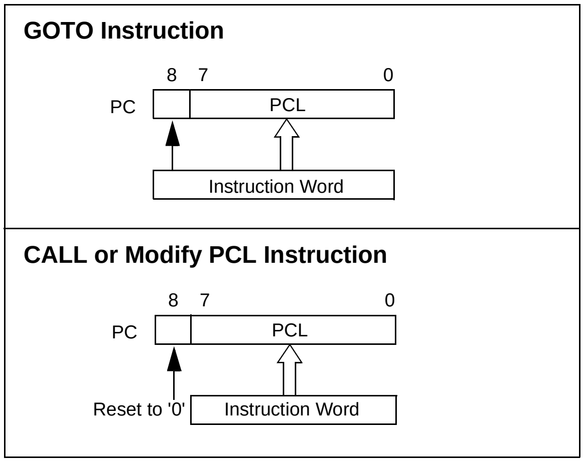


FIGURE 6-8: LOADING OF PC BRANCH INSTRUCTIONS - PIC16C56/PIC16CR56

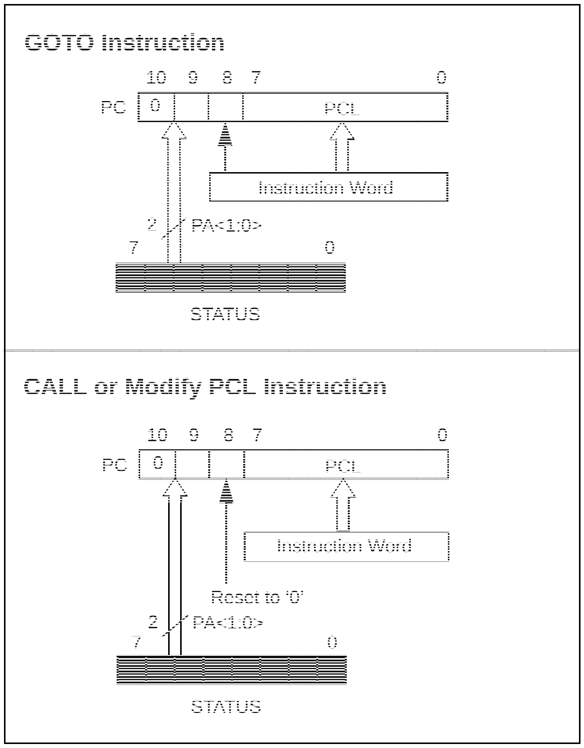
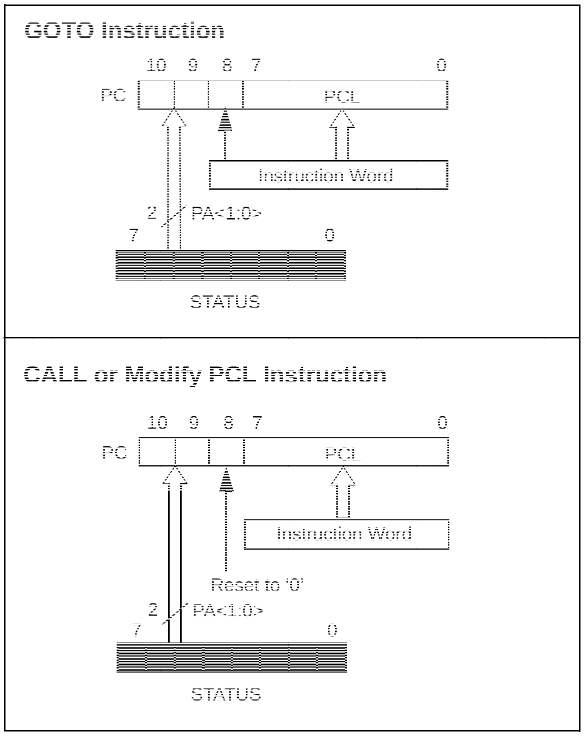


FIGURE 6-9: LOADING OF PC BRANCH INSTRUCTIONS - PIC16C57/PIC16CR57, AND PIC16C58/ PIC16CR58



BSF Bit Set f

Syntax:	[*label*] BSF f,b
Operands:	0 ≤ f ≤ 31 0 ≤ b ≤ 7
Operation:	1 → (f<b>)
Status Affected:	None
Encoding:	`0101` `bbbf` `ffff`
Description:	Bit 'b' in register 'f' is set.
Words:	1
Cycles:	1
Example:	`BSF FLAG_REG, 7`

```
Before Instruction
    FLAG_REG  =  0x0A
After Instruction
    FLAG_REG  =  0x8A
```

BTFSC Bit Test f, Skip if Clear

Syntax:	[*label*] BTFSC f,b
Operands:	0 ≤ f ≤ 31 0 ≤ b ≤ 7
Operation:	skip if (f<b>) = 0
Status Affected:	None
Encoding:	`0110` `bbbf` `ffff`
Description:	If bit 'b' in register 'f' is 0 then the next instruction is skipped. If bit 'b' is 0 then the next instruction fetched during the current instruction execution is discarded, and a `NOP` is executed instead, making this a 2-cycle instruction.
Words:	1
Cycles:	1(2)
Example:	

```
HERE   BTFSC  FLAG,1
FALSE  GOTO   PROCESS_CODE
TRUE   •
       •
       •
```

```
Before Instruction
    PC           =  address (HERE)
After Instruction
    if FLAG<1>   =  0,
    PC           =  address (TRUE);
    if FLAG<1>   =  1,
    PC           =  address(FALSE)
```

