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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 | 4MHz |
| 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) | 3V ~ 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/pic16c56a-04-ss |

**NOTES:**

**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 $V_{SS}$ or $V_{DD}$, if not in use, to reduce current consumption. |
| $\overline{MCLR}$ | 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. |
| $V_{DD}$ | 2 | 2 | 3,4 | P | — | Positive supply for logic and I/O pins. |
| $V_{SS}$ | 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

**NOTES:**

**FIGURE 5-3: TIME-OUT SEQUENCE ON POWER-UP ($\overline{MCLR}$ NOT TIED TO VDD)**

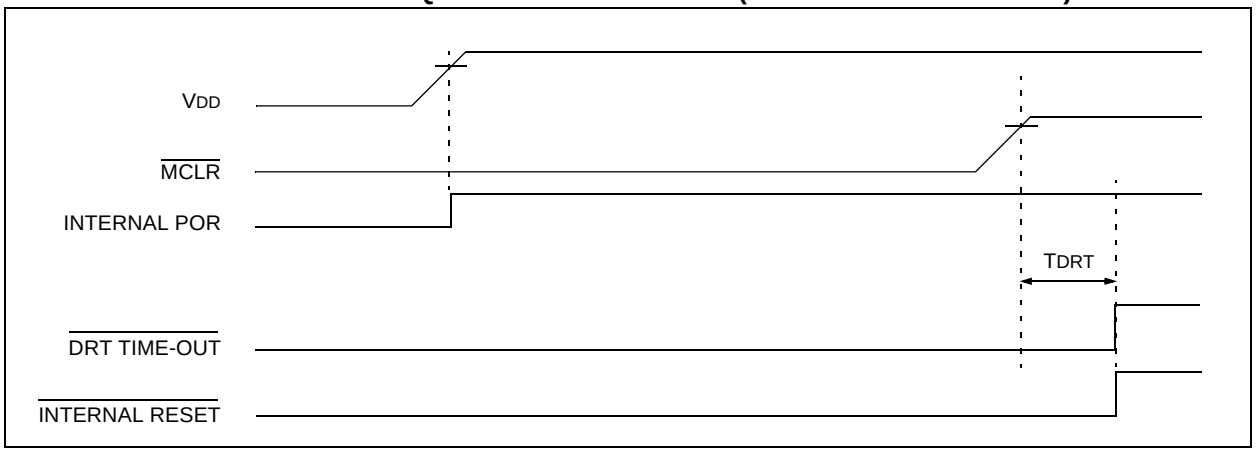



**FIGURE 5-4: TIME-OUT SEQUENCE ON POWER-UP ($\overline{MCLR}$ TIED TO VDD): FAST VDD RISE TIME**

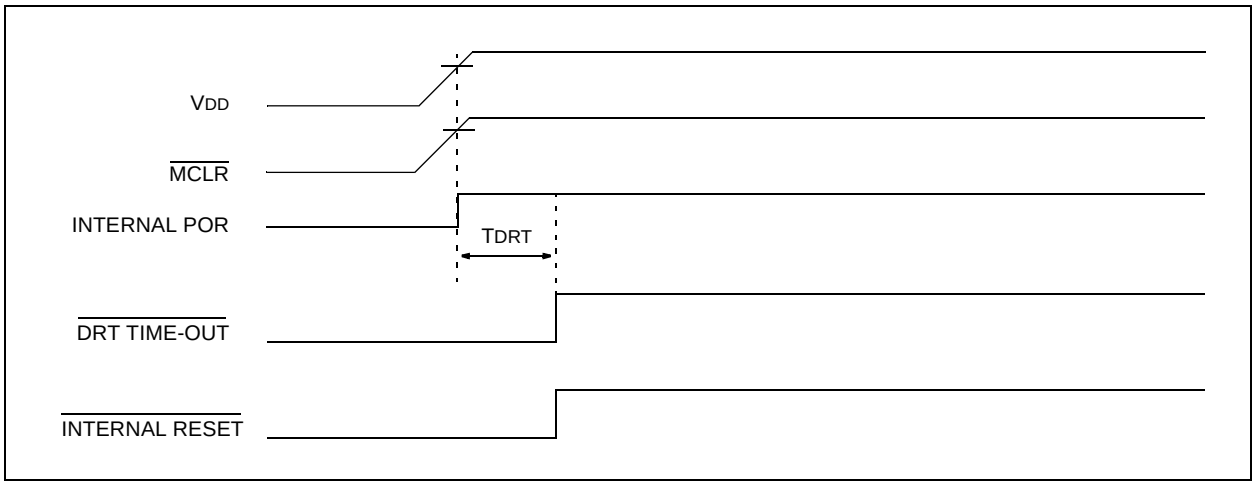
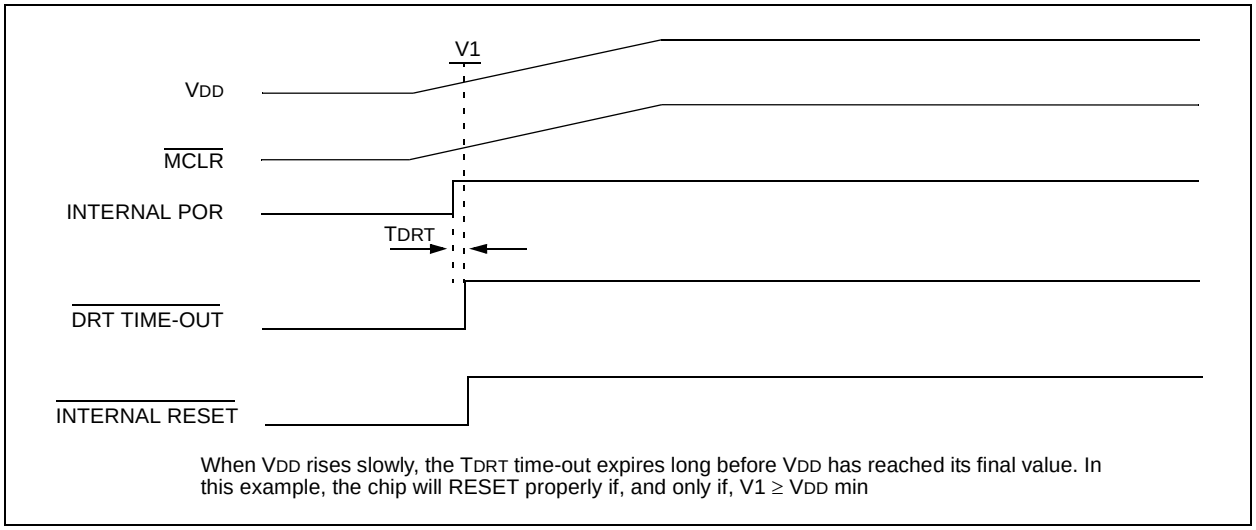



**FIGURE 5-5: TIME-OUT SEQUENCE ON POWER-UP ($\overline{MCLR}$ TIED TO VDD): SLOW VDD RISE TIME**




When VDD rises slowly, the TDRT time-out expires long before VDD has reached its final value. In this example, the chip will RESET properly if, and only if, V1 ≥ VDD min

## 6.2 Data Memory Organization

Data memory is composed of registers, or bytes of RAM. Therefore, data memory for a device is specified by its register file. The register file is divided into two functional groups: Special Function Registers and General Purpose Registers.

