
Full-Featured, Low Pin Count, High-Temperature Microcontrollers

Description

PIC16(L)F1614/8 microcontrollers deliver on-chip features that are unique to the design for embedded control of small motors and general purpose applications in 14/20-pin count packages. Features like 10-bit A/D, CCP, 24-bit SMT and Zero-Cross Detection offer an excellent solution to the variety of applications. The product family also has a CRC+ memory scan and Windowed Watchdog Timer to support safety-critical systems in home appliances, white goods and other end equipment.

Core Features

- C Compiler Optimized RISC Architecture
- Only 49 Instructions
- Operating Speed:
 - DC – 32 MHz clock input
 - 125 ns minimum instruction cycle
- Interrupt Capability
- 16-Level Deep Hardware Stack
- One 8-Bit Timer
- Four 16-bit Timers
- Low Current Power-on Reset (POR)
- Configurable Power-up Timer (PWRT)
- Brown-out Reset (BOR) with Selectable Trip Point
- Windowed Watchdog Timer (WWDT):
 - Variable prescaler selection
 - Variable window size selection
 - All sources configurable in hardware or software

Memory

- 4 KW Flash Program Memory
- 512 Bytes Data SRAM
- Direct, Indirect and Relative Addressing modes
- High-Endurance Flash Data Memory (HEF):
 - 128 B of nonvolatile data storage

Operating Characteristics

- Operating Voltage Range:
 - 2.5V to 5.5V (PIC16LF1614/8)
- Temperature Range:
 - High Temp: -40°C to 150°C

Digital Peripherals

- Configurable Logic Cell (CLC):
 - Two CLCs
 - Integrated combinational and sequential logic
- Complementary Waveform Generator (CWG):
 - Rising and falling edge dead-band control
 - Full-bridge, half-bridge, 1-channel drive
 - Multiple signal sources
- Two Capture/Compare/PWM (CCP) modules

- Two 10-bit Pulse-Width Modulators (PWM)
- Two Signal Measurement Timers (SMT):
 - 24-bit timer/counter with prescaler
 - Multiple gate and clock inputs
- Angular Timer:
 - Single pulse
 - Multiple pulses with missing pulse recovery
- 8-Bit Timers (TMR2+HLT/4/6):
 - Up to 3 Timer2/4/6 with Hardware Limit Timer (HLT)
 - Monitors Fault Conditions: Stall, Stop, etc.
 - Multiple modes
 - 8-bit timer/counter with prescaler
 - 8-bit period register and postscaler
 - Asynchronous H/W Reset sources
- Math Accelerator with Proportional-Integral-Derivative (PID):
 - Four operation modes
 - Add and multiply
 - Simple multiplier
 - Multiply and Accumulate
 - Programmable PID controller
- Cyclic Redundancy Check with Memory Scan (CRC/SCAN):
 - Software configurable
- Serial Communications:
 - Enhanced USART (EUSART)
 - SPI, I²C, RS-232, RS-485, LIN compatible
 - Auto-Baud Detect, Auto-Wake-up on start
- Up to 17 I/O Pins and One Input-only Pin:
 - Individually programmable pull-ups
 - Slew rate control
 - Interrupt-on-change with edge-select
 - Two High Current Drive pins
- Peripheral Pin Select (PPS):
 - Enables pin mapping of digital I/O

Intelligent Analog Peripherals

- 10-Bit Analog-to-Digital Converter (ADC):
 - Up to 12 external channels
 - Conversion available during Sleep
- Two Comparators (COMP):
 - Low-Power/High-Speed mode
 - Up to three external inverting inputs
 - Fixed Voltage Reference at non-inverting input(s)
 - Comparator outputs externally accessible
- 8-Bit Digital-to-Analog Converter (DAC):
 - 8-bit resolution, rail-to-rail
 - Positive Reference Selection
- Voltage Reference:
 - Fixed Voltage Reference (FVR): 1.024V, 2.048V and 4.096V output levels
- Zero-Cross Detect (ZCD):
 - Detect when AC signal on pin crosses ground
- Two High-Current Drive Pins:
 - 100mA @ 5V

Clocking Structure

- 16 MHz Internal Oscillator:
 - Selectable frequency range from 32 MHz to 31 kHz
- 31 kHz Low-Power Internal Oscillator
- 4x Phase-Locked Loop (PLL):
 - For up to 32 MHz internal operation
- External Oscillator Block with:
 - Three external clock modes up to 32 MHz

Note:	This document is supplemented by the "PIC16(L)F1614/8 14/20-Pin, 8-Bit Flash Microcontroller" Data Sheet (DS40001769). See Section 1.0 "Device Overview" .
--------------	---