BTFSS Bit Test f, Skip if Set

Syntax:	[*label*] BTFSS f,b
Operands:	0 ≤ f ≤ 31 0 ≤ b < 7
Operation:	skip if (f<b>) = 1
Status Affected:	None
Encoding:	`0111` `bbbf` `ffff`
Description:	If bit 'b' in register 'f' is '1' then the next instruction is skipped. If bit 'b' is '1', then the next instruction fetched during the current instruction execution, is discarded and a `NOP` is executed instead, making this a 2-cycle instruction.
Words:	1
Cycles:	1(2)
Example:	

```
HERE   BTFSS  FLAG,1
FALSE  GOTO   PROCESS_CODE
TRUE   •
       •
       •
```

```
Before Instruction
    PC           =  address (HERE)
After Instruction
    If FLAG<1>   =  0,
    PC           =  address (FALSE);
    if FLAG<1>   =  1,
    PC           =  address (TRUE)
```

XORLW Exclusive OR literal with W

Syntax:	[*label*] XORLW k
Operands:	0 ≤ k ≤ 255
Operation:	(W) .XOR. k → (W)
Status Affected:	Z
Encoding:	`1111` `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 ≤ f ≤ 31 d ∈ [0,1]
Operation:	(W) .XOR. (f) → (dest)
Status Affected:	Z
Encoding:	`0001` `10df` `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

12.2 DC Characteristics: PIC16C54/55/56/57-RCI, XTI, 10I, HSI, LPI (Industrial)

PIC16C54/55/56/57-RCI, XTI, 10I, HSI, LPI (Industrial)			**Standard Operating Conditions (unless otherwise specified)** Operating Temperature –40°C ≤ T_A ≤ +85°C for industrial				
Param No.	**Symbol**	**Characteristic/Device**	**Min**	**Typ†**	**Max**	**Units**	**Conditions**
D001	V_{DD}	**Supply Voltage**					
		PIC16C5X-RCI	3.0	—	6.25	V	
		PIC16C5X-XTI	3.0	—	6.25	V	
		PIC16C5X-10I	4.5	—	5.5	V	
		PIC16C5X-HSI	4.5	—	5.5	V	
		PIC16C5X-LPI	2.5	—	6.25	V	
D002	V_{DR}	**RAM Data Retention Voltage**(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 5.1 for details on Power-on Reset
D004	S_{VDD}	**V_{DD} Rise Rate** to ensure Power-on Reset	0.05*	—	—	V/ms	See Section 5.1 for details on Power-on Reset
D010	I_{DD}	**Supply Current**(2)					
		PIC16C5X-RCI(3)	—	1.8	3.3	mA	F_{OSC} = 4 MHz, V_{DD} = 5.5V
		PIC16C5X-XTI	—	1.8	3.3	mA	F_{OSC} = 4 MHz, V_{DD} = 5.5V
		PIC16C5X-10I	—	4.8	10	mA	F_{OSC} = 10 MHz, V_{DD} = 5.5V
		PIC16C5X-HSI	—	4.8	10	mA	F_{OSC} = 10 MHz, V_{DD} = 5.5V
		PIC16C5X-HSI	—	9.0	20	mA	F_{OSC} = 20 MHz, V_{DD} = 5.5V
		PIC16C5X-LPI	—	15	40	μA	F_{OSC} = 32 kHz, V_{DD} = 3.0V, WDT disabled
D020	I_{PD}	**Power-down Current**(2)	—	4.0	14	μA	V_{DD} = 3.0V, WDT enabled
			—	0.6	12	μA	V_{DD} = 3.0V, WDT disabled

* These parameters are characterized but not tested.

† Data in “Typ” column is based on characterization results at 25°C. This data is for design guidance only and is 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 bus loading, oscillator type, bus rate, internal code execution pattern and temperature also have an impact on the current consumption.

a) 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 tristated, pulled to V_{SS}, T0CKI = V_{DD}, $\overline{MCLR}$ = V_{DD}; WDT enabled/disabled as specified.

b) For standby current measurements, the conditions are the same, except that the device is in SLEEP mode. The power-down current in SLEEP mode does not depend on the oscillator type.

3: Does not include current through R_{EXT}. The current through the resistor can be estimated by the formula: $I_R = V_{DD}/2R_{EXT}$ (mA) with R_{EXT} in kΩ.

FIGURE 14-6: MAXIMUM IPD vs. VDD, WATCHDOG DISABLED

Typical: statistical mean @ 25°C
Maximum: mean + 3s (-40°C to 125°C)
Minimum: mean – 3s (-40°C to 125°C)

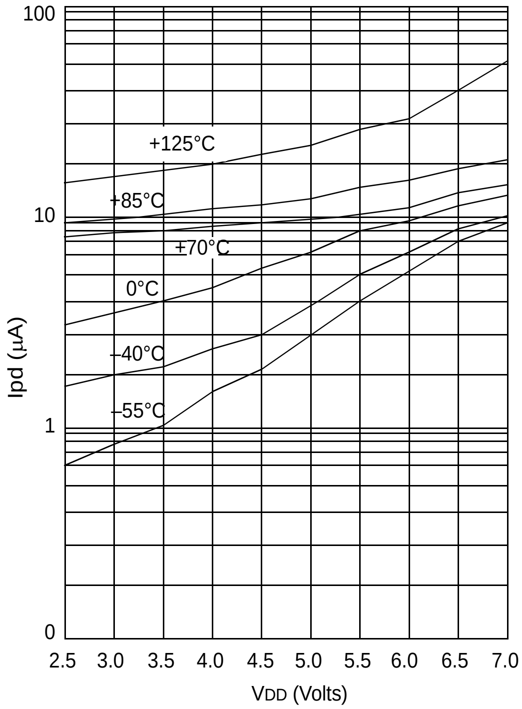


FIGURE 14-7: TYPICAL IPD vs. VDD, WATCHDOG ENABLED

Typical: statistical mean @ 25°C
Maximum: mean + 3s (-40°C to 125°C)
Minimum: mean – 3s (-40°C to 125°C)

