



Welcome to [E-XFL.COM](http://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	40MHz
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)	2.5V ~ 6.25V
Data Converters	-
Oscillator Type	External
Operating Temperature	-40°C ~ 85°C (TA)
Mounting Type	Surface Mount
Package / Case	20-SSOP (0.209", 5.30mm Width)
Supplier Device Package	20-SSOP
Purchase URL	<a href="https://www.e-xfl.com/product-detail/microchip-technology/pic16c56-lpi-ss">https://www.e-xfl.com/product-detail/microchip-technology/pic16c56-lpi-ss</a>



# PIC16C5X

---

## 8-Bit EPROM/ROM-Based CMOS Microcontrollers

---

### 1.0 GENERAL DESCRIPTION

The PIC16C5X from Microchip Technology is a family of low cost, high performance, 8-bit fully static, EPROM/ROM-based CMOS microcontrollers. It employs a RISC architecture with only 33 single word/single cycle instructions. All instructions are single cycle except for program branches which take two cycles. The PIC16C5X delivers performance in an order of magnitude higher than its competitors in the same price category. The 12-bit wide instructions are highly symmetrical resulting in 2:1 code compression over other 8-bit microcontrollers in its class. The easy to use and easy to remember instruction set reduces development time significantly.

The PIC16C5X products are equipped with special features that reduce system cost and power requirements. The Power-on Reset (POR) and Device Reset Timer (DRT) eliminate the need for external RESET circuitry. There are four oscillator configurations to choose from, including the power saving LP (Low Power) oscillator and cost saving RC oscillator. Power saving SLEEP mode, Watchdog Timer and Code Protection features improve system cost, power and reliability.

The UV erasable Cerdip packaged versions are ideal for code development, while the cost effective One Time Programmable (OTP) versions are suitable for production in any volume. The customer can take full advantage of Microchip's price leadership in OTP microcontrollers, while benefiting from the OTP's flexibility.

The PIC16C5X products are supported by a full featured macro assembler, a software simulator, an in-circuit emulator, a low cost development programmer and a full featured programmer. All the tools are supported on IBM® PC and compatible machines.

### 1.1 Applications

The PIC16C5X series fits perfectly in applications ranging from high speed automotive and appliance motor control to low power remote transmitters/receivers, pointing devices and telecom processors. The EPROM technology makes customizing application programs (transmitter codes, motor speeds, receiver frequencies, etc.) extremely fast and convenient. The small footprint packages, for through hole or surface mounting, make this microcontroller series perfect for applications with space limitations. Low cost, low power, high performance ease of use and I/O flexibility make the PIC16C5X series very versatile even in areas where no microcontroller use has been considered before (e.g., timer functions, replacement of "glue" logic in larger systems, co-processor applications).

## 2.0 PIC16C5X DEVICE VARIETIES

A variety of frequency ranges and packaging options are available. Depending on application and production requirements, the proper device option can be selected using the information in this section. When placing orders, please use the PIC16C5X Product Identification System at the back of this data sheet to specify the correct part number.

For the PIC16C5X family of devices, there are four device types, as indicated in the device number:

1. **C**, as in PIC16**C**54C. These devices have EPROM program memory and operate over the standard voltage range.
2. **LC**, as in PIC16**LC**54A. These devices have EPROM program memory and operate over an extended voltage range.
3. **CR**, as in PIC16**CR**54A. These devices have ROM program memory and operate over the standard voltage range.
4. **LCR**, as in PIC16**LCR**54A. These devices have ROM program memory and operate over an extended voltage range.

### 2.1 UV Erasable Devices (EPROM)

The UV erasable versions offered in Cerdip packages, are optimal for prototype development and pilot programs.

UV erasable devices can be programmed for any of the four oscillator configurations. Microchip's PICSTART® Plus<sup>(1)</sup> and PRO MATE® programmers both support programming of the PIC16C5X. Third party programmers also are available. Refer to the Third Party Guide (DS00104) for a list of sources.

### 2.2 One-Time-Programmable (OTP) Devices

The availability of OTP devices is especially useful for customers expecting frequent code changes and updates, or small volume applications.

The OTP devices, packaged in plastic packages, permit the user to program them once. In addition to the program memory, the configuration bits must be programmed.

**Note 1:** PIC16LC54C and PIC16C54A devices require OSC2 not to be connected while programming with PICSTART® Plus programmer.

## 2.3 Quick-Turnaround-Production (QTP) Devices

Microchip offers a QTP Programming Service for factory production orders. This service is made available for users who choose not to program a medium to high quantity of units and whose code patterns have stabilized. The devices are identical to the OTP devices but with all EPROM locations and configuration bit options already programmed by the factory. Certain code and prototype verification procedures apply before production shipments are available. Please contact your Microchip Technology sales office for more details.

## 2.4 Serialized Quick-Turnaround-Production (SQTP<sup>SM</sup>) Devices

Microchip offers the unique programming service where a few user defined locations in each device are programmed with different serial numbers. The serial numbers may be random, pseudo-random or sequential. The devices are identical to the OTP devices but with all EPROM locations and configuration bit options already programmed by the factory.

Serial programming allows each device to have a unique number which can serve as an entry code, password or ID number.

## 2.5 Read Only Memory (ROM) Devices

Microchip offers masked ROM versions of several of the highest volume parts, giving the customer a low cost option for high volume, mature products.

# PIC16C5X

**TABLE 3-2: PINOUT DESCRIPTION - PIC16C55, PIC16C57, PIC16CR57**

Pin Name	Pin Number			Pin Type	Buffer Type	Description
	DIP	SOIC	SSOP			
RA0	6	6	5	I/O	TTL	Bi-directional I/O port
RA1	7	7	6	I/O	TTL	
RA2	8	8	7	I/O	TTL	
RA3	9	9	8	I/O	TTL	
RB0	10	10	9	I/O	TTL	Bi-directional I/O port
RB1	11	11	10	I/O	TTL	
RB2	12	12	11	I/O	TTL	
RB3	13	13	12	I/O	TTL	
RB4	14	14	13	I/O	TTL	
RB5	15	15	15	I/O	TTL	
RB6	16	16	16	I/O	TTL	
RB7	17	17	17	I/O	TTL	
RC0	18	18	18	I/O	TTL	Bi-directional I/O port
RC1	19	19	19	I/O	TTL	
RC2	20	20	20	I/O	TTL	
RC3	21	21	21	I/O	TTL	
RC4	22	22	22	I/O	TTL	
RC5	23	23	23	I/O	TTL	
RC6	24	24	24	I/O	TTL	
RC7	25	25	25	I/O	TTL	
T0CKI	1	1	2	I	ST	Clock input to Timer0. Must be tied to Vss or VDD, if not in use, to reduce current consumption.
$\overline{\text{MCLR}}$	28	28	28	I	ST	Master clear (RESET) input. This pin is an active low RESET to the device.
OSC1/CLKIN	27	27	27	I	ST	Oscillator crystal input/external clock source input.
OSC2/CLKOUT	26	26	26	O	—	Oscillator crystal output. Connects to crystal or resonator in crystal Oscillator mode. In RC mode, OSC2 pin outputs CLKOUT which has 1/4 the frequency of OSC1, and denotes the instruction cycle rate.
VDD	2	2	3,4	P	—	Positive supply for logic and I/O pins.
Vss	4	4	1,14	P	—	Ground reference for logic and I/O pins.
N/C	3,5	3,5	—	—	—	Unused, do not connect.