TABLE 1: PIC12/16F161X FAMILY TYPES

Device	Data Sheet Index	Program Memory Flash (W)	Program Memory Flash (kB)	Data SRAM (bytes)	High Endurance Flash (bytes)	I/O Pins	8-bit Timer with HLT	16-bit Timer	Angular Timer	Windowed Watchdog Timer	24-bit SMT	Comparators	10-bit ADC (ch)	Zero-Cross Detect	CCP/10-bit PWM	CWG	CLC	CRC with Memory Scan	Math Accelerator with PID	High-Current I/O 100mA	PPS	EUSART	I ² C/SPI
PIC12F1612	(A)	2048	3.5	256	256	6	4	1	0	Y	1	1	4	1	2/0	1	0	Y	0	0	N	0	0
PIC16F1613	(A)	2048	3.5	256	256	12	4	1	0	Y	2	2	8	1	2/0	1	0	Y	0	0	N	0	0
PIC16F1614	(B)	4096	7	512	512	12	4	3	1	Y	2	2	8	1	2/2	1	2	Y	1	2	Y	1	1
PIC16F1615	(C)	8192	14	1024	128	12	4	3	1	Y	2	2	8	1	2/2	1	4	Y	1	2	Y	1	1
PIC16F1618	(B)	4096	7	512	512	18	4	3	1	Y	2	2	12	1	2/2	1	2	Y	1	2	Y	1	1
PIC16F1619	(C)	8192	14	1024	128	18	4	3	1	Y	2	2	12	1	2/2	1	4	Y	1	2	Y	1	1

Note 1: Debugging Methods: (I) – Integrated on Chip; E – using Emulation Product

Data Sheet Index:

- A. DS40001737 [PIC12\(L\)F1612/16F1613 Data Sheet, 8/14-Pin, 8-bit Flash Microcontrollers](#)
- B. DS40001769 [PIC16\(L\)F1614/8 Data Sheet, 14/20-Pin, 8-bit Flash Microcontrollers](#)
- C. DS40001770 [PIC16\(L\)F1615/9 Data Sheet, 14/20-Pin, 8-bit Flash Microcontrollers](#)

Table of Contents

1.0 Device Overview 6

2.0 Device/Revision ID Registers 7

3.0 Electrical Characteristics 9

The Microchip WebSite 17

Customer Change Notification Service 17

Customer Support 17

Product Identification System 19

TO OUR VALUED CUSTOMERS

It is our intention to provide our valued customers with the best documentation possible to ensure successful use of your Microchip products. To this end, we will continue to improve our publications to better suit your needs. Our publications will be refined and enhanced as new volumes and updates are introduced.

If you have any questions or comments regarding this publication, please contact the Marketing Communications Department via E-mail at docerrors@microchip.com. We welcome your feedback.

Most Current Data Sheet

To obtain the most up-to-date version of this data sheet, please register at our Worldwide Website at:

<http://www.microchip.com>

You can determine the version of a data sheet by examining its literature number found on the bottom outside corner of any page. The last character of the literature number is the version number, (e.g., DS30000000A is version A of document DS30000000).

Errata

An errata sheet, describing minor operational differences from the data sheet and recommended workarounds, may exist for current devices. As device/documentation issues become known to us, we will publish an errata sheet. The errata will specify the revision of silicon and revision of document to which it applies.

To determine if an errata sheet exists for a particular device, please check with one of the following:

- Microchip's Worldwide Website; <http://www.microchip.com>
- Your local Microchip sales office (see last page)

When contacting a sales office, please specify which device, revision of silicon and data sheet (include literature number) you are using.

Customer Notification System

Register on our website at www.microchip.com to receive the most current information on all of our products.

1.0 DEVICE OVERVIEW

This document contains device specific information for the following devices, operating in an ambient temperature range between -40°C and 150°C:

- PIC16F1614
- PIC16F1618

Note: This data sheet documents only the devices' features and specifications that are in addition to the features and specifications of the non-specialty PIC16F1614/8 devices. For information on the features and specifications shared by this document's high-temperature devices and the non-specialty devices, see the "*PIC16(L)F1614/8 14/20-Pin, 8-Bit Flash Microcontroller*" data sheet (DS40001769).

The PIC16F1614/8 devices offer Core Independent Peripherals (CIPs), Intelligent Analog modules, and several other features that allow for high-performance, low-cost, and low-power applications.

The primary differentiating features and specifications of the high-temperature PIC16F1614/8 devices are:

- All AC timing specifications are increased by 30%
This derating factor includes parameters, such as TPWRT
- Maximum HS frequency of operation is 20 MHz
- Oscillator tolerances and V_{DD} operation range are revised

Note 1: The test duration for AEC-Q100 reliability testing for devices operating at 150°C is 1,000 hours. Any design operating at 125°C to 150°C for longer than that period is not warranted without prior written approval from Microchip Technology Inc.