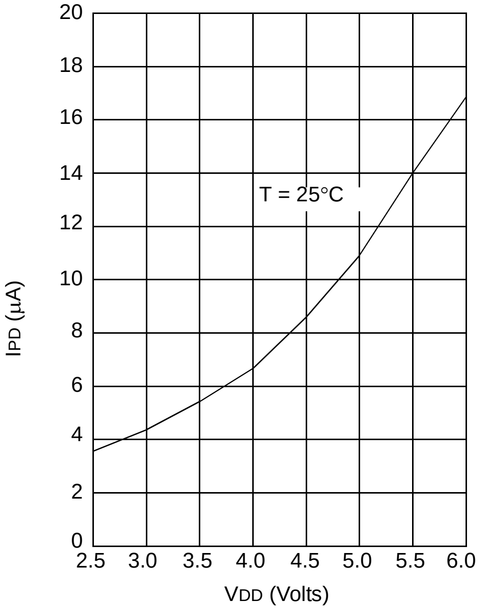
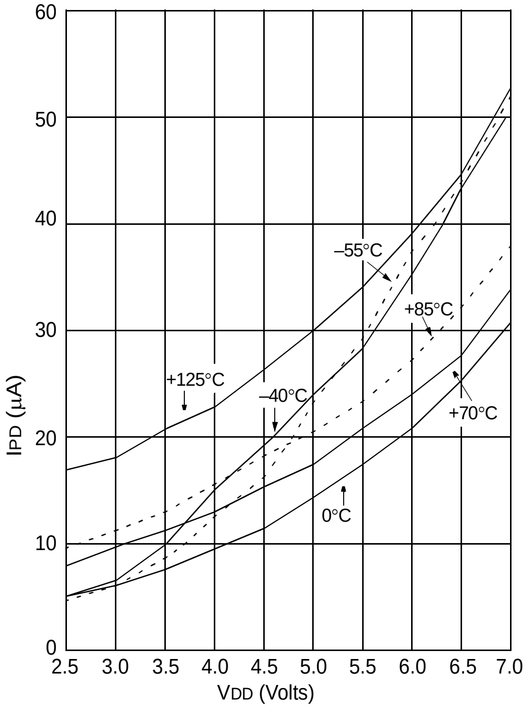


FIGURE 14-8: MAXIMUM IPD vs. VDD, WATCHDOG ENABLED

Typical: statistical mean @ 25°C
Maximum: mean + 3s (-40°C to 125°C)
Minimum: mean – 3s (-40°C to 125°C)



IPD, with WDT enabled, has two components:
The leakage current, which increases with higher temperature, and the operating current of the WDT logic, which increases with lower temperature. At –40°C, the latter dominates explaining the apparently anomalous behavior.

FIGURE 14-11: VTH (INPUT THRESHOLD VOLTAGE) OF OSC1 INPUT (XT, HS, AND LP MODES) vs. VDD

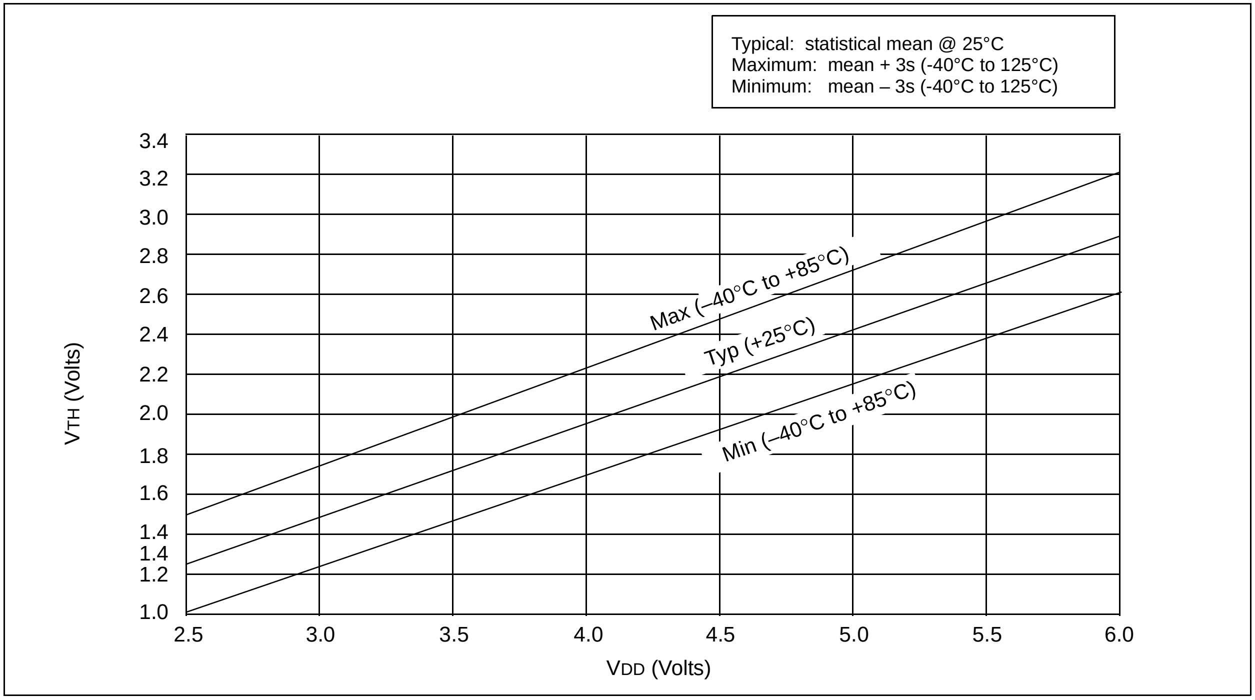
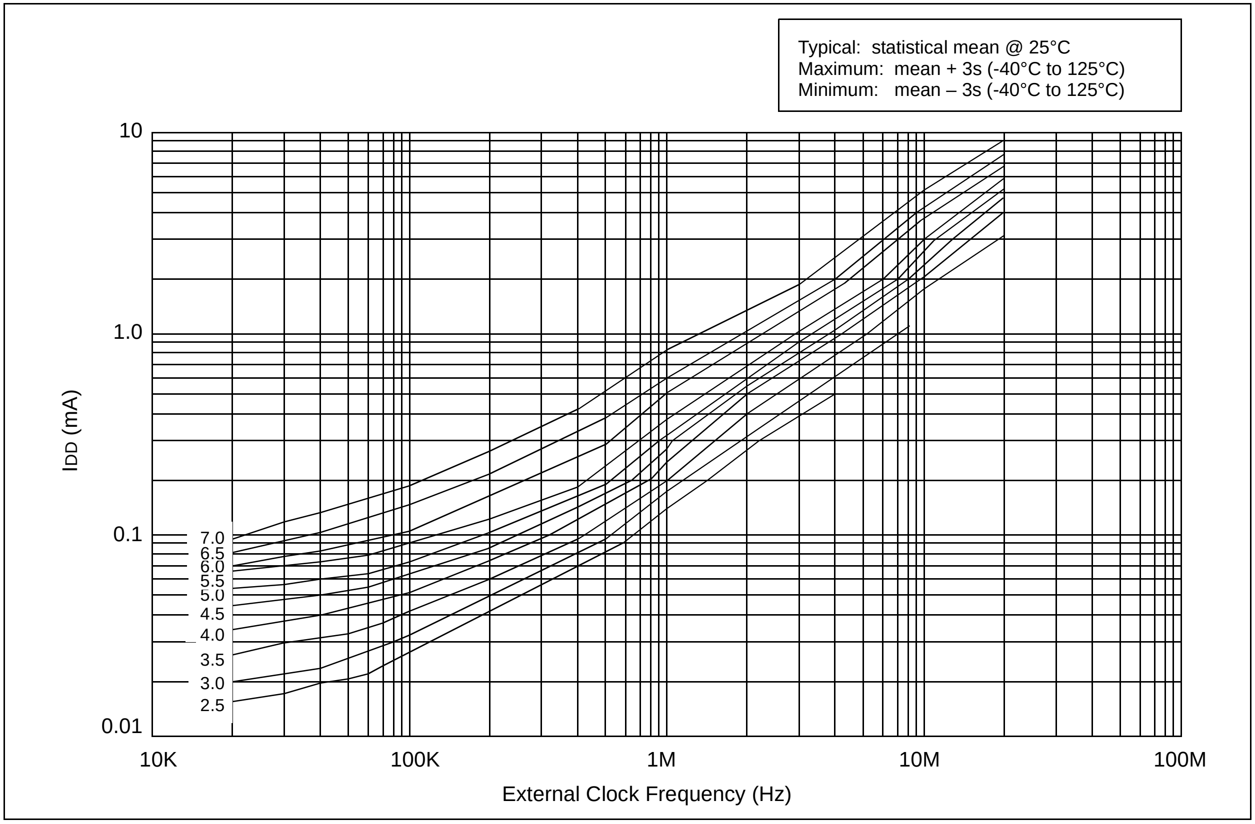