Legend: I = input, O = output, I/O = input/output, P = power, — = Not Used, TTL = TTL input, ST = Schmitt Trigger input

# PIC16C5X

---

NOTES:

# PIC16C5X

---

NOTES:

# PIC16C5X

---

NOTES:

## 11.4 MPLINK Object Linker/ MPLIB Object Librarian

The MPLINK object linker combines relocatable objects created by the MPASM assembler and the MPLAB C17 and MPLAB C18 C compilers. It can also link relocatable objects from pre-compiled libraries, using directives from a linker script.

The MPLIB object librarian is a librarian for pre-compiled code to be used with the MPLINK object linker. When a routine from a library is called from another source file, only the modules that contain that routine will be linked in with the application. This allows large libraries to be used efficiently in many different applications. The MPLIB object librarian manages the creation and modification of library files.

The MPLINK object linker features include:

- Integration with MPASM assembler and MPLAB C17 and MPLAB C18 C compilers.
- Allows all memory areas to be defined as sections to provide link-time flexibility.

The MPLIB object librarian features include:

- Easier linking because single libraries can be included instead of many smaller files.
- Helps keep code maintainable by grouping related modules together.
- Allows libraries to be created and modules to be added, listed, replaced, deleted or extracted.

## 11.5 MPLAB SIM Software Simulator

The MPLAB SIM software simulator allows code development in a PC-hosted environment by simulating the PIC series microcontrollers on an instruction level. On any given instruction, the data areas can be examined or modified and stimuli can be applied from a file, or user-defined key press, to any of the pins. The execution can be performed in single step, execute until break, or trace mode.

The MPLAB SIM simulator fully supports symbolic debugging using the MPLAB C17 and the MPLAB C18 C compilers and the MPASM assembler. The software simulator offers the flexibility to develop and debug code outside of the laboratory environment, making it an excellent multi-project software development tool.

## 11.6 MPLAB ICE High Performance Universal In-Circuit Emulator with MPLAB IDE

The MPLAB ICE universal in-circuit emulator is intended to provide the product development engineer with a complete microcontroller design tool set for PIC microcontrollers (MCUs). Software control of the MPLAB ICE in-circuit emulator is provided by the MPLAB Integrated Development Environment (IDE), which allows editing, building, downloading and source debugging from a single environment.

The MPLAB ICE 2000 is a full-featured emulator system with enhanced trace, trigger and data monitoring features. Interchangeable processor modules allow the system to be easily reconfigured for emulation of different processors. The universal architecture of the MPLAB ICE in-circuit emulator allows expansion to support new PIC microcontrollers.

The MPLAB ICE in-circuit emulator system has been designed as a real-time emulation system, with advanced features that are generally found on more expensive development tools. The PC platform and Microsoft® Windows environment were chosen to best make these features available to you, the end user.

## 11.7 ICEPIC In-Circuit Emulator

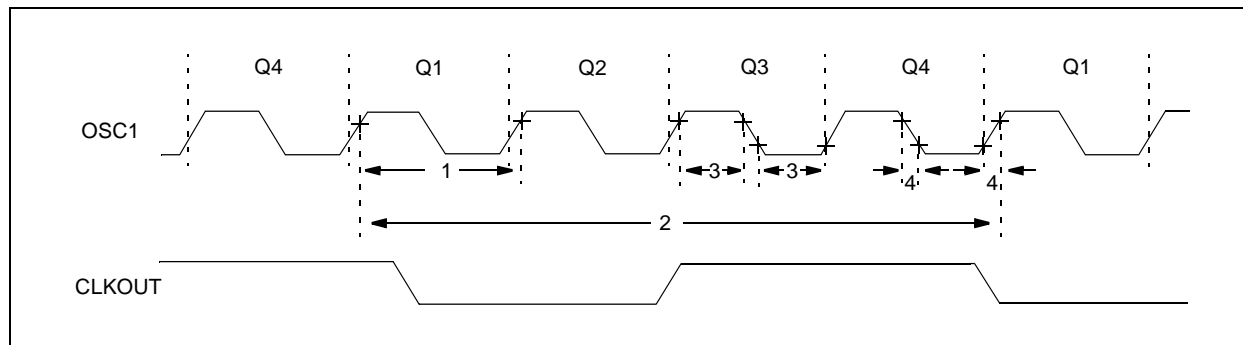
The ICEPIC low cost, in-circuit emulator is a solution for the Microchip Technology PIC16C5X, PIC16C6X, PIC16C7X and PIC16CXXX families of 8-bit One-Time-Programmable (OTP) microcontrollers. The modular system can support different subsets of PIC16C5X or PIC16CXXX products through the use of interchangeable personality modules, or daughter boards. The emulator is capable of emulating without target application circuitry being present.



# PIC16C5X

## 12.7 Timing Diagrams and Specifications

**FIGURE 12-2: EXTERNAL CLOCK TIMING - PIC16C54/55/56/57**



**TABLE 12-1: EXTERNAL CLOCK TIMING REQUIREMENTS - PIC16C54/55/56/57**

Standard Operating Conditions (unless otherwise specified)							
AC Characteristics		Operating Temperature					
		0°C ≤ TA ≤ +70°C for commercial					
		−40°C ≤ TA ≤ +85°C for industrial					
		−40°C ≤ TA ≤ +125°C for extended					
Param No.	Symbol	Characteristic	Min	Typ†	Max	Units	Conditions
1A	FOSC	External CLKIN Frequency <sup>(1)</sup>	DC	—	4.0	MHz	XT osc mode
			DC	—	10	MHz	10 MHz mode
			DC	—	20	MHz	HS osc mode (Comm/Ind)
			DC	—	16	MHz	HS osc mode (Ext)
			DC	—	40	kHz	LP osc mode
		Oscillator Frequency <sup>(1)</sup>	DC	—	4.0	MHz	RC osc mode
			0.1	—	4.0	MHz	XT osc mode
			4.0	—	10	MHz	10 MHz mode
			4.0	—	20	MHz	HS osc mode (Comm/Ind)
			4.0	—	16	MHz	HS osc mode (Ext)
			DC	—	40	kHz	LP osc mode

\* These parameters are characterized but not tested.

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

**Note 1:** 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.

When an external clock input is used, the "max" cycle time limit is "DC" (no clock) for all devices.