2: Writes are not allowed for Flash program memory above 125°C

3: The temperature range indicator in the catalog part number and device marking is "H" for -40°C and 150°C

Example: PIC16F1618T-H/SL indicates the device is shipped in tape and reel configuration in the SOIC package and is rated for operation from -40°C and 150°C

4: The low voltage versions of these devices PIC16LF1614 and PIC16LF1618 are not released for operation above 125°C

5: Only SOIC (SL), TSSOP (ST), SSOP (SS) and QFN (ML) packages will be offered, not PDIP or UQFN

2.0 DEVICE/REVISION ID REGISTERS

Note: For additional details on the Device ID, Revision ID or Configuration bits, refer to Section 5.0 “Device Configuration” in the “PIC16(L)F1614/8 14/20-Pin, 8-Bit Flash Microcontroller” data sheet (DS40001769). Device/Revision ID information presented in this section is for the high-temperature PIC16F1614/8 devices only.

REGISTER 2-1: DEVID: DEVICE ID REGISTER

R	R	R	R	R	R
DEV<13:8>					
bit 13			bit 8		

R	R	R	R	R	R	R	R
DEV<7:0>							
bit 7				bit 0			

Legend:

R = Readable bit W = Writable bit U = Unimplemented bit, read as '0'
 -n = Value at POR '1' = Bit is set '0' = Bit is cleared x = Bit is unknown

bit 13-0 **DEV<13:0>**: Device ID bits

Device	DEVID<13:0> Values
PIC16F1614	11 0000 0111 1000 (3078h)
PIC16F1618	11 0000 0111 1001 (3079h)

REGISTER 2-2: REVID: REVISION ID REGISTER 2

R-1	R-0	R	R	R	R
REV<13:8>					
bit 13					
bit 8					

R	R	R	R	R	R	R	R
REV<7:0>							
bit 7							
bit 0							

Legend:

R = Readable bit

W = Writable bit

U = Unimplemented bit, read as '0'

-n = Value at POR

'1' = Bit is set

'0' = Bit is cleared

x = Bit is unknown

bit 13-0

DEV<13:0>: Revision ID bits

Note: The upper two bits of the Revision ID register will always read '10'.

3.0 ELECTRICAL CHARACTERISTICS

Note: Other than some basic data, this section documents only the high-temperature PIC16F1614/8 devices' specifications that differ from those of the non-specialty PIC16F1614/8 devices. For detailed information on the electrical specifications shared by the high-temperature and non-specialty devices, see the "*PIC16(L)F1614/8 14/20-Pin, 8-Bit Flash Microcontroller*" data sheet (DS40001769).

3.1 Absolute Maximum Ratings^(†)

Parameter	Condition	Value
Max. Current: VDD	Source	15 mA
Max. Current: VSS	Sink	15 mA
Max. Current: Pin	Source	5 mA
Max. Current: Pin	Sink	5 mA
Max. Storage Temperature	—	-65°C to +155°C
Max. Junction Temperature	Under Bias	+155°C
Ambient Temperature	Under Bias	-40°C to +150°C

Note 1: Maximum current rating requires even load distribution across I/O pins. Maximum current rating may be limited by the device package power dissipation characterizations, see Table-35-6: "Thermal Characteristics" to calculate device specifications.

2: 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 "Absolute 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 above maximum rating conditions for extended periods may affect device reliability.

3.2 Standard Operating Conditions

The standard operating conditions for any device are defined as:

Operating Voltage: $V_{DDMIN} \leq V_{DD} \leq V_{DDMAX}$

Operating Temperature: $TA_{MIN} \leq TA \leq TA_{MAX}$

V_{DD} — Operating Supply Voltage

PIC16F1614/8

V_{DDMIN} ($F_{OSC} \leq 16$ MHz)..... +2.5V

V_{DDMIN} ($F_{OSC} > 32$ MHz)..... +2.5V

V_{DDMAX} +5.5V

TA — Operating Ambient Temperature Range

High Temperature

TA_{MIN} -40°C

TA_{MAX} +150°C

3.3 DC Characteristics

TABLE 3-1: SUPPLY VOLTAGE (-40°C ≤ TA ≤ +150°C)

PIC16F1614/8			Standard Operating Conditions (unless otherwise stated)				
Param No.	Symbol	Characteristic	Min.	Typ.	Max.	Units	Conditions
Supply Voltage							
D001	V _{DD}	Supply Voltage	2.5	—	5.5	V	F _{OSC} ≤ 16 MHz F _{OSC} ≤ 32 MHz
D002	V _{DR}	RAM Data Retention Voltage	2.1	—	—	V	Device in Sleep mode
D003A	V _{ADFVR}	FVR Gain Voltage Accuracy for ADC	-10	—	+10	V	1x V _{FVR} , V _{DD} ≥ 2.5V 2x V _{FVR} , V _{DD} ≥ 2.5V 4x V _{FVR} , V _{DD} ≥ 4.75V

† Data in "Typ." column is at 3.0V, 25°C unless otherwise stated. These parameters are for design guidance only and are not tested.