The Special Function Registers include the TMR0 register, the Program Counter (PC), the Status Register, the I/O registers (ports) and the File Select Register (FSR). In addition, Special Purpose Registers are used to control the I/O port configuration and prescaler options.

The General Purpose Registers are used for data and control information under command of the instructions.

For the PIC16C54, PIC16CR54, PIC16C56 and PIC16CR56, the register file is composed of 7 Special Function Registers and 25 General Purpose Registers (Figure 6-4).

For the PIC16C55, the register file is composed of 8 Special Function Registers and 24 General Purpose Registers.

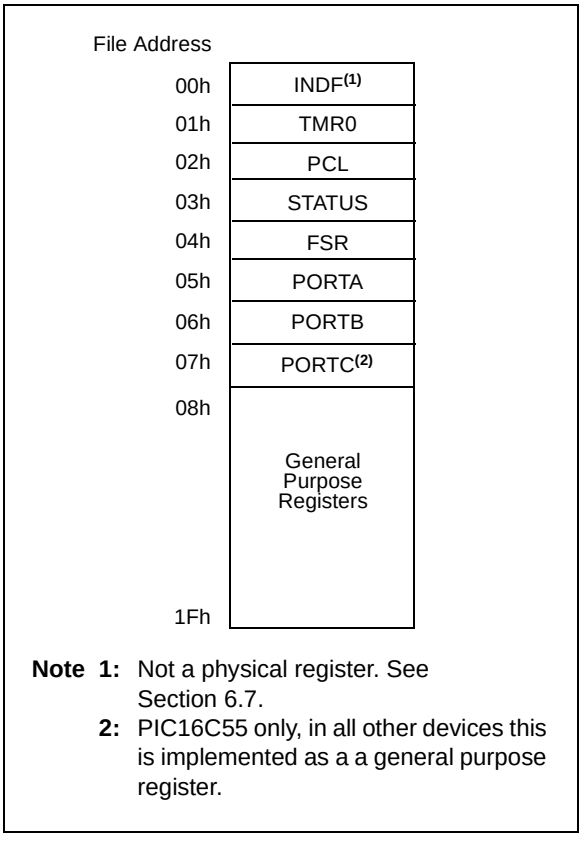
For the PIC16C57 and PIC16CR57, the register file is composed of 8 Special Function Registers, 24 General Purpose Registers and up to 48 additional General Purpose Registers that may be addressed using a banking scheme (Figure 6-5).

For the PIC16C58 and PIC16CR58, the register file is composed of 7 Special Function Registers, 25 General Purpose Registers and up to 48 additional General Purpose Registers that may be addressed using a banking scheme (Figure 6-6).

### 6.2.1 GENERAL PURPOSE REGISTER FILE

The register file is accessed either directly or indirectly through the File Select Register (FSR). The FSR Register is described in Section 6.7.

**FIGURE 6-4: PIC16C54, PIC16CR54, PIC16C55, PIC16C56, PIC16CR56 REGISTER FILE MAP**




**Note 1:** Not a physical register. See Section 6.7.

**2:** PIC16C55 only, in all other devices this is implemented as a a general purpose register.

## 12.3 DC Characteristics: PIC16C54/55/56/57-RCE, XTE, 10E, HSE, LPE (Extended)

| PIC16C54/55/56/57-RCE, XTE, 10E, HSE, LPE (Extended) | | | Standard Operating Conditions (unless otherwise specified) Operating Temperature –40°C ≤ TA ≤ +125°C for extended | | | | |
|---|---|---|---|---|---|---|---|
| **Param No.** | **Symbol** | **Characteristic/Device** | **Min** | **Typ†** | **Max** | **Units** | **Conditions** |
| D001 | VDD | **Supply Voltage** | | | | | |
| | | PIC16C5X-RCE | 3.25 | — | 6.0 | V | |
| | | PIC16C5X-XTE | 3.25 | — | 6.0 | V | |
| | | PIC16C5X-10E | 4.5 | — | 5.5 | V | |
| | | PIC16C5X-HSE | 4.5 | — | 5.5 | V | |
| | | PIC16C5X-LPE | 2.5 | — | 6.0 | V | |
| 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 |
| D010 | IDD | **Supply Current(2)** | | | | | |
| | | PIC16C5X-RCE(3) | — | 1.8 | 3.3 | mA | FOSC = 4 MHz, VDD = 5.5V |
| | | PIC16C5X-XTE | — | 1.8 | 3.3 | mA | FOSC = 4 MHz, VDD = 5.5V |
| | | PIC16C5X-10E | — | 4.8 | 10 | mA | FOSC = 10 MHz, VDD = 5.5V |
| | | PIC16C5X-HSE | — | 4.8 | 10 | mA | FOSC = 10 MHz, VDD = 5.5V |
| | | PIC16C5X-HSE | — | 9.0 | 20 | mA | FOSC = 16 MHz, VDD = 5.5V |
| | | PIC16C5X-LPE | — | 19 | 55 | μA | FOSC = 32 kHz, VDD = 3.25V, WDT disabled |
| D020 | IPD | **Power-down Current(2)** | — | 5.0 | 22 | μA | VDD = 3.25V, WDT enabled |
| | | | — | 0.8 | 18 | μA | VDD = 3.25V, 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 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.

## 13.5 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 |

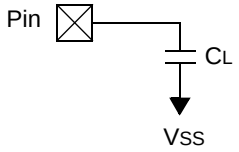
Lowercase letters (pp) and their meanings:

| 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 |

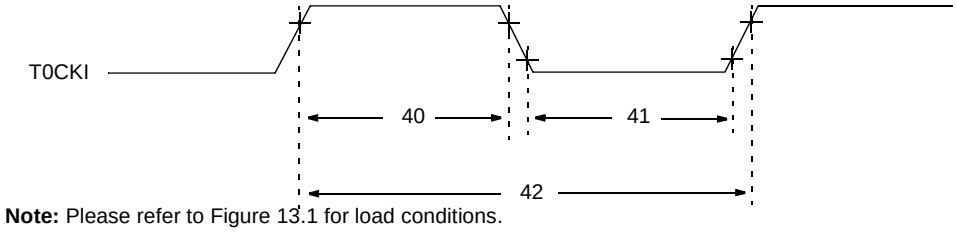
**FIGURE 13-1: LOAD CONDITIONS FOR DEVICE TIMING SPECIFICATIONS - PIC16CR54A**




$C_L$ = 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 13-5: TIMER0 CLOCK TIMINGS - PIC16CR54A**




**Note:** Please refer to Figure 13.1 for load conditions.

**TABLE 13-4: TIMER0 CLOCK REQUIREMENTS - PIC16CR54A**

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

* 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.