**2:** Instruction cycle period (TCY) equals four times the input oscillator time base period.

**TABLE 12-1: EXTERNAL CLOCK TIMING REQUIREMENTS - PIC16C54/55/56/57**

<b>Standard Operating Conditions (unless otherwise specified)</b> <b>AC Characteristics</b> Operating Temperature $0^{\circ}\text{C} \leq T_A \leq +70^{\circ}\text{C}$ for commercial $-40^{\circ}\text{C} \leq T_A \leq +85^{\circ}\text{C}$ for industrial $-40^{\circ}\text{C} \leq T_A \leq +125^{\circ}\text{C}$ for extended							
Param No.	Symbol	Characteristic	Min	Typ†	Max	Units	Conditions
1	TOSC	External CLKIN Period <sup>(1)</sup>	250	—	—	ns	XT osc mode
			100	—	—	ns	10 MHz mode
			50	—	—	ns	HS osc mode (Comm/Ind)
			62.5	—	—	ns	HS osc mode (Ext)
			25	—	—	μs	LP osc mode
		Oscillator Period <sup>(1)</sup>	250	—	—	ns	RC osc mode
			250	—	10,000	ns	XT osc mode
			100	—	250	ns	10 MHz mode
			50	—	250	ns	HS osc mode (Comm/Ind)
			62.5	—	250	ns	HS osc mode (Ext)
			25	—	—	μs	LP osc mode
2	Tcy	Instruction Cycle Time <sup>(2)</sup>	—	4/FOSC	—	—	
3	TosL, TosH	Clock in (OSC1) Low or High Time	85*	—	—	ns	XT oscillator
			20*	—	—	ns	HS oscillator
			2.0*	—	—	μs	LP oscillator
4	TosR, TosF	Clock in (OSC1) Rise or Fall Time	—	—	25*	ns	XT oscillator
			—	—	25*	ns	HS oscillator
			—	—	50*	ns	LP oscillator

\* These parameters are characterized but not tested.

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

**Note 1:** 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.

When an external clock input is used, the "max" cycle time limit is "DC" (no clock) for all devices.

**2:** Instruction cycle period (Tcy) equals four times the input oscillator time base period.

**TABLE 13-1: EXTERNAL CLOCK TIMING REQUIREMENTS - PIC16CR54A**

<b>Standard Operating Conditions (unless otherwise specified)</b> Operating Temperature $0^{\circ}\text{C} \leq T_A \leq +70^{\circ}\text{C}$ for commercial $-40^{\circ}\text{C} \leq T_A \leq +85^{\circ}\text{C}$ for industrial $-40^{\circ}\text{C} \leq T_A \leq +125^{\circ}\text{C}$ for extended							
Param No.	Symbol	Characteristic	Min	Typ†	Max	Units	Conditions
1	Tosc	External CLKIN Period <sup>(1)</sup>	250	—	—	ns	XT osc mode
			250	—	—	ns	HS osc mode (04)
			100	—	—	ns	HS osc mode (10)
			50	—	—	ns	HS osc mode (20)
			5.0	—	—	μs	LP osc mode
		Oscillator Period <sup>(1)</sup>	250	—	—	ns	RC osc mode
			250	—	10,000	ns	XT osc mode
			250	—	250	ns	HS osc mode (04)
			100	—	250	ns	HS osc mode (10)
			50	—	250	ns	HS osc mode (20)
			5.0	—	200	μs	LP osc mode
2	Tcy	Instruction Cycle Time <sup>(2)</sup>	—	4/Fosc	—	—	
3	TosL, TosH	Clock in (OSC1) Low or High Time	50*	—	—	ns	XT oscillator
			20*	—	—	ns	HS oscillator
			2.0*	—	—	μs	LP oscillator
4	TosR, TosF	Clock in (OSC1) Rise or Fall Time	—	—	25*	ns	XT oscillator
			—	—	25*	ns	HS oscillator
			—	—	50*	ns	LP oscillator

\* 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:** 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.

When an external clock input is used, the "max" cycle time limit is "DC" (no clock) for all devices.