FIGURE 3-1: VOLTAGE-FREQUENCY GRAPH, -40°C ≤ TA ≤ +150°C

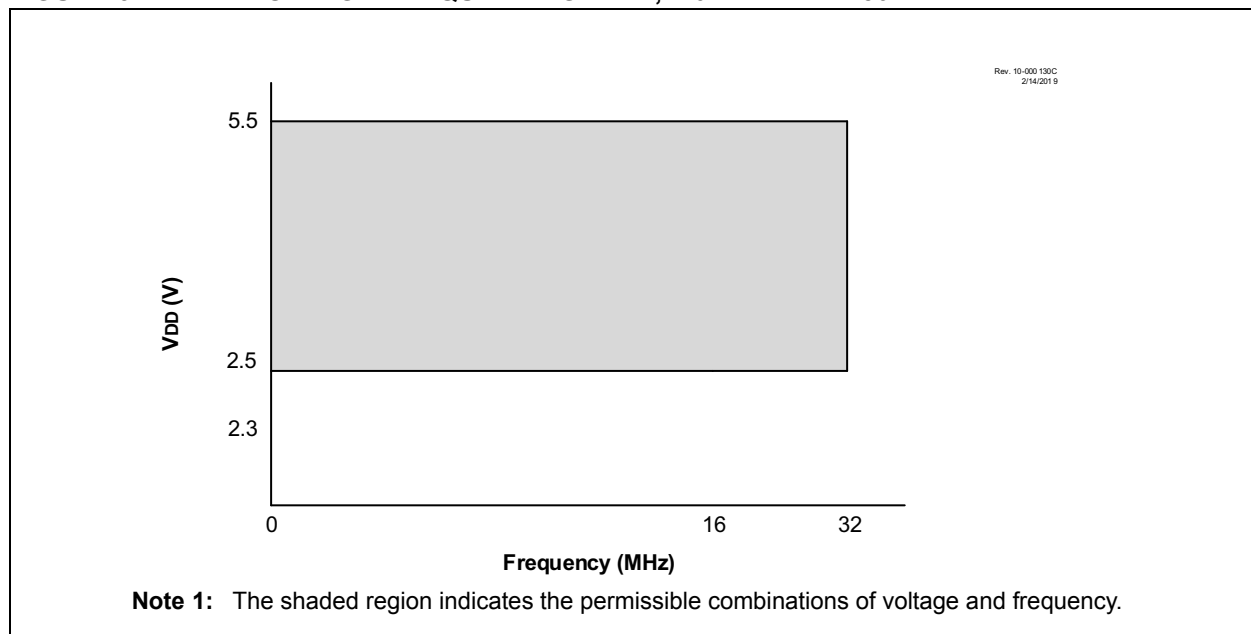


TABLE 3-2: DC CHARACTERISTICS: SUPPLY CURRENT^(1,2)

PIC16F1614/8		Standard Operating Conditions (unless otherwise stated)					
Param. No.	Device Characteristics	Min.	Typ†	Max.	Units	Conditions	
						VDD	Note
D013		—	—	135	μA	2.5	Fosc = 1 MHz, External Clock (ECM), Medium-Power mode
		—	—	160	μA	3.0	
		—	—	210	μA	5.0	
D014		—	—	365	μA	2.5	Fosc = 4 MHz, External Clock (ECM), Medium-Power mode
		—	—	420	μA	3.0	
		—	—	530	μA	5.0	
D017*		—	—	1100	μA	2.5	Fosc = 8 MHz, HFINTOSC
		—	—	1300	μA	3.0	
		—	—	1400	μA	5.0	
D018		—	—	1600	μA	2.5	Fosc = 16 MHz, HFINTOSC
		—	—	1900	μA	3.0	
		—	—	2100	μA	5.0	
D020C		—	—	65	μA	2.5	Fosc = 500 kHz, External Clock (ECL), Low-Power mode
		—	—	100	μA	3.0	
		—	—	110	μA	5.0	

* These parameters are characterized but not tested.

† Data in "Typ" column is at 3.0V, 25°C unless otherwise stated. These parameters are for design guidance only and are not tested.

- Note 1:** 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_{SS}; MCLR = V_{DD}; WDT disabled.
- 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.

TABLE 3-3: DC CHARACTERISTICS: POWER-DOWN CURRENTS (IPD)^(1,2,3)

PIC16F1614/8			Standard Operating Conditions (unless otherwise stated) VREPGM = 1			
Param No.	Symbol	Device Characteristic	Max. +150°C	Units	Conditions	
					V _{DD}	Notes
D023			16	μA	2.5	WDT Current
			20	μA	3.0	
			22	μA	5.0	
D023A			37	μA	2.5	FVR Current
			38	μA	3.0	
			39	μA	5.0	
D024A			—	μA	2.5	LPBOR Current
			15	μA	3.0	
			17	μA	5.0	
D026			15	μA	2.5	ADC Current No conversion in progress
			17	μA	3.0	
			20	μA	5.0	
D027			37	μA	2.5	Comparator, CxSP = 0
			38	μA	3.0	
			45	μA	5.0	

† Data in "Typ." column is at 3.0V, 25°C unless otherwise stated. These parameters are for design guidance only and are not tested.