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

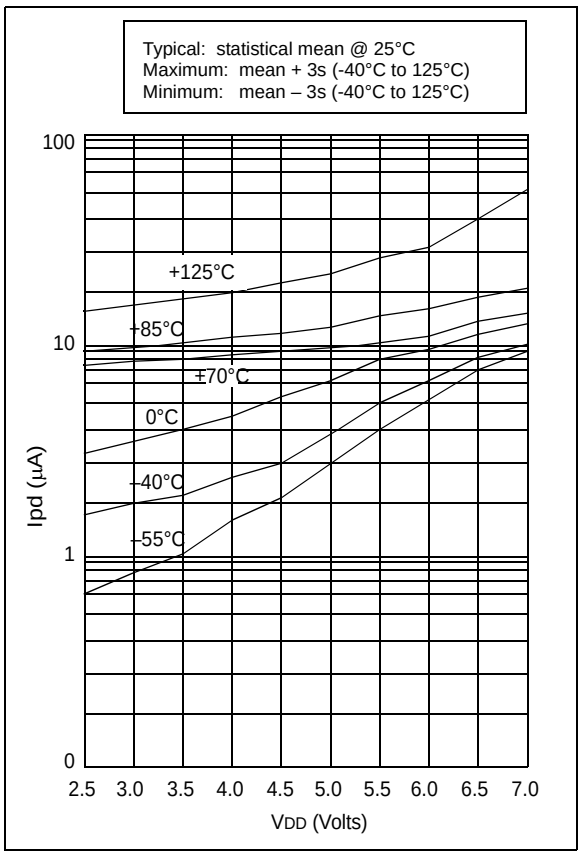



**FIGURE 14-7: TYPICAL IPD vs. VDD, WATCHDOG ENABLED**

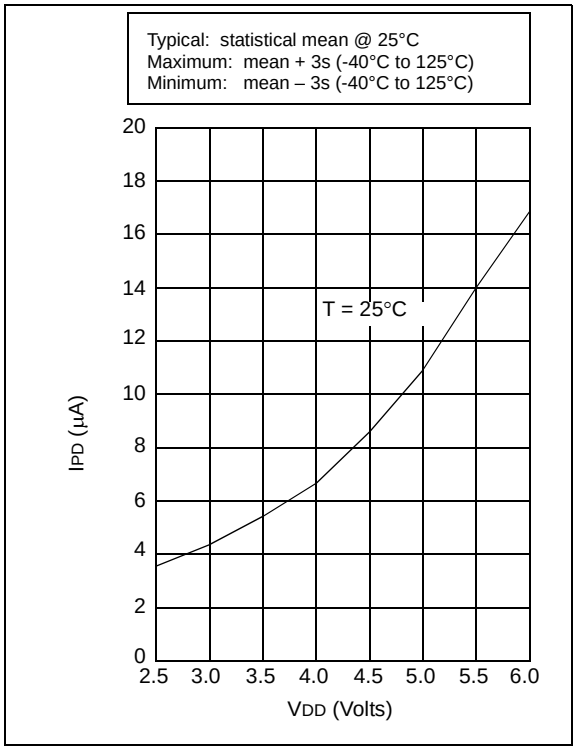
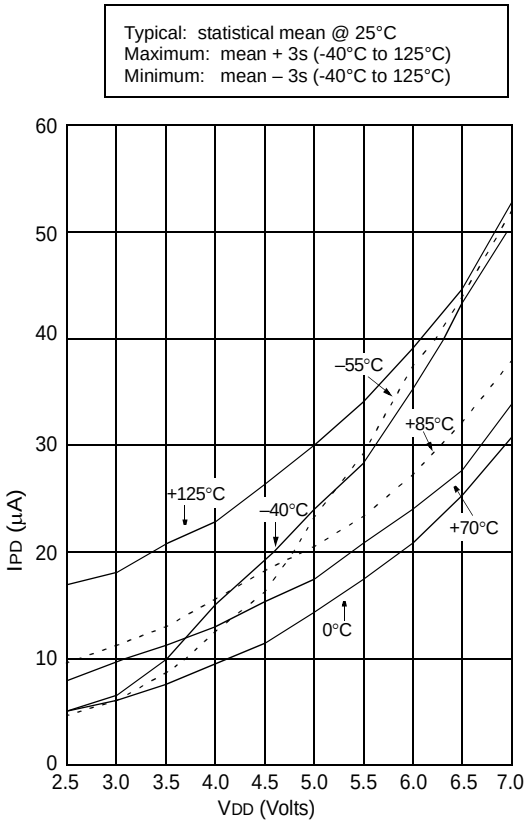



**FIGURE 14-8: MAXIMUM IPD vs. VDD, WATCHDOG ENABLED**




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.

## 15.0 ELECTRICAL CHARACTERISTICS - PIC16C54A

Absolute Maximum Ratings(†)

Ambient temperature under bias ..... –55°C to +125°C

Storage temperature ..... –65°C to +150°C

Voltage on $V_{DD}$ with respect to $V_{SS}$ ..... 0 to +7.5V

Voltage on $\overline{MCLR}$ with respect to $V_{SS}$ ..... 0 to +14V

Voltage on all other pins with respect to $V_{SS}$ ..... –0.6V to ($V_{DD}$ + 0.6V)

Total power dissipation(1) ..... 800 mW

Max. current out of $V_{SS}$ pin ..... 150 mA

Max. current into $V_{DD}$ pin ..... 100 mA

Max. current into an input pin (T0CKI only) ..... ±500 µA

Input clamp current, $I_{IK}$ ($V_I$ < 0 or $V_I$ > $V_{DD}$) ..... ±20 mA

Output clamp current, $I_{OK}$ ($V_O$ < 0 or $V_O$ > $V_{DD}$) ..... ±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 (PORTA or B) ..... 50 mA

Max. output current sunk by a single I/O port (PORTA or B) ..... 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.