**2:** Instruction cycle period (TCY) equals four times the input oscillator time base period.

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

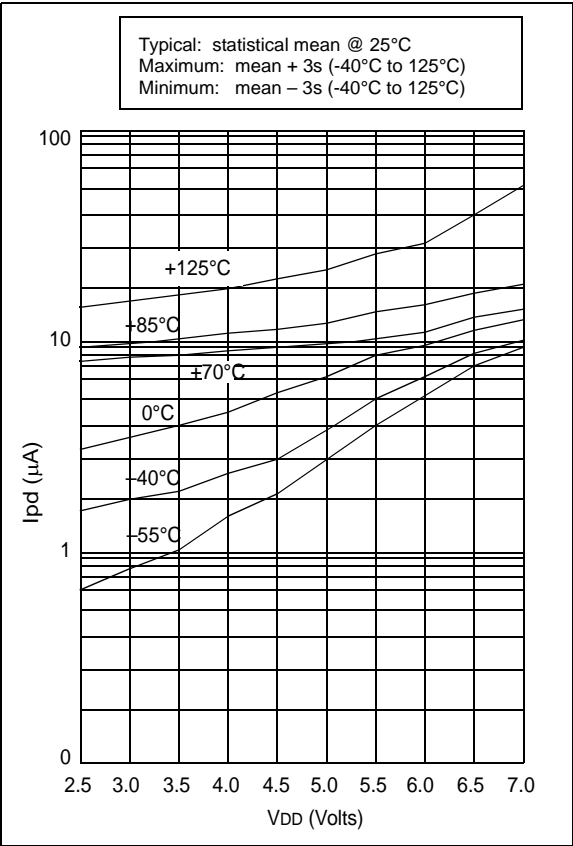


FIGURE 14-7: TYPICAL IPD vs. VDD, WATCHDOG ENABLED

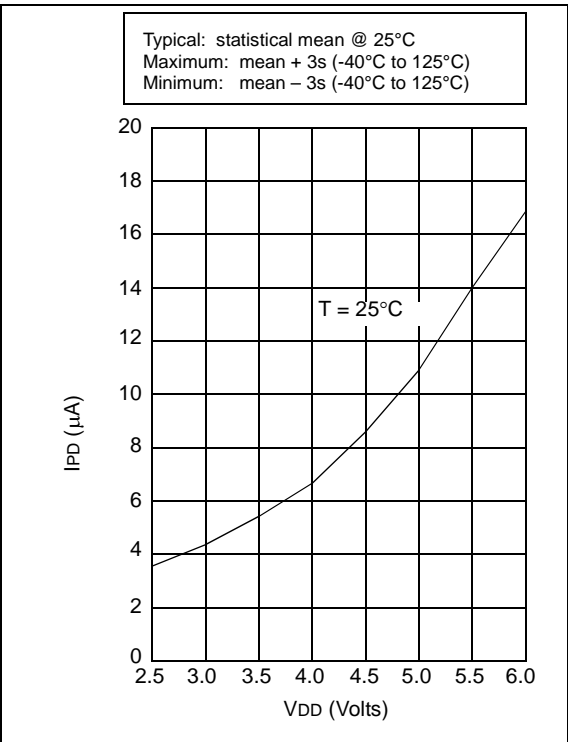
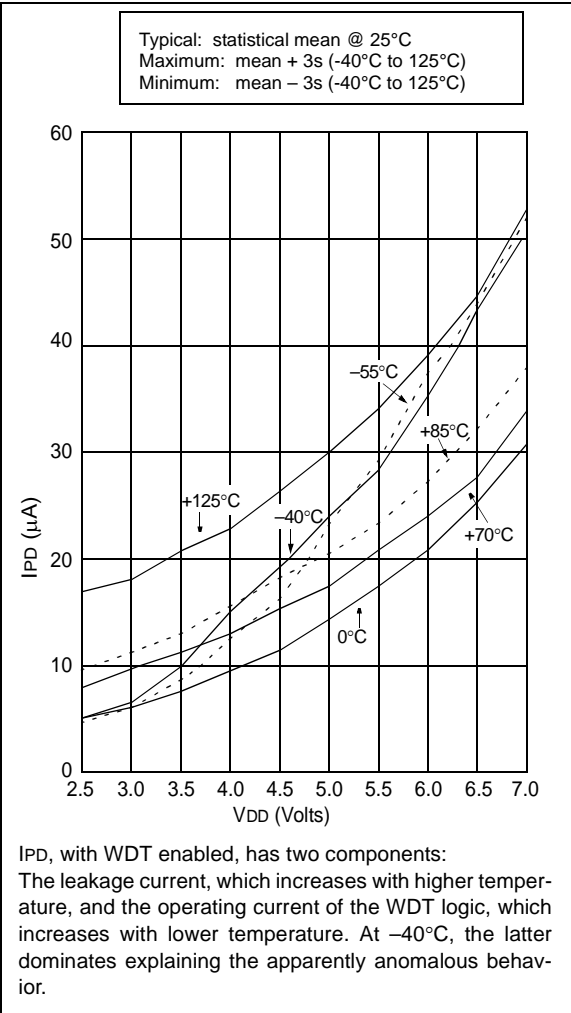
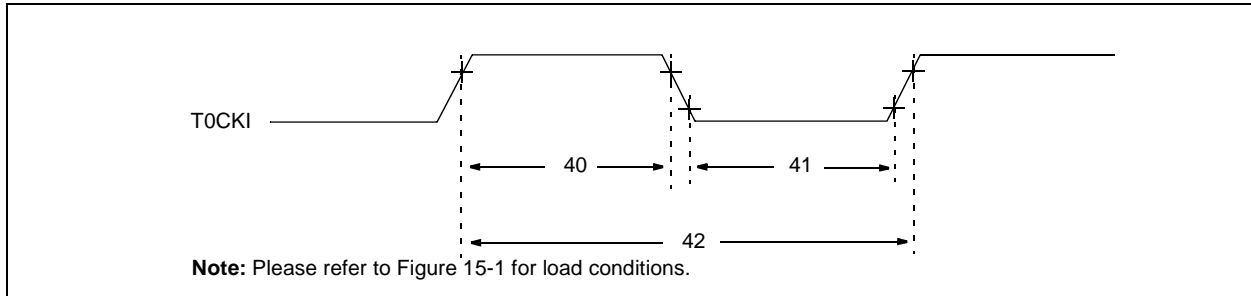


FIGURE 14-8: MAXIMUM IPD vs. VDD, WATCHDOG ENABLED



**FIGURE 15-5: TIMER0 CLOCK TIMINGS - PIC16C54A**



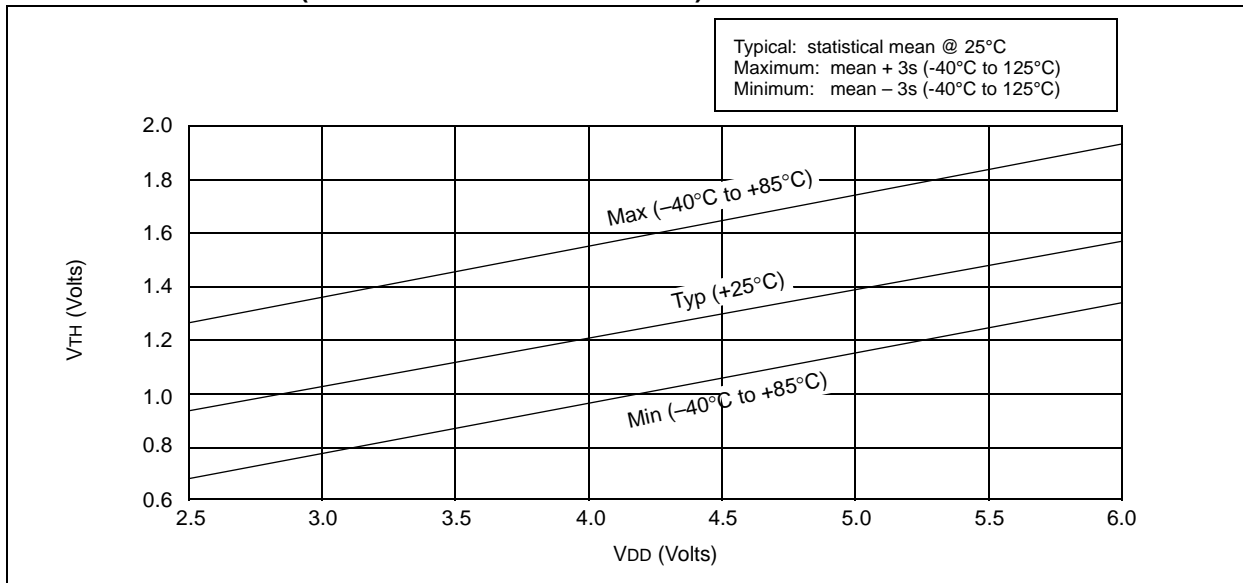
**TABLE 15-4: TIMER0 CLOCK REQUIREMENTS - PIC16C54A**

<b>Standard Operating Conditions (unless otherwise specified)</b> Operating Temperature $0^{\circ}\text{C} \leq T_A \leq +70^{\circ}\text{C}$ for commercial $-40^{\circ}\text{C} \leq T_A \leq +85^{\circ}\text{C}$ for industrial $-20^{\circ}\text{C} \leq T_A \leq +85^{\circ}\text{C}$ for industrial - PIC16LV54A-02I $-40^{\circ}\text{C} \leq T_A \leq +125^{\circ}\text{C}$ for extended							
<b>AC Characteristics</b>							
Param No.	Symbol	Characteristic	Min	Typ†	Max	Units	Conditions
40	Tt0H	T0CKI High Pulse Width					
		- No Prescaler	$0.5 T_{CY} + 20^*$	—	—	ns	
		- With Prescaler	$10^*$	—	—	ns	
41	Tt0L	T0CKI Low Pulse Width					
		- No Prescaler	$0.5 T_{CY} + 20^*$	—	—	ns	
		- With Prescaler	$10^*$	—	—	ns	
42	Tt0P	T0CKI Period	$20$ or $\frac{T_{CY} + 40^*}{N}$	—	—	ns	Whichever is greater. N = Prescale Value (1, 2, 4,..., 256)