- Note 1:** The peripheral current is the sum of the base IPD and the additional current consumed when this peripheral is enabled. The peripheral Δ current can be determined by subtracting the base IDD or IPD current from this limit. Max. values should be used when calculating total current consumption.
- 2:** 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 high-impedance state and tied to V_{SS}.
- 3:** All peripheral currents listed are on a per-peripheral basis if more than one instance of a peripheral is available.
- 4:** ADC clock source is ADCRC.

3.4 AC Characteristics

TABLE 3-4: MEMORY PROGRAMMING REQUIREMENTS FOR PIC16F1615/9 (HIGH TEMP)

PIC16F16F1614/1618			Standard Operating Conditions (unless otherwise stated) Operating Temperature: $-40^{\circ}\text{C} \leq T_A \leq +150^{\circ}\text{C}$ for High Temperature				
Param No.	Symbol	Device Characteristic	Min.	Typ.†	Max.	Units	Conditions
		Program Flash Memory					
D121	EP	Cell Endurance	—	—	—	—	Programming the Flash memory above $+125^{\circ}\text{C}$ is not permitted
D124	TRETD	Data Retention	—	20	—	Years	

Note:

TABLE 3-5: INTERNAL OSCILLATOR PARAMETERS FOR PIC16F1615/9 (HIGH TEMP)

PIC16F16F1614/1618			Standard Operating Conditions (unless otherwise stated) Operating Temperature: $-40^{\circ}\text{C} \leq T_A \leq +150^{\circ}\text{C}$ for High Temperature					
Param No.	Symbol	Device Characteristic	Frequency Tolerance	Min.	Typ.†	Max.	Units	Conditions
OS08	HFosc	Internal-Calibrated HFINTOSC Frequency	—	—	16	—	MHz	$-40^{\circ}\text{C} \leq T_A \leq 125^{\circ}\text{C}$ $V_{DD} \geq 2.5\text{V}$
			$\pm 10\%$	—	16	—	MHz	$-40^{\circ}\text{C} \leq T_A \leq 150^{\circ}\text{C}$ $V_{DD} \geq 2.5\text{V}$
OS09	LFosc	Internal LFINTOSC Frequency	—	—	31	—	kHz	$-40^{\circ}\text{C} \leq T_A \leq 125^{\circ}\text{C}$ $V_{DD} \geq 2.5\text{V}$
			$\pm 35\%$	—	31	—	kHz	$-40^{\circ}\text{C} \leq T_A \leq 150^{\circ}\text{C}$ $V_{DD} \geq 2.5\text{V}$

* These parameters are characterized but not tested.

† Data in "Typ" column is at 3.0V, 25°C unless otherwise stated. These parameters are for design guidance only and are not tested.

Note 1: To ensure these oscillator frequency tolerances, V_{DD} and V_{SS} must be capacitively decoupled as close to the device as possible. 0.1 μF and 0.01 μF values in parallel are recommended.