FIGURE 14-12: TYPICAL IDD VS. FREQUENCY (EXTERNAL CLOCK, 25°C)



15.2 DC Characteristics: PIC16C54A-04E, 10E, 20E (Extended)
PIC16LC54A-04E (Extended)

PIC16LC54A-04E (Extended)			**Standard Operating Conditions (unless otherwise specified)** Operating Temperature –40°C ≤ TA ≤ +125°C for extended				
PIC16C54A-04E, 10E, 20E (Extended)			**Standard Operating Conditions (unless otherwise specified)** Operating Temperature –40°C ≤ TA ≤ +125°C for extended				
Param No.	**Symbol**	**Characteristic**	**Min**	**Typ†**	**Max**	**Units**	**Conditions**
	IPD	**Power-down Current**(2)					
D020		PIC16LC54A	—	2.5	15	µA	VDD = 2.5V, WDT enabled, Extended
			—	0.25	7.0	µA	VDD = 2.5V, WDT disabled, Extended
D020A		PIC16C54A	—	5.0	22	µA	VDD = 3.5V, WDT enabled
			—	0.8	18*	µA	VDD = 3.5V, WDT disabled

Legend: Rows with standard voltage device data only are shaded for improved readability.

* These parameters are characterized but not tested.

† Data in the Typical (“Typ”) column is based on characterization results at 25°C. This data is for design guidance only and is not tested.

Note 1: This is the limit to which VDD 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 bus loading, oscillator type, bus rate, internal code execution pattern and temperature also have an impact on the current consumption.

a) The test conditions for all IDD measurements in active Operation mode are: OSC1 = external square wave, from rail-to-rail; all I/O pins tristated, pulled to VSS, T0CKI = VDD, $\overline{\text{MCLR}}$ = VDD; WDT enabled/disabled as specified.

b) For standby current measurements, the conditions are the same, except that the device is in SLEEP mode. The power-down current in SLEEP mode does not depend on the oscillator type.

3: Does not include current through REXT. The current through the resistor can be estimated by the formula: IR = VDD/2REXT (mA) with REXT in kΩ.

15.5 Timing Parameter Symbology and Load Conditions

The timing parameter symbols have been created with one of the following formats:

1. TppS2ppS
2. TppS

T	
F Frequency	T Time

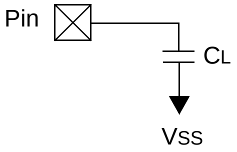
Lowercase letters (pp) and their meanings:

pp	
2 to	mc $\overline{\text{MCLR}}$
ck CLKOUT	osc oscillator
cy cycle time	os OSC1
drt device reset timer	t0 T0CKI
io I/O port	wdt watchdog timer

Uppercase letters and their meanings:

S	
F Fall	P Period
H High	R Rise
I Invalid (Hi-impedance)	V Valid
L Low	Z Hi-impedance

FIGURE 15-1: LOAD CONDITIONS FOR DEVICE TIMING SPECIFICATIONS - PIC16C54A



C_L =	50 pF	for all pins and OSC2 for RC modes
	0 -15 pF	for OSC2 in XT, HS or LP modes when external clock is used to drive OSC1