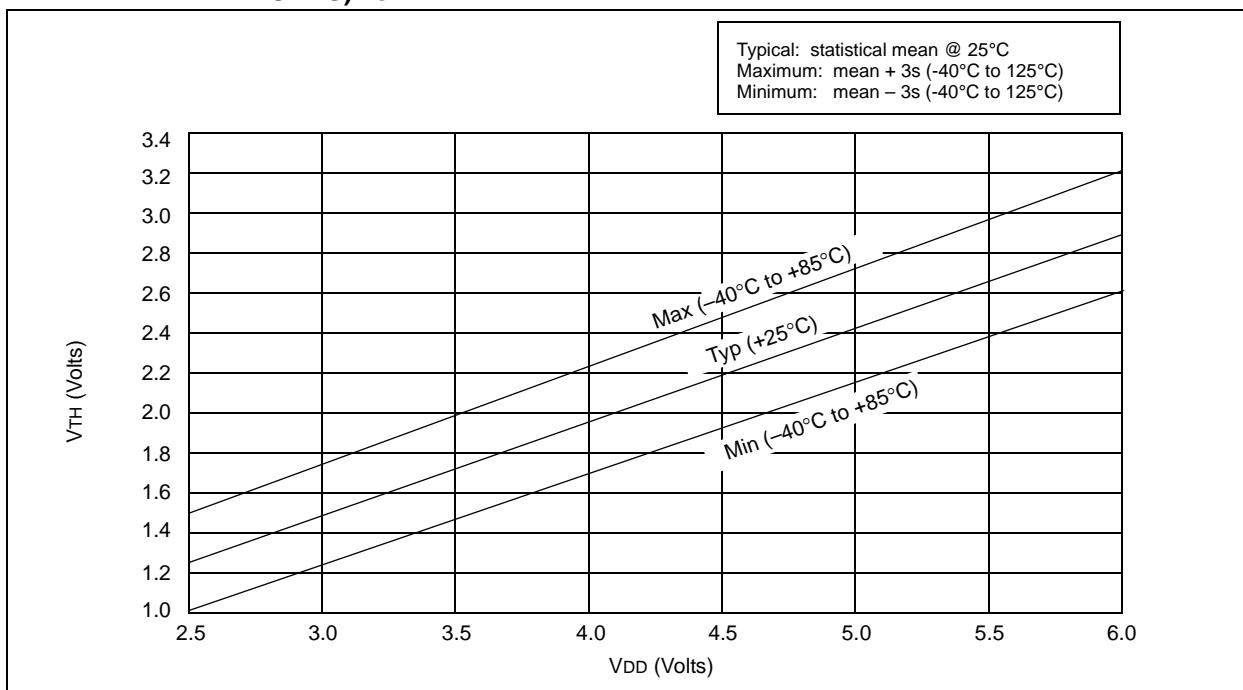
\* These parameters are characterized but not tested.

† Data in the Typical ("Typ") column is at 5V, 25°C unless otherwise stated. These parameters are for design guidance only and are not tested.

**FIGURE 16-7:  $V_{TH}$  (INPUT THRESHOLD VOLTAGE) OF I/O PINS -  $V_{DD}$**

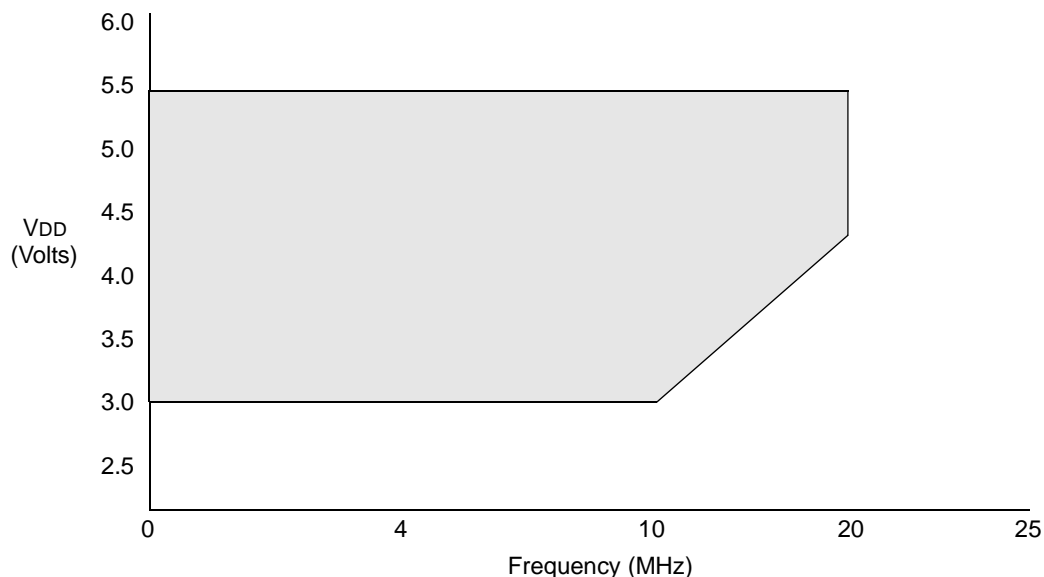


**FIGURE 16-8:  $V_{TH}$  (INPUT THRESHOLD VOLTAGE) OF OSC1 INPUT (IN XT, HS, AND LP MODES) vs.  $V_{DD}$**



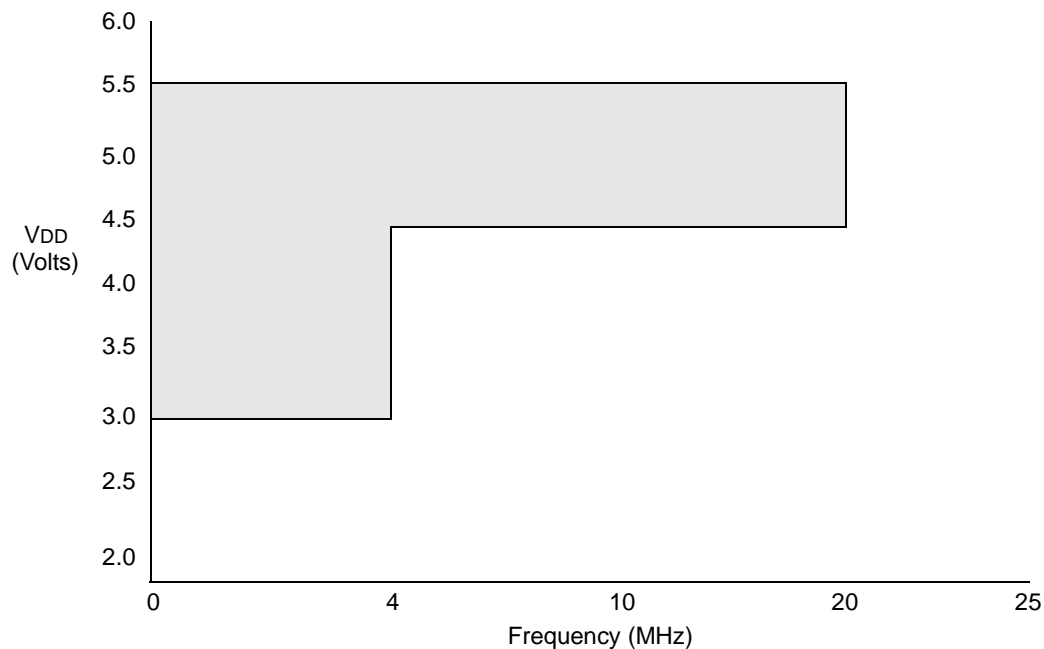
# PIC16C5X

**FIGURE 17-1: PIC16C54C/55A/56A/57C/58B-04, 20 VOLTAGE-FREQUENCY GRAPH,  $0^{\circ}\text{C} \leq T_A \leq +70^{\circ}\text{C}$  (COMMERCIAL TEMPS)**



- Note 1:** The shaded region indicates the permissible combinations of voltage and frequency.
- Note 2:** The maximum rated speed of the part limits the permissible combinations of voltage and frequency. Please reference the Product Identification System section for the maximum rated speed of the parts.