**TABLE 15-1: EXTERNAL CLOCK TIMING REQUIREMENTS - PIC16C54A**

| AC Characteristics | Standard Operating Conditions (unless otherwise specified)<br>Operating Temperature 0°C ≤ TA ≤ +70°C for commercial<br>–40°C ≤ TA ≤ +85°C for industrial<br>–20°C ≤ TA ≤ +85°C for industrial - PIC16LV54A-02I<br>–40°C ≤ TA ≤ +125°C for extended | | | | | | |
|---|---|---|---|---|---|---|---|
| **Param No.** | **Symbol** | **Characteristic** | **Min** | **Typ†** | **Max** | **Units** | **Conditions** |
| 1 | TOSC | External CLKIN Period(1) | 250 | — | — | ns | XT OSC mode |
| | | | 500 | — | — | ns | XT OSC mode (PIC16LV54A) |
| | | | 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(1) | 250 | — | — | ns | RC OSC mode |
| | | | 500 | — | — | ns | RC OSC mode (PIC16LV54A) |
| | | | 250 | — | 10,000 | ns | XT OSC mode |
| | | | 500 | — | — | ns | XT OSC mode (PIC16LV54A) |
| | | | 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(2) | — | 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.

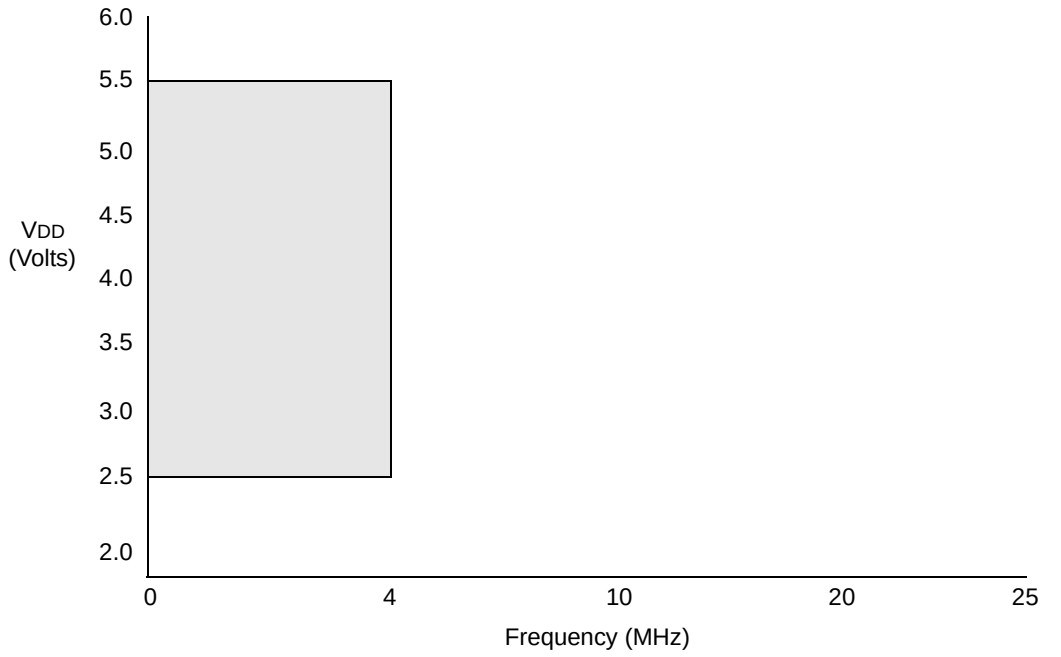
† Data in the Typical ("Typ") column is based on characterization results at 25°C. This data is for design guidance only and is not tested.

**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.

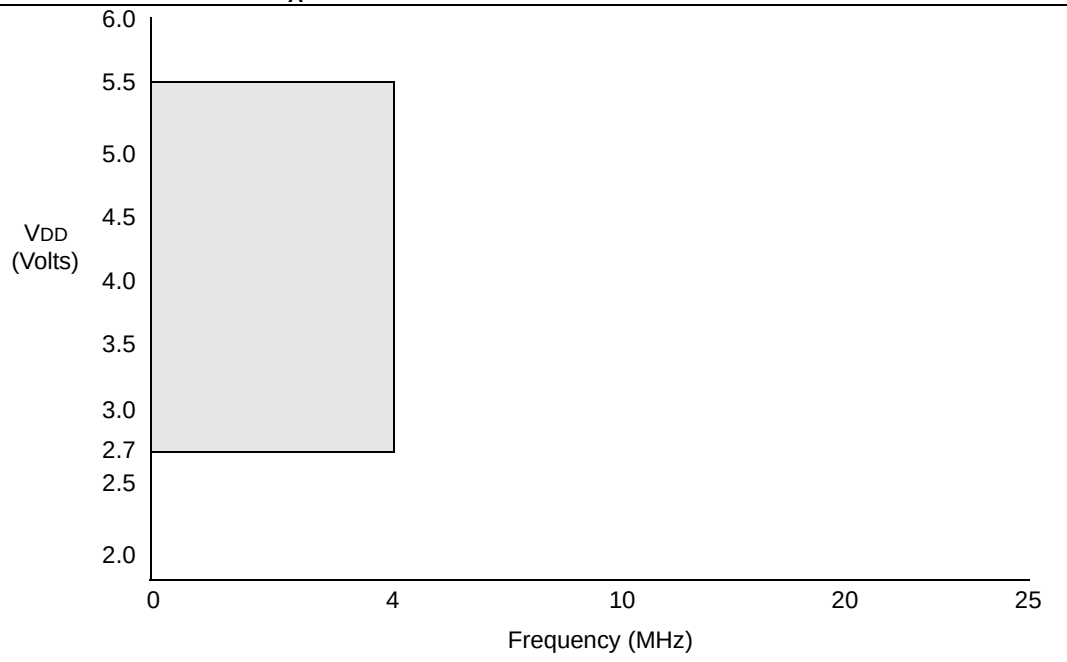
**FIGURE 17-3: PIC16LC54C/55A/56A/57C/58B VOLTAGE-FREQUENCY GRAPH, $0°C \leq T_A \leq +85°C$**




**Note 1:** The shaded region indicates the permissible combinations of voltage and frequency.

**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 17-4: PIC16LC54C/55A/56A/57C/58B VOLTAGE-FREQUENCY GRAPH, $-40°C \leq T_A \leq 0°C$**