FIGURE 16-18: TRANSCONDUCTANCE (gm) OF LP OSCILLATOR vs. VDD

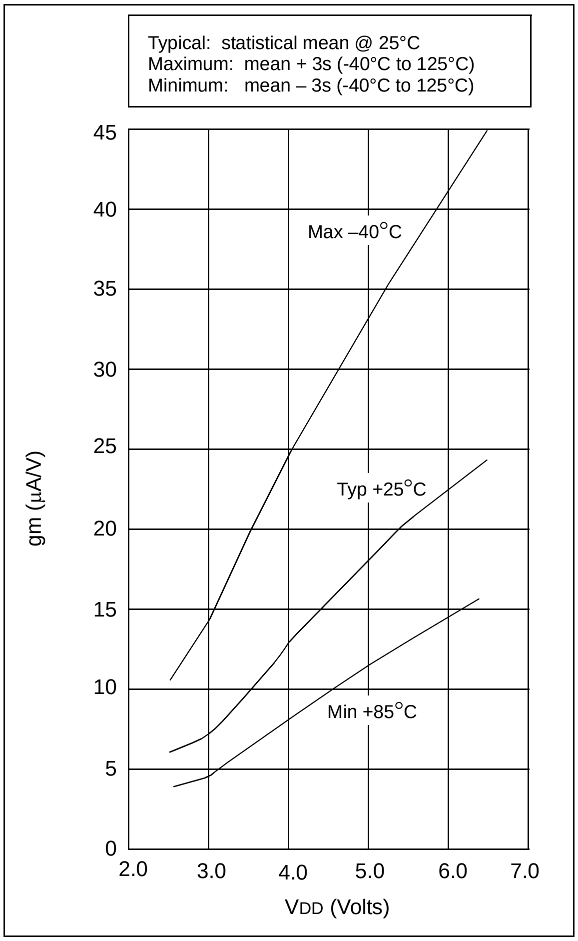
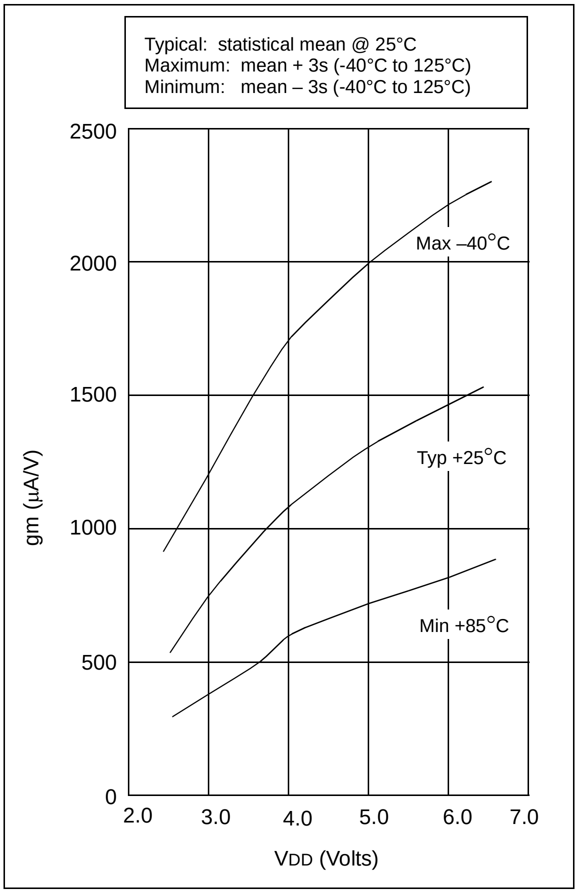


FIGURE 16-19: TRANSCONDUCTANCE (gm) OF XT OSCILLATOR vs. VDD



NOTES:

17.1 DC Characteristics: PIC16C54C/C55A/C56A/C57C/C58B-04, 20 (Commercial, Industrial) PIC16LC54C/LC55A/LC56A/LC57C/LC58B-04 (Commercial, Industrial) PIC16CR54C/CR56A/CR57C/CR58B-04, 20 (Commercial, Industrial) PIC16LCR54C/LCR56A/LCR57C/LCR58B-04 (Commercial, Industrial)

PIC16LC5X **PIC16LCR5X** (Commercial, Industrial)	**Standard Operating Conditions (unless otherwise specified)** Operating Temperature 0°C ≤ TA ≤ +70°C for commercial –40°C ≤ TA ≤ +85°C for industrial
PIC16C5X **PIC16CR5X** (Commercial, Industrial)	**Standard Operating Conditions (unless otherwise specified)** Operating Temperature 0°C ≤ TA ≤ +70°C for commercial –40°C ≤ TA ≤ +85°C for industrial

Param No.	Symbol	Characteristic/Device	Min	Typ†	Max	Units	Conditions
D001	VDD	**Supply Voltage**					
		PIC16LC5X	2.5	—	5.5	V	–40°C ≤ TA ≤ + 85°C, 16LCR5X
			2.7	—	5.5	V	–40°C ≤ TA ≤ 0°C, 16LC5X
			2.5	—	5.5	V	0°C ≤ TA ≤ + 85°C 16LC5X
D001A		PIC16C5X					RC, XT, LP and HS mode
			3.0	—	5.5	V	from 0 - 10 MHz
			4.5	—	5.5	V	from 10 - 20 MHz
D002	VDR	**RAM Data Retention Voltage**[(1)]	—	1.5*	—	V	Device in SLEEP mode
D003	VPOR	**VDD Start Voltage** to ensure Power-on Reset	—	VSS	—	V	See Section 5.1 for details on Power-on Reset
D004	SVDD	**VDD Rise Rate** to ensure Power-on Reset	0.05*	—	—	V/ms	See Section 5.1 for details on Power-on Reset

Legend: Rows with standard voltage device data only are shaded for improved readability.