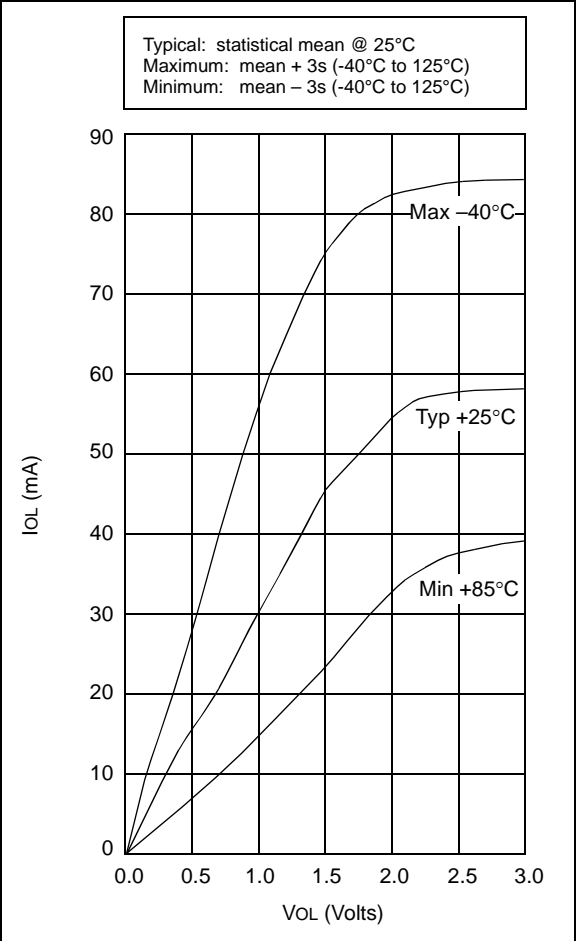
**FIGURE 17-2: PIC16C54C/55A/56A/57C/58B-04, 20 VOLTAGE-FREQUENCY GRAPH,  $-40^{\circ}\text{C} \leq T_A < 0^{\circ}\text{C}$ ,  $+70^{\circ}\text{C} < T_A \leq +125^{\circ}\text{C}$  (OUTSIDE OF COMMERCIAL TEMPS)**



- Note 1:** The shaded region indicates the permissible combinations of voltage and frequency.
- Note 2:** The maximum rated speed of the part limits the permissible combinations of voltage and frequency. Please reference the Product Identification System section for the maximum rated speed of the parts.

# PIC16C5X

**FIGURE 18-18:    PORTA, B AND C IoL vs.  
VOL, VDD = 5 V**



**TABLE 18-2:    INPUT CAPACITANCE**

Pin	Typical Capacitance (pF)	
	18L PDIP	18L SOIC
RA port	5.0	4.3
RB port	5.0	4.3
MCLR	17.0	17.0
OSC1	4.0	3.5
OSC2/CLKOUT	4.3	3.5
T0CKI	3.2	2.8

All capacitance values are typical at 25°C. A part-to-part variation of ±25% (three standard deviations) should be taken into account.



## 19.0 ELECTRICAL CHARACTERISTICS - PIC16LC54C 40MHz

### Absolute Maximum Ratings<sup>(†)</sup>

Ambient temperature under bias .....	–55°C to +125°C
Storage temperature .....	–65°C to +150°C
Voltage on VDD with respect to VSS .....	0 to +7.5V
Voltage on $\overline{\text{MCLR}}$ with respect to VSS.....	0 to +14V
Voltage on all other pins with respect to VSS .....	–0.6V to (VDD + 0.6V)
Total power dissipation <sup>(1)</sup> .....	800 mW
Max. current out of Vss pin .....	150 mA
Max. current into VDD pin .....	100 mA
Max. current into an input pin (T0CKI only) .....	±500 $\mu$ A
Input clamp current, I <sub>IK</sub> (V <sub>I</sub> < 0 or V <sub>I</sub> > VDD).....	±20 mA
Output clamp current, I <sub>OK</sub> (V <sub>O</sub> < 0 or V <sub>O</sub> > VDD) .....	±20 mA
Max. output current sunk by any I/O pin .....	25 mA
Max. output current sourced by any I/O pin .....	20 mA
Max. output current sourced by a single I/O (Port A, B or C) .....	50 mA
Max. output current sunk by a single I/O (Port A, B or C).....	50 mA

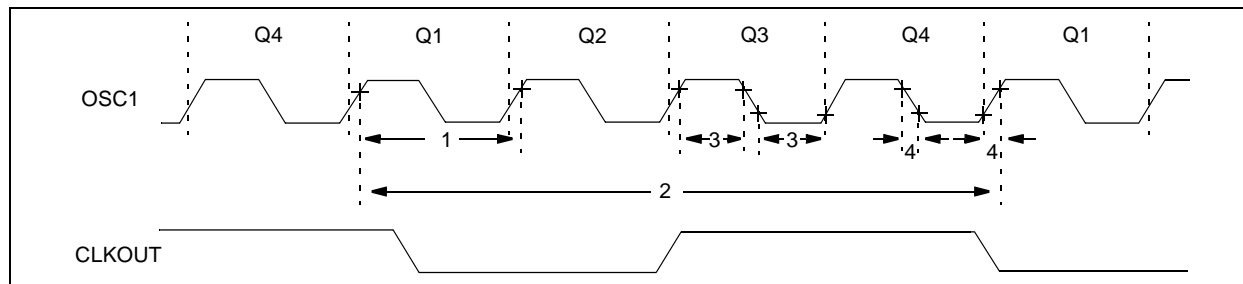
**Note 1:** Power dissipation is calculated as follows:  $P_{dis} = V_{DD} \times \{I_{DD} - \sum I_{OH}\} + \sum \{(V_{DD}-V_{OH}) \times I_{OH}\} + \sum (V_{OL} \times I_{OL})$

† NOTICE: Stresses above those listed under "Maximum Ratings" may cause permanent damage to the device. This is a stress rating only and functional operation of the device at those or any other conditions above those indicated in the operation listings of this specification is not implied. Exposure to maximum rating conditions for extended periods may affect device reliability.