**Note 1:** The shaded region indicates the permissible combinations of voltage and frequency.

**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.

## 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**<br>**PIC16LCR5X**<br>(Commercial, Industrial) | | | **Standard Operating Conditions (unless otherwise specified)**<br>Operating Temperature 0°C ≤ TA ≤ +70°C for commercial<br>–40°C ≤ TA ≤ +85°C for industrial | | | | |
| **PIC16C5X**<br>**PIC16CR5X**<br>(Commercial, Industrial) | | | **Standard Operating Conditions (unless otherwise specified)**<br>Operating Temperature 0°C ≤ TA ≤ +70°C for commercial<br>–40°C ≤ TA ≤ +85°C for industrial | | | | |
| **Param No.** | **Symbol** | **Characteristic/Device** | **Min** | **Typ†** | **Max** | **Units** | **Conditions** |
| | IPD | **Power-down Current(2)** | | | | | |
| D020 | | PIC16LC5X | — | 0.25 | 2 | µA | VDD = 2.5V, WDT disabled, Commercial |
| | | | — | 0.25 | 3 | µA | VDD = 2.5V, WDT disabled, Industrial |
| | | | — | 1 | 5 | µA | VDD = 2.5V, WDT enabled, Commercial |
| | | | — | 1.25 | 8 | µA | VDD = 2.5V, WDT enabled, Industrial |
| D020A | | PIC16C5X | — | 0.25 | 4.0 | µA | VDD = 3.0V, WDT disabled, Commercial |
| | | | — | 0.25 | 5.0 | µA | VDD = 3.0V, WDT disabled, Industrial |
| | | | — | 1.8 | 7.0* | µA | VDD = 5.5V, WDT disabled, Commercial |
| | | | — | 2.0 | 8.0* | µA | VDD = 5.5V, WDT disabled, Industrial |
| | | | — | 4 | 12* | µA | VDD = 3.0V, WDT enabled, Commercial |
| | | | — | 4 | 14* | µA | VDD = 3.0V, WDT enabled, Industrial |
| | | | — | 9.8 | 27* | µA | VDD = 5.5V, WDT enabled, Commercial |
| | | | — | 12 | 30* | µA | VDD = 5.5V, WDT enabled, Industrial |

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, $\overline{MCLR}$ = 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.

## 17.4 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 |

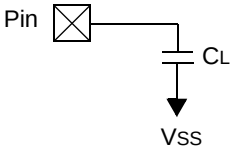
Lowercase letters (pp) and their meanings:

| | |
|---|---|
| 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 17-5: LOAD CONDITIONS FOR DEVICE TIMING SPECIFICATIONS - PIC16C54C/CR54C/C55A/C56A/CR56A/C57C/CR57C/C58B/CR58B-04, 20**




$C_L$ = 50 pF for all pins and OSC2 for RC mode

0 -15 pF for OSC2 in XT, HS or LP modes when external clock is used to drive OSC1