* These parameters are characterized but not tested.

† Data in “Typ” column is at 5V, 25°C, unless otherwise stated. These parameters are for design guidance only, and are not tested.

Note 1: This is the limit to which VDD 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 bus loading, oscillator type, bus rate, internal code execution pattern and temperature also have an impact on the current consumption.

a) The test conditions for all IDD measurements in active Operation mode are: OSC1 = external square wave, from rail-to-rail; all I/O pins tristated, pulled to VSS, T0CKI = VDD, $\overline{\text{MCLR}}$ = VDD; WDT enabled/disabled as specified.

b) For standby current measurements, the conditions are the same, except that the device is in SLEEP mode. The power-down current in SLEEP mode does not depend on the oscillator type.

3: Does not include current through REXT. The current through the resistor can be estimated by the formula: IR = VDD/2REXT (mA) with REXT in kΩ.

18.0 DEVICE CHARACTERIZATION - PIC16LC54A

The graphs and tables provided following this note are a statistical summary based on a limited number of samples and are provided for informational purposes only. The performance characteristics listed herein are not tested or guaranteed. In some graphs or tables, the data presented may be outside the specified operating range (e.g., outside specified power supply range) and therefore outside the warranted range.

"Typical" represents the mean of the distribution at 25°C. "Maximum" or "minimum" represents (mean + 3σ) or (mean – 3σ) respectively, where σ is a standard deviation, over the whole temperature range.

FIGURE 18-1: TYPICAL RC OSCILLATOR FREQUENCY vs. TEMPERATURE

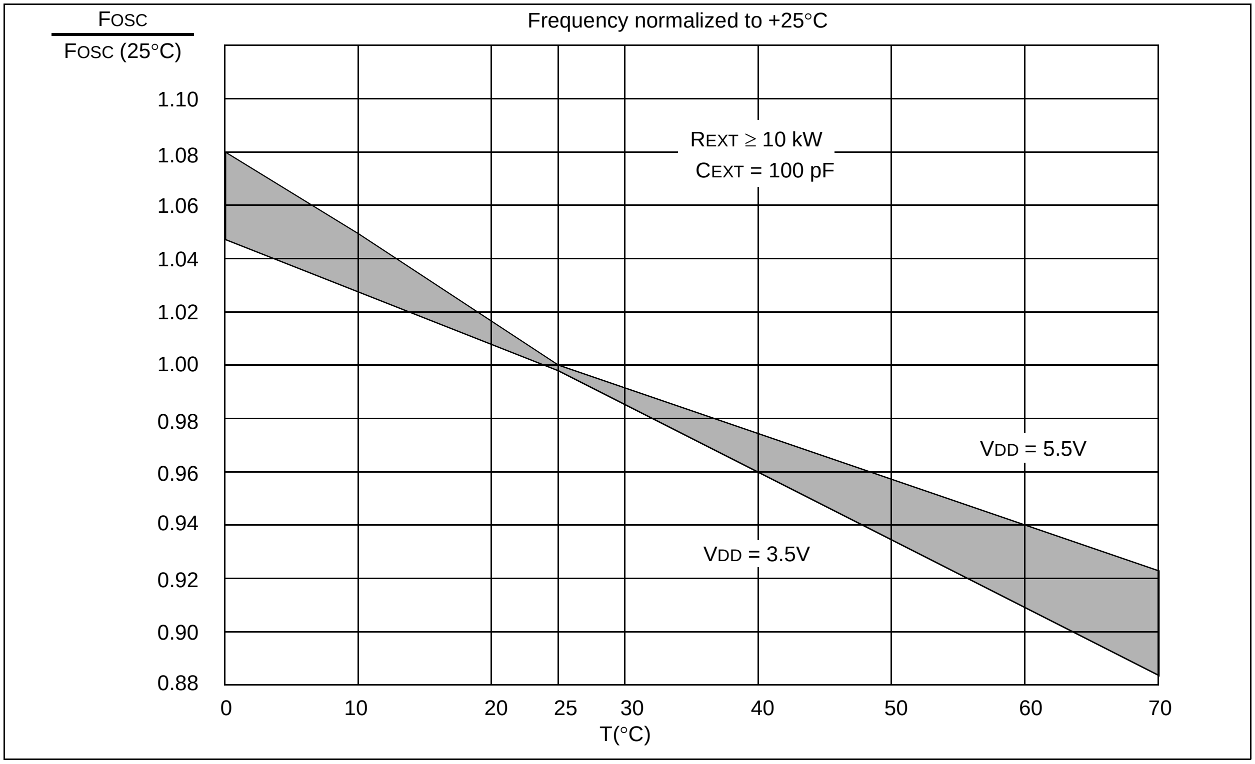


TABLE 18-1: RC OSCILLATOR FREQUENCIES

CEXT	REXT	Average Fosc @ 5V, 25°C	
20 pF	3.3K	5 MHz	± 27%
	5K	3.8 MHz	± 21%
	10K	2.2 MHz	± 21%
	100K	262 kHz	± 31%
100 pF	3.3K	1.63 MHz	± 13%
	5K	1.2 MHz	± 13%
	10K	684 kHz	± 18%
	100K	71 kHz	± 25%
300 pF	3.3K	660 kHz	± 10%
	5.0K	484 kHz	± 14%
	10K	267 kHz	± 15%
	100K	29 kHz	± 19%

The frequencies are measured on DIP packages.

The percentage variation indicated here is part-to-part variation due to normal process distribution. The variation indicated is ±3 standard deviation from average value for VDD = 5V.