# PIC16C5X

## 19.4 Timing Diagrams and Specifications

**FIGURE 19-3: EXTERNAL CLOCK TIMING - PIC16C5X-40**



**TABLE 19-1: EXTERNAL CLOCK TIMING REQUIREMENTS - PIC16C5X-40**

AC Characteristics		Standard Operating Conditions (unless otherwise specified) Operating Temperature $0^{\circ}\text{C} \leq T_A \leq +70^{\circ}\text{C}$ for commercial					
Param No.	Symbol	Characteristic	Min	Typ†	Max	Units	Conditions
	FOSC	External CLKIN Frequency <sup>(1)</sup>	20	—	40	MHz	HS osc mode
1	TOSC	External CLKIN Period <sup>(1)</sup>	25	—	—	ns	HS osc mode
2	Tcy	Instruction Cycle Time <sup>(2)</sup>	—	4/FOSC	—	—	
3	TosL, TosH	Clock in (OSC1) Low or High Time	6.0*	—	—	ns	HS oscillator
4	TosR, TosF	Clock in (OSC1) Rise or Fall Time	—	—	6.5*	ns	HS oscillator

\* These parameters are characterized but not tested.

† Data in the Typical ("Typ") column is at 5V, 25°C unless otherwise stated. These parameters are for design guidance only and are not tested.

**Note 1:** 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.

When an external clock input is used, the "max" cycle time limit is "DC" (no clock) for all devices.

**2:** Instruction cycle period (Tcy) equals four times the input oscillator time base period.

## 20.0 DEVICE CHARACTERIZATION - PIC16LC54C 40MHz

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 + 3 $\sigma$ ) or (mean – 3 $\sigma$ ) respectively, where  $\sigma$  is a standard deviation, over the whole temperature range.

**FIGURE 20-1: TYPICAL  $I_{PD}$  vs.  $V_{DD}$ , WATCHDOG DISABLED (25°C)**

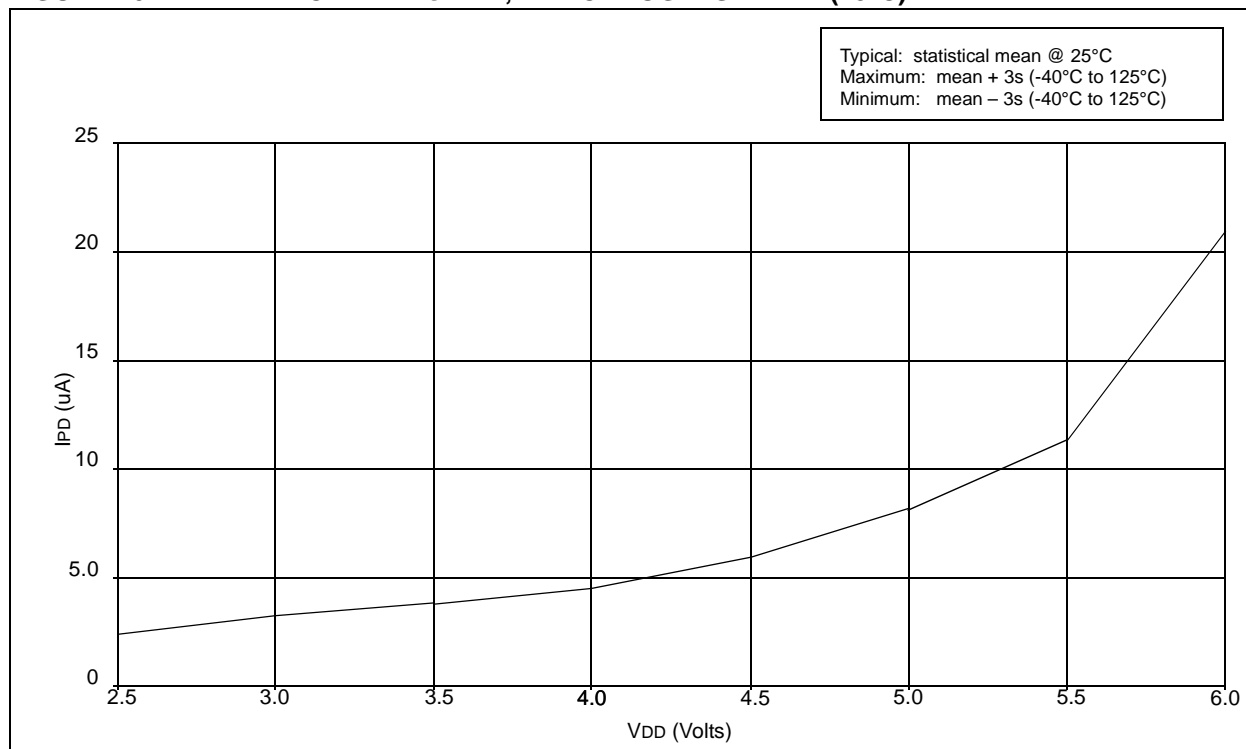


FIGURE 20-2: TYPICAL IPD vs. VDD, WATCHDOG ENABLED (25°C)