**FIGURE 18-4: TYPICAL RC OSCILLATOR FREQUENCY vs. VDD, CEXT = 300 pF, 25°C**

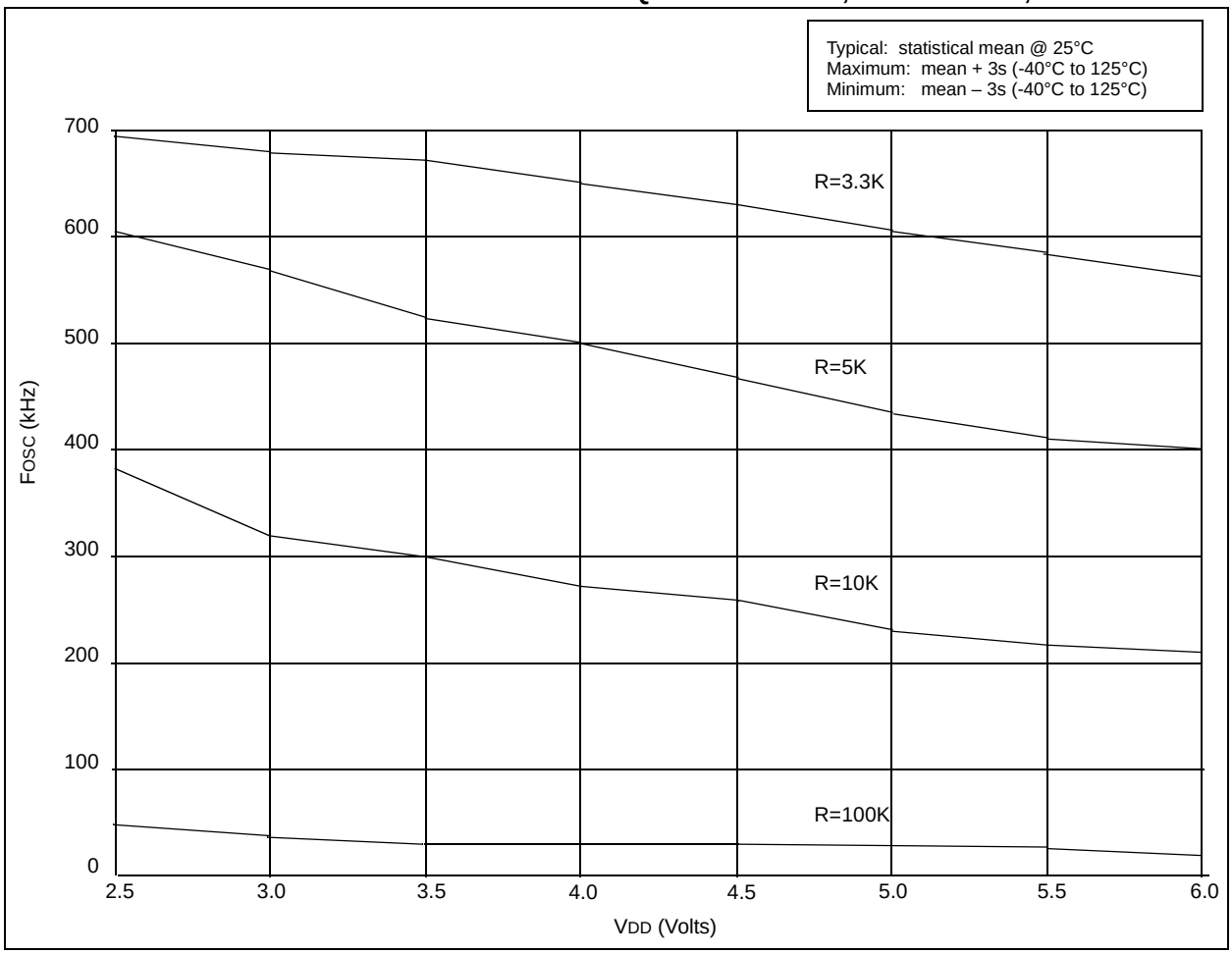



**FIGURE 18-5: TYPICAL IPD vs. VDD, WATCHDOG DISABLED (25°C)**

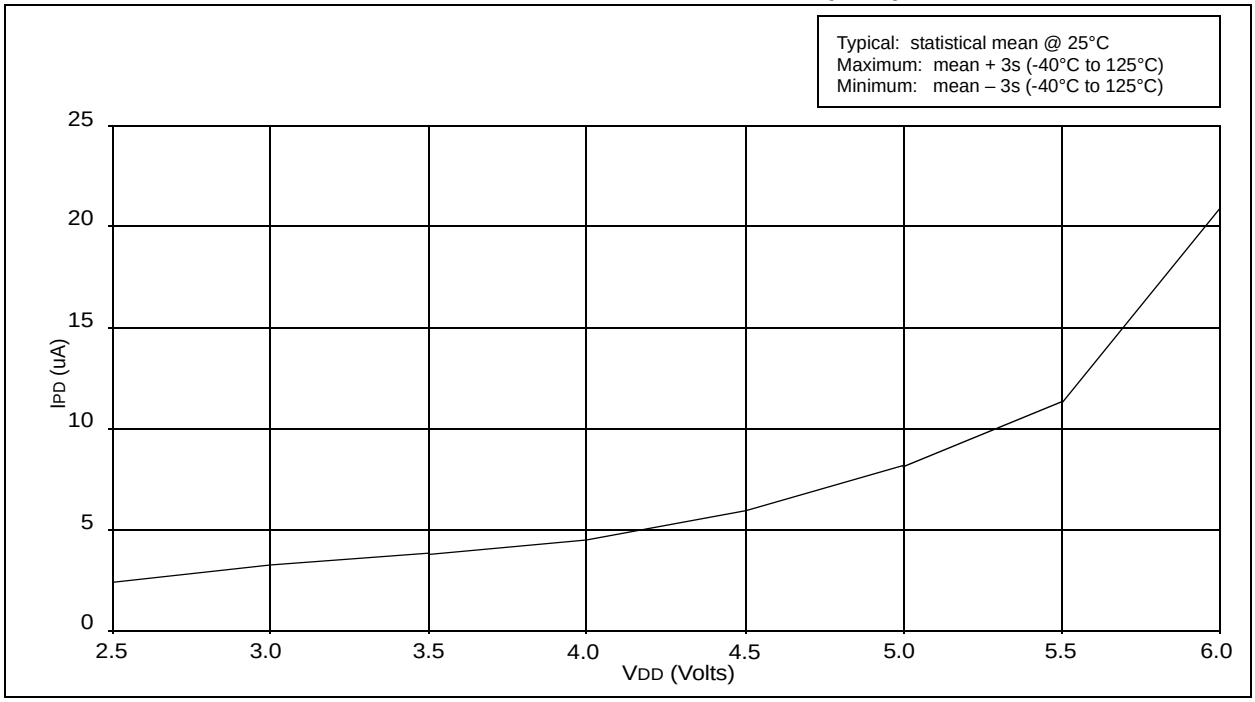
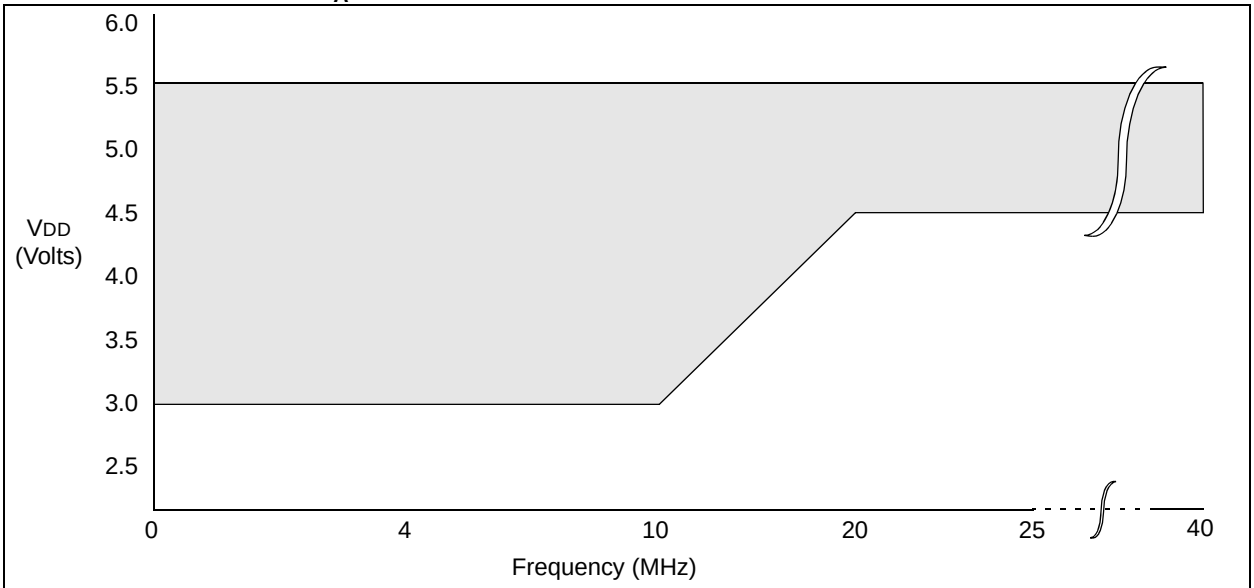


**FIGURE 19-1: PIC16C54C/C55A/C56A/C57C/C58B-40 VOLTAGE-FREQUENCY GRAPH, $0°C \leq T_A \leq +70°C$**




**Note 1:** The shaded region indicates the permissible combinations of voltage and frequency.

**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.

**3:** Operation between 20 to 40 MHz requires the following:

- VDD between 4.5V. and 5.5V
- OSC1 externally driven
- OSC2 not connected
- HS mode
- Commercial temperatures

Devices qualified for 40 MHz operation have -40 designation (ex: PIC16C54C-40/P).