FIGURE 3-2: HFINTOSC FREQUENCY ACCURACY OVER V_{DD} AND TEMPERATURE

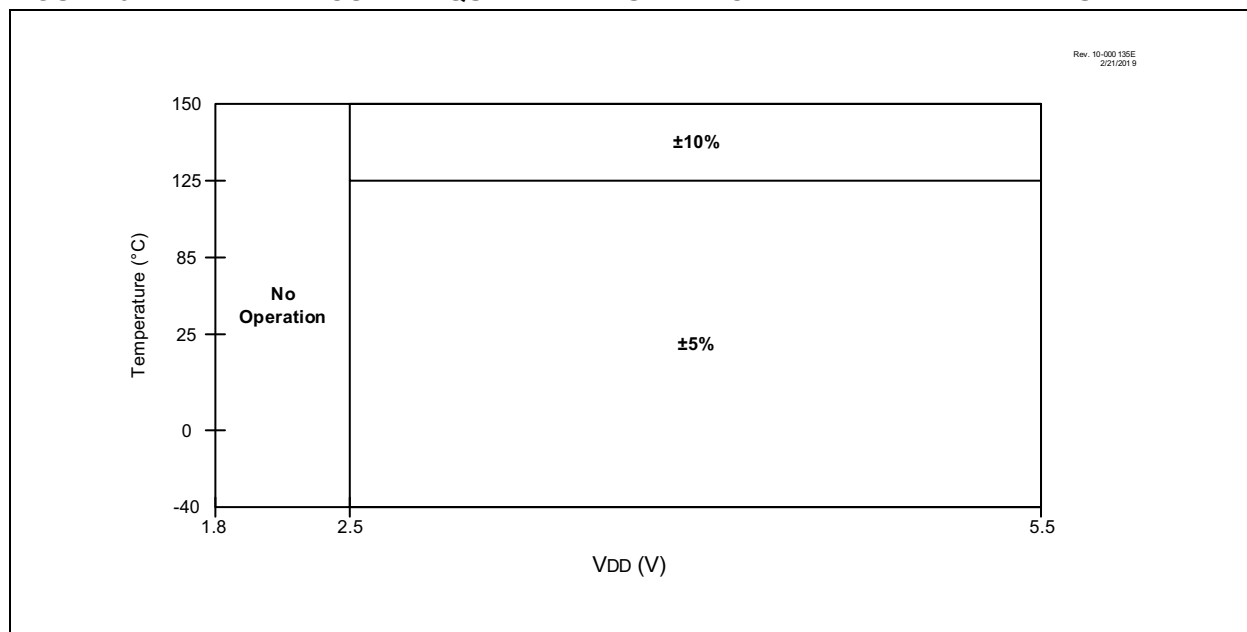


TABLE 3-6: RESET, WATCHDOG TIMER, OSCILLATOR START-UP TIMER, POWER-UP TIMER, BROWN-OUT TIMER AND LOW-POWER BROWN-OUT RESET SPECIFICATIONS

PIC16F1614/8			Standard Operating Conditions (unless otherwise stated)				
			Min.	Typ.†	Max. +150°C	Units	Conditions
31	TWDTLP	Low-Power Watchdog Timer Time-out Period	7	—	33	ms	VDD = 3.3V-5V, 1:512 Prescaler used
35	VBOR	Brown-out Reset Voltage	—	—	2.9	V	BORV = 0
			—	—	—	—	BORV = 1

TABLE 3-7: ANALOG-TO-DIGITAL CONVERTER (ADC) CHARACTERISTICS

Standard Operating Conditions (unless otherwise stated) VDD = 3.0V, TA = 150°C							
Param. No.	Sym.	Characteristic	Min.	Typ.†	Max.	Units	Conditions
AD04	EOFF	Offset Error	—	—	±3.5	LSB	VREF = 3.0V

TABLE 3-8: COMPARATOR SPECIFICATIONS

Standard Operating Conditions (unless otherwise stated) VDD = 3.0V, TA = 150°C							
Param. No.	Sym.	Characteristic	Min.	Typ.†	Max.	Units	Conditions
CM01	VIOFF	Input Offset Voltage	—	—	±70	mV	CxSP = 1, VICM = VDD/2

APPENDIX A: REVISION HISTORY

Revision A (2/2019)

Initial release of document.

THE MICROCHIP WEBSITE

Microchip provides online support via our WWW site at www.microchip.com. This website is used as a means to make files and information easily available to customers. Accessible by using your favorite Internet browser, the website contains the following information:

- **Product Support** – Data sheets and errata, application notes and sample programs, design resources, user's guides and hardware support documents, latest software releases and archived software
- **General Technical Support** – Frequently Asked Questions (FAQ), technical support requests, online discussion groups, Microchip consultant program member listing
- **Business of Microchip** – Product selector and ordering guides, latest Microchip press releases, listing of seminars and events, listings of Microchip sales offices, distributors and factory representatives

CUSTOMER CHANGE NOTIFICATION SERVICE

Microchip's customer notification service helps keep customers current on Microchip products. Subscribers will receive e-mail notification whenever there are changes, updates, revisions or errata related to a specified product family or development tool of interest.

To register, access the Microchip website at www.microchip.com. Under "Support", click on "Customer Change Notification" and follow the registration instructions.

CUSTOMER SUPPORT

Users of Microchip products can receive assistance through several channels:

- Distributor or Representative
- Local Sales Office
- Field Application Engineer (FAE)
- Technical Support

Customers should contact their distributor, representative or Field Application Engineer (FAE) for support. Local sales offices are also available to help customers. A listing of sales offices and locations is included in the back of this document.

Technical support is available through the website at: <http://microchip.com/support>

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.	[X]⁽¹⁾	-	X	/XX	XXX
Device	Tape and Reel Option		Temperature Range	Package	Pattern
<div> <div> Device: PIC16F1614, PIC16F1618 </div> <div> Tape and Reel Option: Blank = Standard packaging (tube or tray) T = Tape and Reel⁽¹⁾ </div> <div> Temperature Range: I = -40°C to +85°C (Industrial) E = -40°C to +125°C (Extended) </div> <div> Package:⁽²⁾ ML = QFN (16-Lead and 20-Lead) P = Plastic DIP SL = SOIC (14-Lead) ST = TSSOP GZ = UQFN (20-Lead) </div> <div> Pattern: QTP, SQTP, Code or Special Requirements (blank otherwise) </div> </div>					
Examples: a) PIC16F1614T - I/SL Tape and Reel, Industrial temperature, SOIC package b) PIC16F1618 - I/P Industrial temperature PDIP package c) PIC16F1618 - E/ML 298 Extended temperature, QFN package QTP pattern #298					
Note 1: Tape and Reel identifier only appears in the catalog part number description. This identifier is used for ordering purposes and is not printed on the device package. Check with your Microchip Sales Office for package availability with the Tape and Reel option. 2: For other small form-factor package availability and marking information, please visit www.microchip.com/packaging or contact your local sales office.					