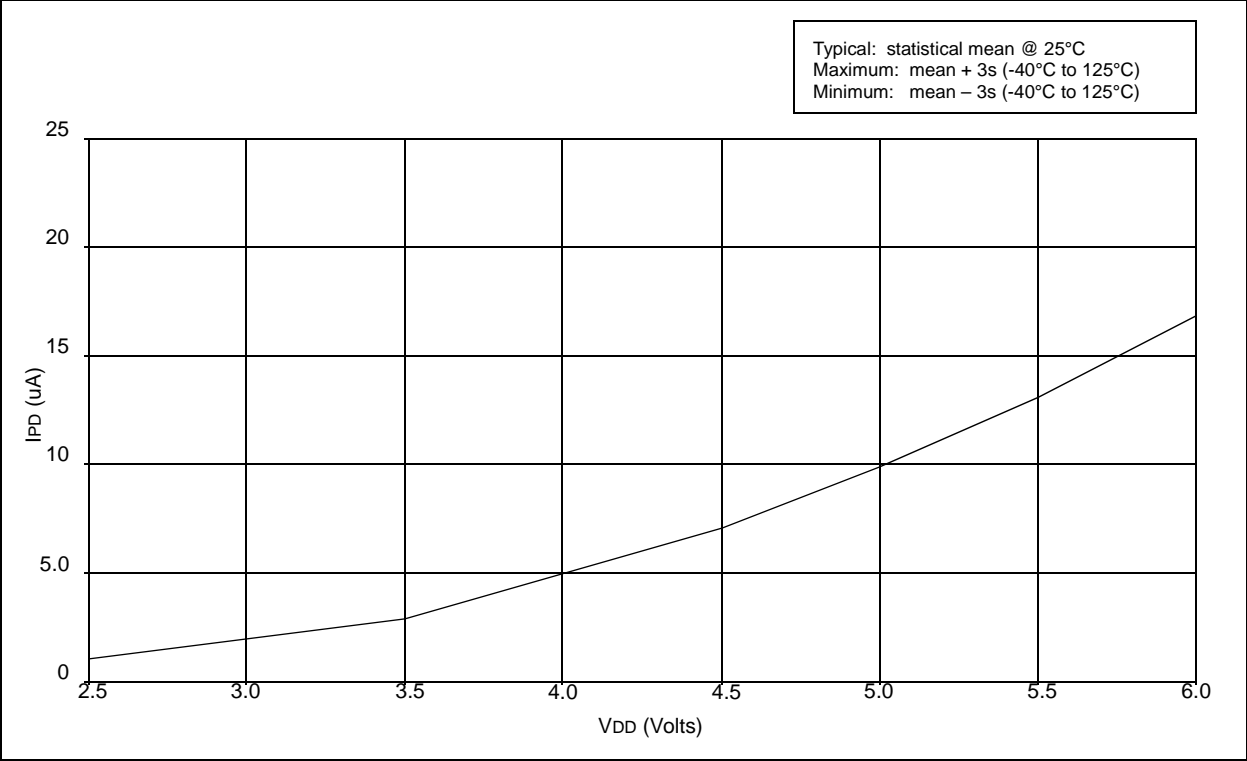
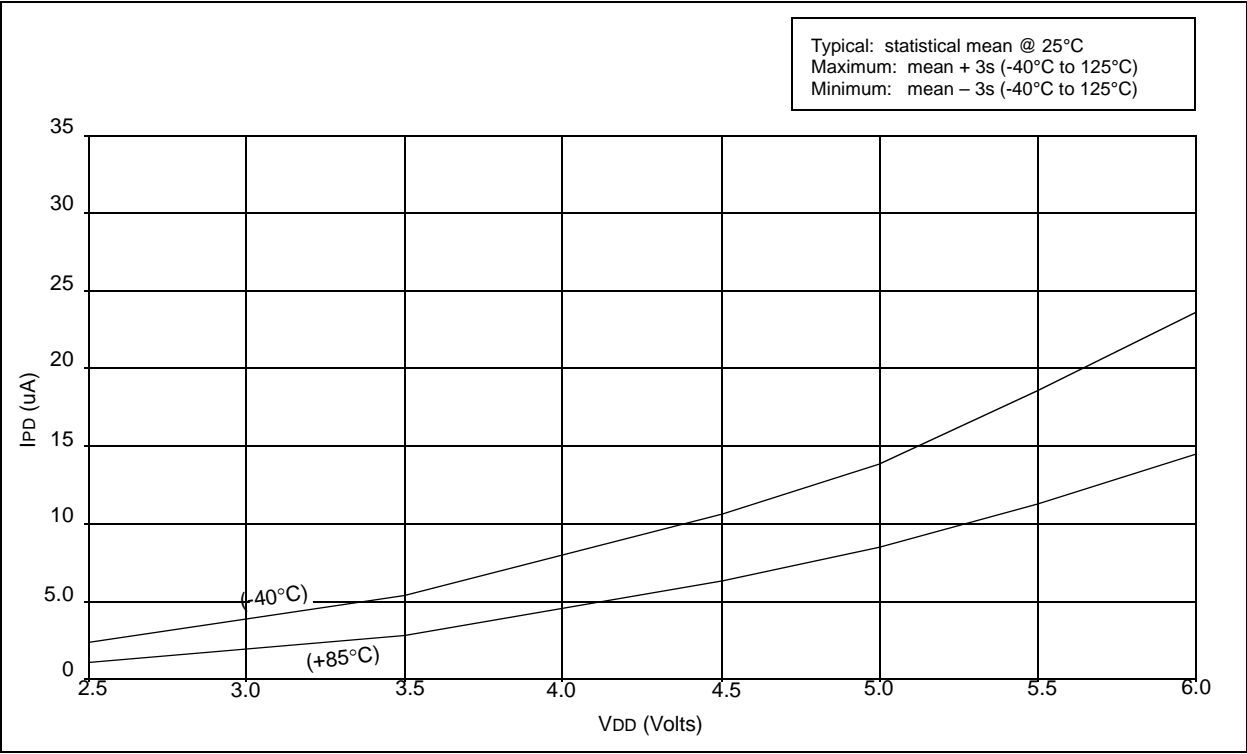
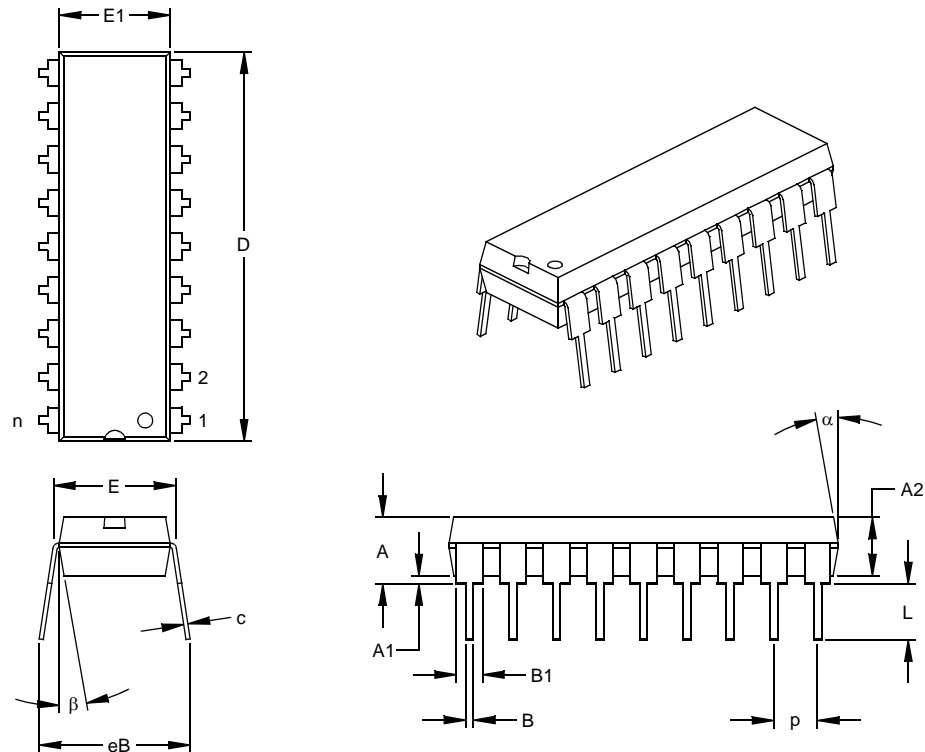


FIGURE 20-3: TYPICAL IPD vs. VDD, WATCHDOG ENABLED (-40°C, 85°C)



## 18-Lead Plastic Dual In-line (P) – 300 mil (PDIP)

**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		.100			2.54	
Top to Seating Plane	A	.140	.155	.170	3.56	3.94	4.32
Molded Package Thickness	A2	.115	.130	.145	2.92	3.30	3.68
Base to Seating Plane	A1	.015			0.38		
Shoulder to Shoulder Width	E	.300	.313	.325	7.62	7.94	8.26
Molded Package Width	E1	.240	.250	.260	6.10	6.35	6.60
Overall Length	D	.890	.898	.905	22.61	22.80	22.99
Tip to Seating Plane	L	.125	.130	.135	3.18	3.30	3.43
Lead Thickness	c	.008	.012	.015	0.20	0.29	0.38
Upper Lead Width	B1	.045	.058	.070	1.14	1.46	1.78
Lower Lead Width	B	.014	.018	.022	0.36	0.46	0.56
Overall Row Spacing	§ eB	.310	.370	.430	7.87	9.40	10.92
Mold Draft Angle Top	α	5	10	15	5	10	15
Mold Draft Angle Bottom	β	5	10	15	5	10	15

\* Controlling Parameter

§ Significant Characteristic

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-001

Drawing No. C04-007