**4:** For operation between DC and 20 MHz, see Section 17.1.

**FIGURE 20-4: VTH (INPUT THRESHOLD TRIP POINT VOLTAGE) OF I/O PINS vs. VDD**

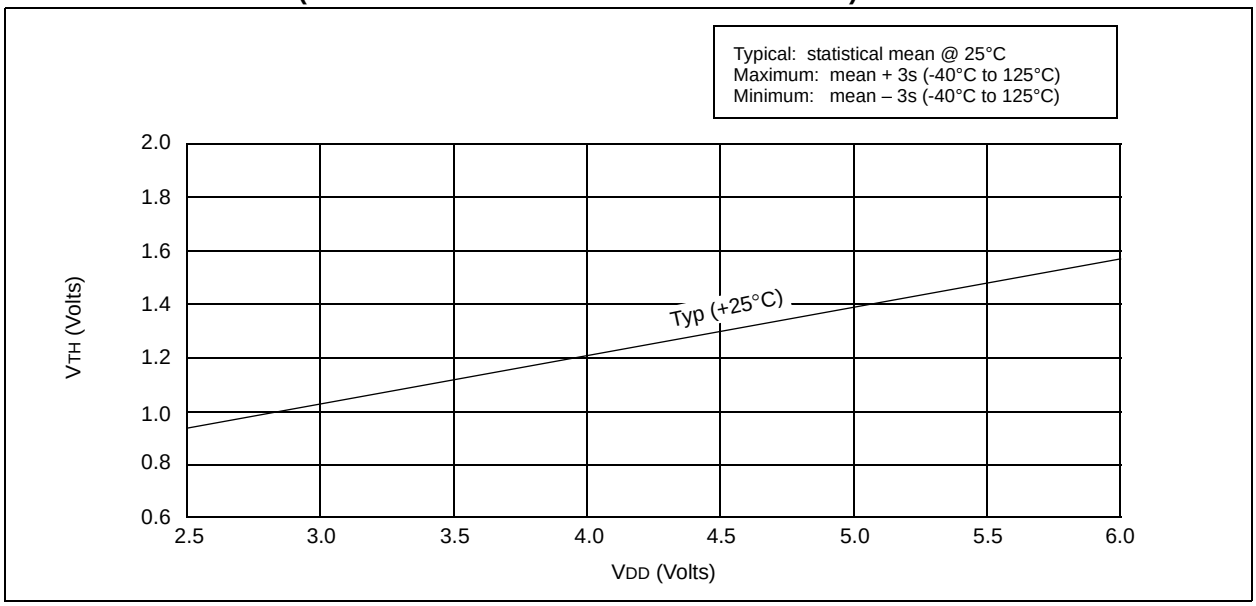
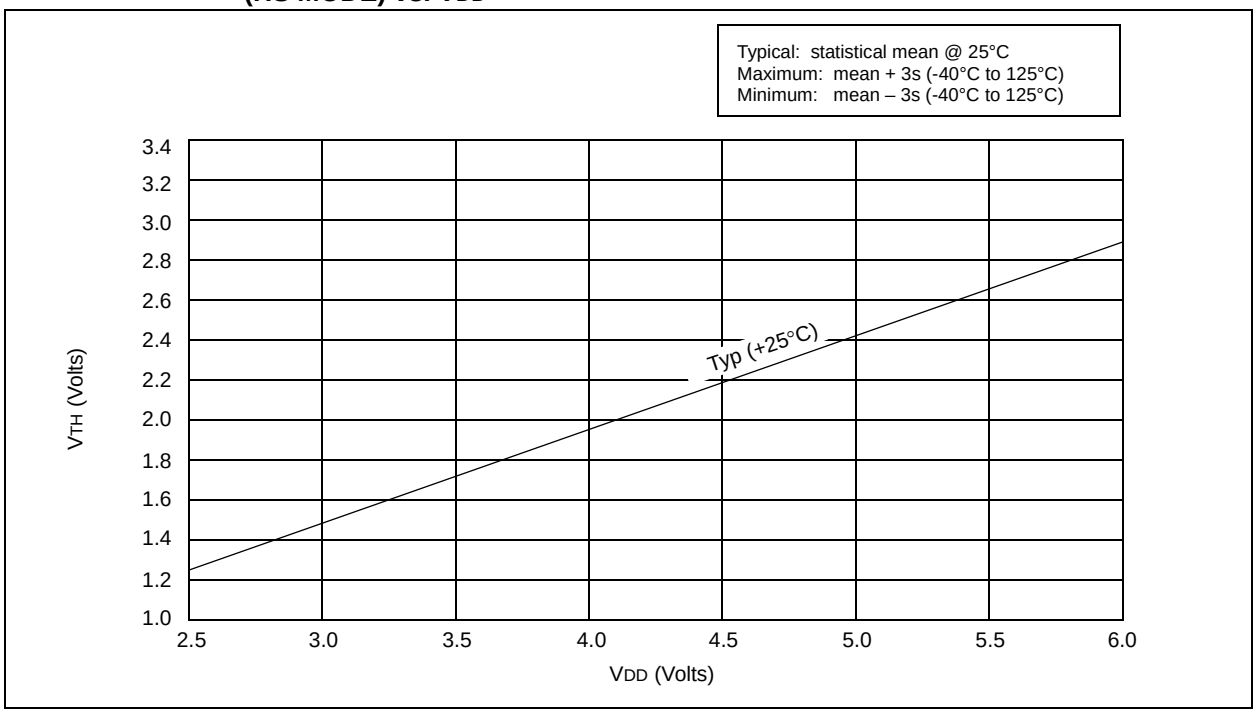


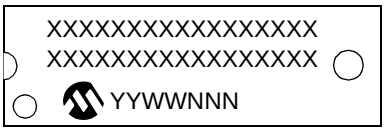

**FIGURE 20-5: VTH (INPUT THRESHOLD TRIP POINT VOLTAGE) OF OSC1 INPUT (HS MODE) vs. VDD**



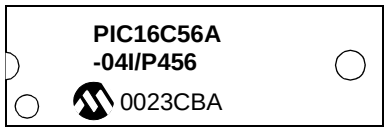
## 21.0 PACKAGING INFORMATION

### 21.1 Package Marketing Information

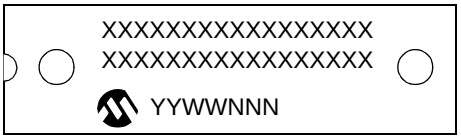
18-Lead PDIP



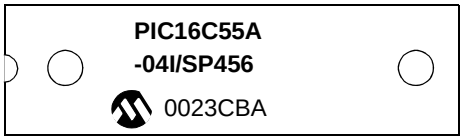

Example



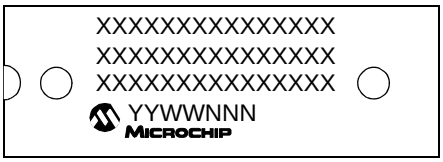

28-Lead Skinny PDIP (.300")



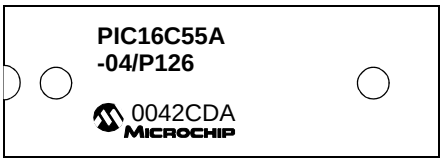

Example




28-Lead PDIP (.600")