FIGURE 18-8: V_{TH} (INPUT THRESHOLD TRIP POINT VOLTAGE) OF I/O PINS vs. V_{DD}

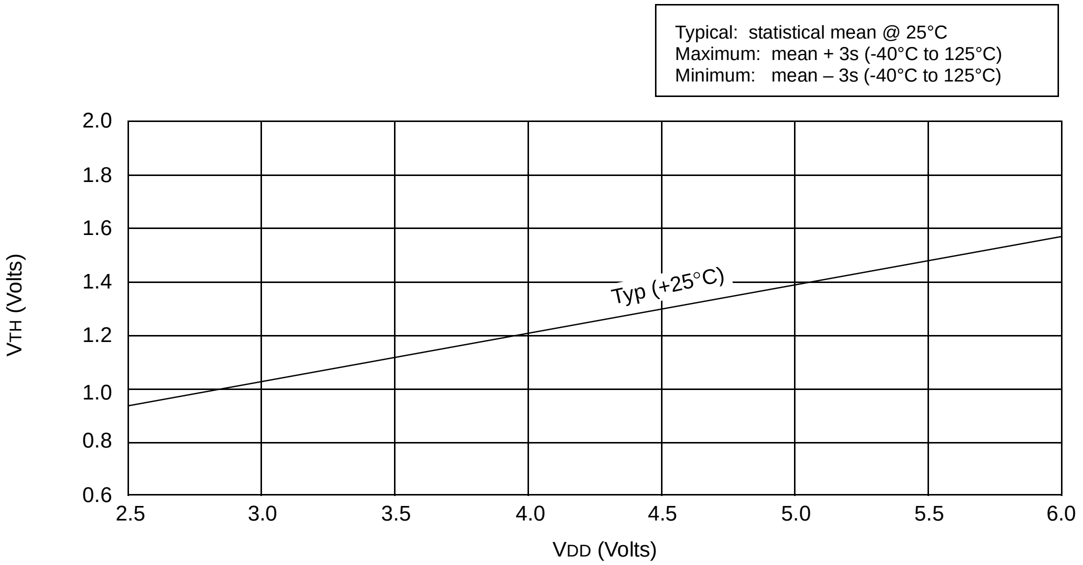
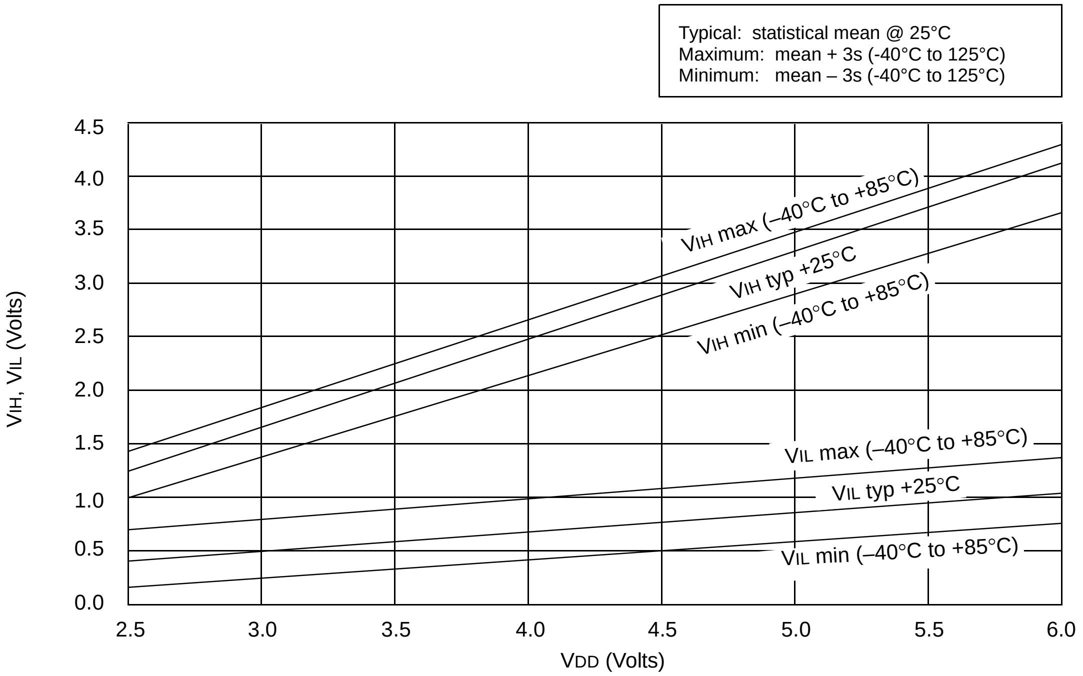


FIGURE 18-9: V_{IH}, V_{IL} OF $\overline{\text{MCLR}}$, T0CKI AND OSC1 (IN RC MODE) vs. V_{DD}



Note: These input pins have Schmitt Trigger input buffers.

FIGURE 18-12: TYPICAL IDD vs. FREQUENCY (WDT DISABLED, RC MODE @ 100 pF, 25°C)