Note the following details of the code protection feature on Microchip devices:

- Microchip products meet the specification contained in their particular Microchip Data Sheet.
- Microchip believes that its family of products is one of the most secure families of its kind on the market today, when used in the intended manner and under normal conditions.
- There are dishonest and possibly illegal methods used to breach the code protection feature. All of these methods, to our knowledge, require using the Microchip products in a manner outside the operating specifications contained in Microchip's Data Sheets. Most likely, the person doing so is engaged in theft of intellectual property.
- Microchip is willing to work with the customer who is concerned about the integrity of their code.
- Neither Microchip nor any other semiconductor manufacturer can guarantee the security of their code. Code protection does not mean that we are guaranteeing the product as "unbreakable."

Code protection is constantly evolving. We at Microchip are committed to continuously improving the code protection features of our products. Attempts to break Microchip's code protection feature may be a violation of the Digital Millennium Copyright Act. If such acts allow unauthorized access to your software or other copyrighted work, you may have a right to sue for relief under that Act.

Information contained in this publication regarding device applications and the like is provided only for your convenience and may be superseded by updates. It is your responsibility to ensure that your application meets with your specifications. MICROCHIP MAKES NO REPRESENTATIONS OR WARRANTIES OF ANY KIND WHETHER EXPRESS OR IMPLIED, WRITTEN OR ORAL, STATUTORY OR OTHERWISE, RELATED TO THE INFORMATION, INCLUDING BUT NOT LIMITED TO ITS CONDITION, QUALITY, PERFORMANCE, MERCHANTABILITY OR FITNESS FOR PURPOSE. Microchip disclaims all liability arising from this information and its use. Use of Microchip devices in life support and/or safety applications is entirely at the buyer's risk, and the buyer agrees to defend, indemnify and hold harmless Microchip from any and all damages, claims, suits, or expenses resulting from such use. No licenses are conveyed, implicitly or otherwise, under any Microchip intellectual property rights unless otherwise stated.

Microchip received ISO/TS-16949:2009 certification for its worldwide headquarters, design and wafer fabrication facilities in Chandler and Tempe, Arizona; Gresham, Oregon and design centers in California and India. The Company's quality system processes and procedures are for its PIC® MCUs and dsPIC® DSCs, KEELOQ® code hopping devices, Serial EEPROMs, microperipherals, nonvolatile memory and analog products. In addition, Microchip's quality system for the design and manufacture of development systems is ISO 9001:2000 certified.

QUALITY MANAGEMENT SYSTEM
CERTIFIED BY DNV
= ISO/TS 16949 =

Trademarks

The Microchip name and logo, the Microchip logo, AnyRate, AVR, AVR logo, AVR Freaks, BitCloud, chipKIT, chipKIT logo, CryptoMemory, CryptoRF, dsPIC, FlashFlex, flexPWR, Helder, JukeBlox, KeeLoq, Kleeer, LANCheck, LINK MD, maXStylus, maXTouch, MediaLB, megaAVR, MOST, MOST logo, MPLAB, OptoLyzer, PIC, picoPower, PICSTART, PIC32 logo, Prochip Designer, QTouch, SAM-BA, SpyNIC, SST, SST Logo, SuperFlash, tinyAVR, UNI/O, and XMEGA are registered trademarks of Microchip Technology Incorporated in the U.S.A. and other countries.

ClockWorks, The Embedded Control Solutions Company, EtherSynch, Hyper Speed Control, HyperLight Load, IntelliMOS, mTouch, Precision Edge, and Quiet-Wire are registered trademarks of Microchip Technology Incorporated in the U.S.A.

Adjacent Key Suppression, AKS, Analog-for-the-Digital Age, Any Capacitor, AnyIn, AnyOut, BodyCom, CodeGuard, CryptoAuthentication, CryptoAutomotive, CryptoCompanion, CryptoController, dsPICDEM, dsPICDEM.net, Dynamic Average Matching, DAM, ECAN, EtherGREEN, In-Circuit Serial Programming, ICSP, INICnet, Inter-Chip Connectivity, JitterBlocker, KleeerNet, KleeerNet logo, memBrain, Mindi, MiWi, motorBench, MPASM, MPF, MPLAB Certified logo, MPLIB, MPLINK, MultiTRAK, NetDetach, Omniscient Code Generation, PICDEM, PICDEM.net, PICKit, PICtail, PowerSmart, PureSilicon, QMatrix, REAL ICE, Ripple Blocker, SAM-ICE, Serial Quad I/O, SMART-I.S., SQI, SuperSwitcher, SuperSwitcher II, Total Endurance, TSHARC, USBCheck, VariSense, ViewSpan, WiperLock, Wireless DNA, and ZENA are trademarks of Microchip Technology Incorporated in the U.S.A. and other countries.