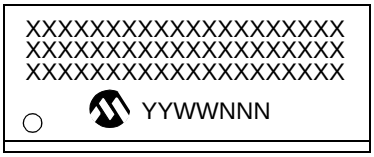

Example




18-Lead SOIC

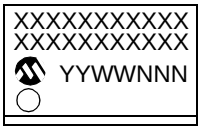

Example


28-Lead SOIC




Example


20-Lead SSOP



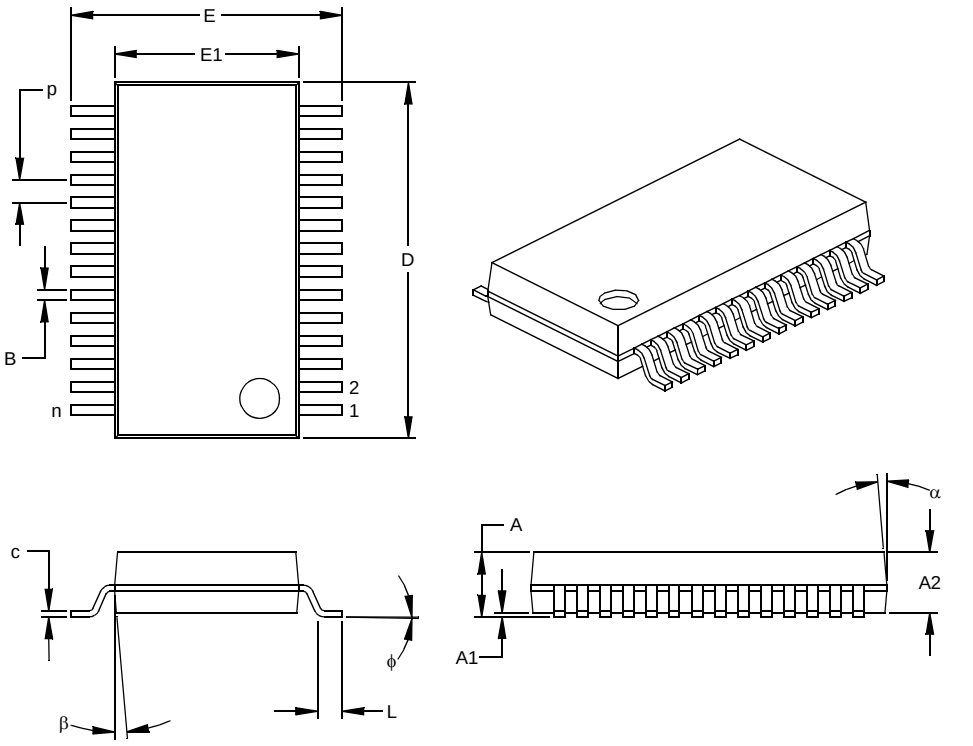

Example


28-Lead SSOP


Example

### 28-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 | | 28 | | | 28 | |
| Pitch | p | | .026 | | | 0.65 | |
| 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 | .319 | 7.59 | 7.85 | 8.10 |
| Molded Package Width | E1 | .201 | .207 | .212 | 5.11 | 5.25 | 5.38 |
| Overall Length | D | .396 | .402 | .407 | 10.06 | 10.20 | 10.34 |
| 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
§ 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-150
Drawing No. C04-073

## PRODUCT IDENTIFICATION SYSTEM

To order or obtain information, e.g., on pricing or delivery, refer to the factory or the listed sales office.

| PART NO. | - | XX | X | /XX | XXX |
|---|---|---|---|---|---|
| Device | | Frequency Range/OSC Type | Temperature Range | Package | Pattern |

| | | |
|---|---|---|
| Device | PIC16C54 | PIC16C54T(2) |
| | PIC16C54A | PIC16C54AT(2) |
| | PIC16CR54A | PIC16CR54AT(2) |
| | PIC16C54C | PIC16C54CT(2) |
| | PIC16CR54C | PIC16CR54CT(2) |
| | PIC16C55 | PIC16C55T(2) |
| | PIC16C55A | PIC16C55AT(2) |
| | PIC16C56 | PIC16C56T(2) |
| | PIC16C56A | PIC16C56AT(2) |
| | PIC16CR56A | PIC16CR56AT(2) |
| | PIC16C57 | PIC16C57T(2) |
| | PIC16C57C | PIC16C57CT(2) |
| | PIC16CR57C | PIC16CR57CT(2) |
| | PIC16C58B | PIC16C58BT(2) |
| | PIC16CR58B | PIC16CR58BT(2) |

| | | |
|---|---|---|
| Frequency Range/ Oscillator Type | RC | Resistor Capacitor |
| | LP | Low Power Crystal |
| | XT | Standard Crystal/Resonator |
| | HS | High Speed Crystal |
| | 02 | 200 KHz (LP) or 2 MHz (XT and RC) |
| | 04 | 200 KHz (LP) or 4 MHz (XT and RC) |
| | 10 | 10 MHz (HS only) |
| | 20 | 20 MHz (HS only) |
| | 40 | 40 MHz (HS only) |
| | b(4) | No oscillator type for JW packages(3) |

*RC/LP/XT/HS are for 16C54/55/56/57 devices only
-02 is available for 16LV54A only
-04/10/20 options are available for all other devices
-40 is available for 16C54C/55A/56A/57C/58B devices only

| | | | |
|---|---|---|---|
| Temperature Range | b(4) | = | 0°C to +70°C |
| | I | = | -40°C to +85°C |
| | E | = | -40°C to +125°C |

| | | | |
|---|---|---|---|
| Package | S | = | Die in Waffle Pack |
| | JW | = | 28-pin 600 mil/18-pin 300 mil windowed CERDIP(3) |
| | P | = | 28-pin 600 mil/18-pin 300 mil PDIP |
| | SO | = | 300 mil SOIC |
| | SS | = | 209 mil SSOP |
| | SP | = | 28-pin 300 mil Skinny PDIP |

*See Section 21 for additional package information.

| | |
|---|---|
| Pattern | QTP, SQTP, ROM code (factory specified) or Special Requirements. Blank for OTP and Windowed devices. |

**Examples:**

a) PIC16C55A - 04/P 301 = Commercial Temp., PDIP package, 4 MHz, standard VDD limits, QTP pattern #301

b) PIC16LC54C - 04I/SO Industrial Temp., SOIC package, 200 kHz, extended VDD limits

c) PIC16C57 - RC/SP = RC Oscillator, commercial temp, skinny PDIP package, 4 MHz, standard VDD limits

d) PIC16C58BT -40/SS 123 = commercial temp, SSOP package in tape and reel, 4 MHz, extended VDD limits, ROM pattern #123

**Note 1:** C = normal voltage range
LC = extended

**2:** T = in tape and reel - SOIC and SSOP packages only

**3:** JW Devices are UV erasable and can be programmed to any device configuration. JW Devices meet the electrical requirements of each oscillator type, including LC devices.

**4:** b = Blank

### Sales and Support

**Data Sheets**

Products supported by a preliminary Data Sheet may have an errata sheet describing minor operational differences and recommended workarounds. To determine if an errata sheet exists for a particular device, please contact one of the following:

1. Your local Microchip sales office
2. The Microchip Worldwide Site (www.microchip.com)