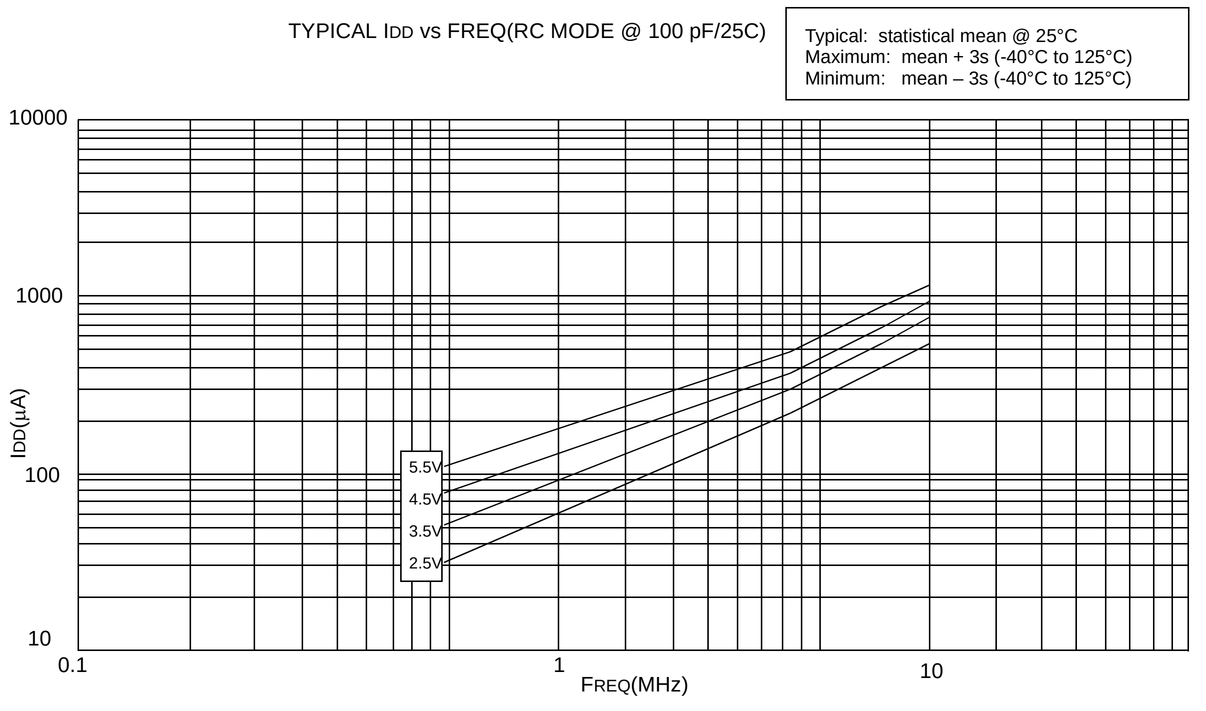
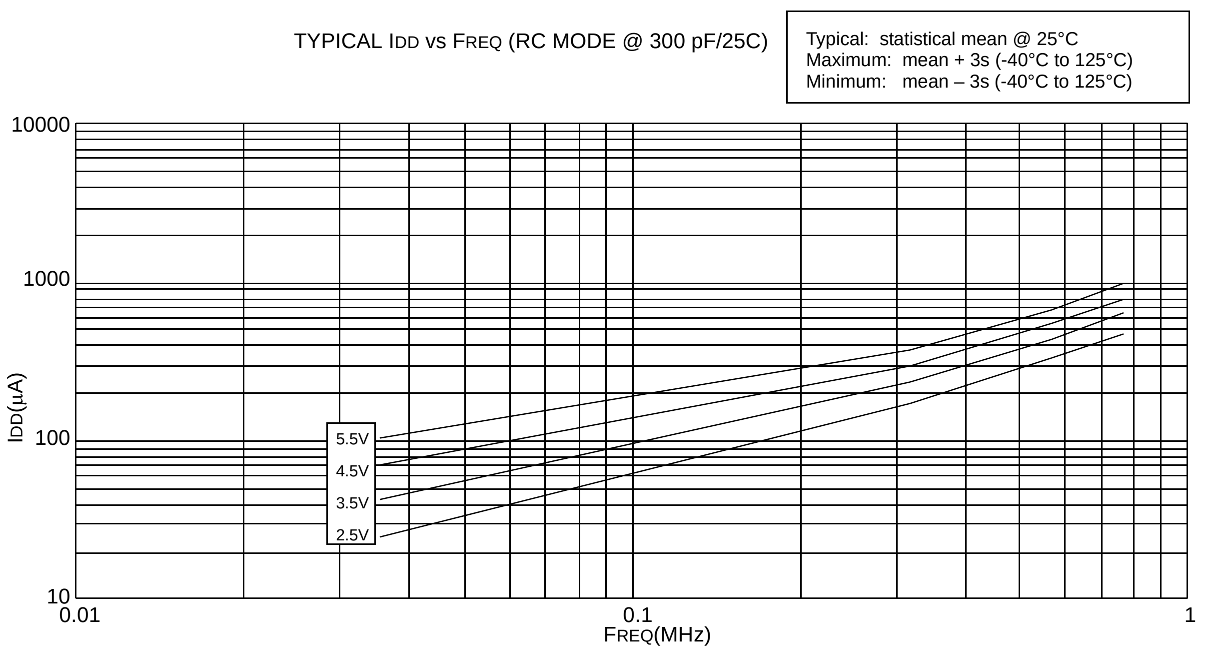
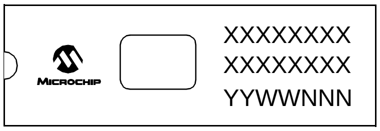


FIGURE 18-13: TYPICAL IDD vs. FREQUENCY (WDT DISABLED, RC MODE @ 300 pF, 25°C)

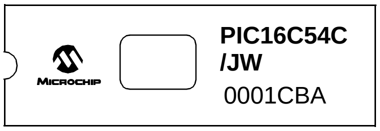


Package Marking Information (Cont'd)

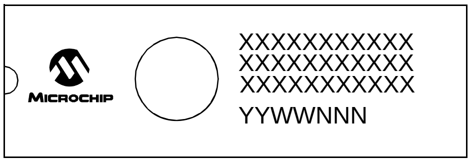
18-Lead CERDIP Windowed



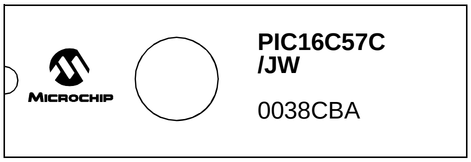
Example



28-Lead CERDIP Windowed



Example



Legend:		
	XX...X	Customer-specific information
	Y	Year code (last digit of calendar year)
	YY	Year code (last 2 digits of calendar year)
	WW	Week code (week of January 1 is week '01')
	NNN	Alphanumeric traceability code
	e3	Pb-free JEDEC designator for Matte Tin (Sn)
	*	This package is Pb-free. The Pb-free JEDEC designator (e3) can be found on the outer packaging for this package.

Note: In the event the full Microchip part number cannot be marked on one line, it will be carried over to the next line, thus limiting the number of available characters for customer-specific information.