SQTP is a service mark of Microchip Technology Incorporated in the U.S.A.

Silicon Storage Technology is a registered trademark of Microchip Technology Inc. in other countries.

GestIC is a registered trademark of Microchip Technology Germany II GmbH & Co. KG, a subsidiary of Microchip Technology Inc., in other countries.

All other trademarks mentioned herein are property of their respective companies.

© 2019, Microchip Technology Incorporated, All Rights Reserved.
ISBN: 978-1-5224-4203-5

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

Austin, TX
Tel: 512-257-3370

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

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

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

Detroit
Novi, MI
Tel: 248-848-4000

Houston, TX
Tel: 281-894-5983

Indianapolis
Noblesville, IN
Tel: 317-773-8323
Fax: 317-773-5453
Tel: 317-536-2380

Los Angeles
Mission Viejo, CA
Tel: 949-462-9523
Fax: 949-462-9608
Tel: 951-273-7800

Raleigh, NC
Tel: 919-844-7510

New York, NY
Tel: 631-435-6000

San Jose, CA
Tel: 408-735-9110
Tel: 408-436-4270

Canada - Toronto
Tel: 905-695-1980
Fax: 905-695-2078

ASIA/PACIFIC

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

China - Beijing
Tel: 86-10-8569-7000

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

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

China - Dongguan
Tel: 86-769-8702-9880

China - Guangzhou
Tel: 86-20-8755-8029

China - Hangzhou
Tel: 86-571-8792-8115

China - Hong Kong SAR
Tel: 852-2943-5100

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

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

China - Shanghai
Tel: 86-21-3326-8000

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

China - Shenzhen
Tel: 86-755-8864-2200

China - Suzhou
Tel: 86-186-6233-1526

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

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

China - Xiamen
Tel: 86-592-2388138

China - Zhuhai
Tel: 86-756-3210040

ASIA/PACIFIC

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

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

India - Pune
Tel: 91-20-4121-0141

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

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

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

Korea - Seoul
Tel: 82-2-554-7200

Malaysia - Kuala Lumpur
Tel: 60-3-7651-7906

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

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

Singapore
Tel: 65-6334-8870

Taiwan - Hsin Chu
Tel: 886-3-577-8366

Taiwan - Kaohsiung
Tel: 886-7-213-7830

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

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

Vietnam - Ho Chi Minh
Tel: 84-28-5448-2100

EUROPE

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

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

Finland - Espoo
Tel: 358-9-4520-820

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

Germany - Garching
Tel: 49-8931-9700

Germany - Haan
Tel: 49-2129-3766400

Germany - Heilbronn
Tel: 49-7131-67-3636

Germany - Karlsruhe
Tel: 49-721-625370

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

Germany - Rosenheim
Tel: 49-8031-354-560

Israel - Ra'anana
Tel: 972-9-744-7705

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

Italy - Padova
Tel: 39-049-7625286

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

Norway - Trondheim
Tel: 47-7288-4388

Poland - Warsaw
Tel: 48-22-3325737

Romania - Bucharest
Tel: 40-21-407-87-50

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

Sweden - Gothenberg
Tel: 46-31-704-60-40

Sweden - Stockholm
Tel: 46-8-5090-4654

UK - Wokingham
Tel: 44-118-921-5800
Fax: 44-118-921-5820

Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

[Microchip:](#)

[PIC16F1614-I/P](#) [PIC16F1614-E/ST](#) [PIC16F1614-I/SL](#) [PIC16F1614-I/ST](#) [PIC16F1618T-I/SS](#) [PIC16LF1618-I/SS](#)
[PIC16F1614-E/P](#) [PIC16LF1614-I/P](#) [PIC16F1618-I/P](#) [PIC16F1618-I/ML](#) [PIC16F1618-E/SO](#) [PIC16F1618-E/P](#)
[PIC16F1618-I/SO](#) [PIC16LF1618-I/P](#) [PIC16LF1618-I/ML](#) [PIC16LF1614-I/SL](#) [PIC16F1614-E/SL](#) [PIC16F1618-E/ML](#)
[PIC16F1618-E/SS](#) [PIC16LF1614-I/ST](#) [PIC16F1614T-I/SL](#) [PIC16F1614T-I/ST](#) [PIC16F1618-I/SS](#) [PIC16F1618T-I/ML](#)
[PIC16F1618T-I/SO](#) [PIC16LF1614T-I/SL](#) [PIC16F1614-E/ML](#) [PIC16LF1614T-I/ML](#) [PIC16F1614-I/ML](#) [PIC16LF1614-](#)
[I/ML](#) [PIC16LF1614T-I/ST](#) [PIC16LF1618-I/SO](#) [PIC16LF1618T-I/ML](#) [PIC16LF1618T-I/SS](#) [PIC16F1614T-I/ML](#)
[PIC16F1618-I/GZ](#) [PIC16F1618T-I/GZ](#)