



## PIC16C622A → PIC16F628 Migration

### DEVICE MIGRATIONS

This document is intended to describe the functional differences and the electrical specification differences that are present when migrating from one device to the next. Table 1 shows the considerations that must be taken into account when migrating from the PIC16C622A to the PIC16F628. Table 2 shows electrical and timing differences.

**Note:** This device has been designed to perform to the parameters of its data sheet. It has been tested to an electrical specification designed to determine its conformance with these parameters. Due to process differences in the manufacture of this device, this device may have different performance characteristics than its earlier version. These differences may cause this device to perform differently in your application than the earlier version of this device.

**Note:** The user should verify that the device oscillator starts and performs as expected. Adjusting the loading capacitor values and/or the Oscillator mode may be required.

**TABLE 1: PIC16C622A → PIC16F628 FUNCTIONAL DIFFERENCES**

No.	Module	Differences from PIC16C622A	H/W	S/W	Prog.
1	Oscillator	ER Osc mode	Yes	—	—
2	Oscillator	Dual Speed mode	Yes	—	—
3	Oscillator	EC Osc mode	Yes	—	—
4	Oscillator	IntRC Osc mode	Yes	—	—
5	USART	9-bit USART	Yes	—	—
6	MCLR	MCLR Disable	Yes	—	—
7	Programming	Low Voltage Programming mode	—	—	Yes
8	Memory	RAM	—	—	Yes
9	Memory	EEPROM Data Memory	—	—	Yes

**Legend:** H/W - Issues may exist with regard to the application circuit.  
 S/W - Issues may exist with regard to the user program.  
 Prog. - Issues may exist with regard to programming.

---

---

## OSCILLATOR MODULE

### ER Mode

The PIC16F628 supports the new External Resistor Oscillator mode. This mode differs from the traditional RC Oscillator mode in that only a resistor to bias current is required. Designers should verify their oscillator design for suitability in the application before use. ER Oscillator mode also supports Dual Speed mode.

### EC Mode

The PIC16F628 supports the new External Clock-in mode. It is designed for usage in applications where a system clock is available. This mode provides a 1x

clock directly to the PIC16F628 core. There is no gain stage in-line. Designers should verify their oscillator design for suitability in the application before use.

### IntRC Mode

The PIC16F628 IntRC Oscillator mode now supports Dual Speed mode also.

### Dual Speed Mode

The PIC16F628 supports Dual Speed mode when configured in either ER or IntRC modes. This sub-mode of operation toggles between a fixed 37 kHz frequency and the frequency set by either ER or IntRC modes.

CONFIG Reg. bits Fosc<2:0>	Description	PCON Reg. bit OSCF	Result
111	ER mode w/clkout	1	ER bias'ed speed
111	ER mode w/clkout	0	37 kHz
110	ER mode w/o clkout	1	ER bias'ed speed
110	ER mode w/o clkout	0	37 kHz
101	IntRC w/clkout	1	4 MHz
101	IntRC w/clkout	0	37 kHz
100	IntRC w/o clkout	1	4 MHz
100	IntRC w/o clkout	0	37 kHz

## USART MODULE

### 9-bit USART

The PIC16F628 USART now supports 9-bit mode. This mode is useful in multi-processor communications. When bits RX9 and ADEN in register RCSTA are set, multi-processor communication is enabled. The 9th bit is used to indicate whether address or data is being transmitted by the Master.

## MCLR MODULE

The  $\overline{\text{MCLR}}$  pin can be disabled on the PIC16F628 if LVP is disabled. If LVP is enabled, then  $\overline{\text{MCLR}}$  is always enabled, regardless of the state of the  $\overline{\text{MCLR}}$  disable fuse. When the  $\overline{\text{MCLR}}$  is disabled, the pin becomes RA5 and is an input only pin.  $V_{PP}$  can still be applied to this pin to initiate programming. All  $\overline{\text{MCLR}}$  signals are generated internally if the  $\overline{\text{MCLR}}$  is disabled.

## MEMORY ORGANIZATION MODULE

### RAM

The PIC16F628 has 224 bytes of data RAM while the PIC16C622A has 128 bytes.

### EEPROM Data

The PIC16F628 has 128 bytes of EEPROM data memory.

## PROGRAMMING MODULE

### Low Voltage Programming Mode

The PIC16F628 supports Low Voltage Programming mode. When the LVP bit of the configuration word is asserted, placing a '1' on the RB4/PGM pin will instruct the part to enter Low Voltage Programming mode.

**Note 1:** While in this mode, the RB4 pin can no longer be used as a general purpose I/O pin.

**2:**  $V_{DD}$  must be 5.0V  $\pm$ 10% during erase/program operations while in Low Voltage Programming mode.

**TABLE 2: PIC16C622A → PIC16F628 ELECTRICAL SPECIFICATION DIFFERENCES**

Parm. No.	Sym.	Characteristic	PIC16C622A Data Sheet			PIC16F628 Data Sheet			Units	Conditions
			Min	Typ†	Max	Min	Typ†	Max		
D010	IDD	Supply Current (Note 1)	—	0.4	1.2	—	—	0.7	mA	FOSC = 4 MHz, VDD = 3.0V, WDT Disabled, XT Osc mode FOSC = 10 MHz, VDD = 3.0V, WDT Disabled, HS Osc mode
			—	1.0	2.0	—	—	2.0	mA	
D023	ΔIWDT	WDT Current (Note 3)	—	6.0	10	—	6.0	20	μA	VDD = 4.0V (125°)
	ΔICOMP	Comparator Current for each Comparator (Note 3)	—	30	60	—	30	50	μA	
	ΔIVREF	VREF Current (Note 3)	—	80	135	—	—	135	μA	

\* These parameters are characterized but not tested.

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

**Note 1:** The supply current is mainly a function of the operating voltage and frequency. Other factors, such as I/O pin loading and switching rate, oscillator type, internal code execution pattern, and temperature, also have an impact on the current consumption.

The test conditions for all IDD measurements in active operation mode are:

OSC1 = external square wave, from rail to rail; all I/O pins tri-stated, pulled to VDD,

MCLR = VDD; WDT enabled/disabled as specified.

- 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 hi-impedance state and tied to VDD or VSS.
- 3: The Δ current is the additional current consumed when this peripheral is enabled. This current should be added to the base IDD or IPD measurement.
- 4: Commercial temperature range only.
- 5: Includes EE static current. Does not include EE reads or writes.

**TABLE 3: PIC16LC622A → PIC16LF628 ELECTRICAL SPECIFICATION DIFFERENCES**

Parm. No.	Sym.	Characteristic	PIC16LC622A Data Sheet			PIC16LF628 Data Sheet			Units	Conditions
			Min	Typ†	Max	Min	Typ†	Max		
D010	IDD	Supply Current (Note 1)	—	—	1.1	—	—	0.6	mA	FOSC = 4 MHz, VDD = 2.5V, WDT Disabled, XT Osc mode
D023	ΔIWDT	WDT Current (Note 3)	—	—	—	—	6.0	15	μA	VDD = 3.0V
			—	6.0	10	—	—	—	μA	VDD = 4.0V
			—	—	12	—	—	—	μA	(125°)
	ΔICOMP	Comparator Current for each Comparator (Note 3)	—	—	—	—	30	50	μA	VDD = 3.0V
			—	30	60	—	—	—	μA	VDD = 4.0V
	ΔIVREF	VREF Current (Note 3)	—	—	—	—	—	135	μA	VDD = 3.0V
—			80	135	—	—	—	μA	VDD = 4.0V	

\* These parameters are characterized but not tested.

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

**Note 1:** The supply current is mainly a function of the operating voltage and frequency. Other factors, such as I/O pin loading and switching rate, oscillator type, internal code execution pattern, and temperature, also have an impact on the current consumption.

The test conditions for all IDD measurements in active operation mode are:

QSC1 = external square wave, from rail to rail; all I/O pins tri-stated, pulled to VDD,

MCLR = VDD; WDT enabled/disabled as specified.

- 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 hi-impedance state and tied to VDD or VSS.
- 3: The Δ current is the additional current consumed when this peripheral is enabled. This current should be added to the base IDD or IPD measurement.
- 4: Includes EE static current. Does not include EE reads or writes.

---

**Note the following details of the code protection feature on PICmicro® MCUs.**

- The PICmicro family meets the specifications contained in the Microchip Data Sheet.
- Microchip believes that its family of PICmicro microcontrollers is one of the most secure products 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 PICmicro microcontroller in a manner outside the operating specifications contained in the data sheet. The person doing so may be 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 product.

If you have any further questions about this matter, please contact the local sales office nearest to you.

---

Information contained in this publication regarding device applications and the like is intended through suggestion only and may be superseded by updates. It is your responsibility to ensure that your application meets with your specifications. No representation or warranty is given and no liability is assumed by Microchip Technology Incorporated with respect to the accuracy or use of such information, or infringement of patents or other intellectual property rights arising from such use or otherwise. Use of Microchip's products as critical components in life support systems is not authorized except with express written approval by Microchip. No licenses are conveyed, implicitly or otherwise, under any intellectual property rights.

#### Trademarks


The Microchip name and logo, the Microchip logo, FilterLab, KEELOQ, microID, MPLAB, PIC, PICmicro, PICMASTER, PICSTART, PRO MATE, SEEVAL and The Embedded Control Solutions Company are registered trademarks of Microchip Technology Incorporated in the U.S.A. and other countries.

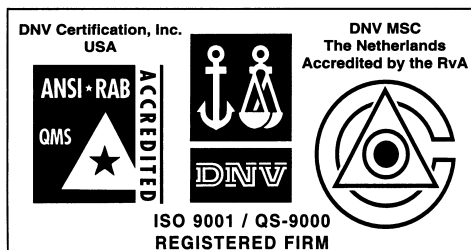
dsPIC, ECONOMONITOR, FanSense, FlexROM, fuzzyLAB, In-Circuit Serial Programming, ICSP, ICEPIC, microPort, Migratable Memory, MPASM, MPLIB, MPLINK, MPSIM, MXDEV, PICC, PICDEM, PICDEM.net, rfPIC, Select Mode and Total Endurance are trademarks of Microchip Technology Incorporated in the U.S.A.

Serialized Quick Term Programming (SQTP) is a service mark of Microchip Technology Incorporated in the U.S.A.

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

© 2002, Microchip Technology Incorporated, Printed in the U.S.A., All Rights Reserved.

 Printed on recycled paper.



*Microchip received QS-9000 quality system certification for its worldwide headquarters, design and wafer fabrication facilities in Chandler and Tempe, Arizona in July 1999. The Company's quality system processes and procedures are QS-9000 compliant for its PICmicro® 8-bit MCUs, KEELOQ® code hopping devices, Serial EEPROMs and microperipheral products. In addition, Microchip's quality system for the design and manufacture of development systems is ISO 9001 certified.*



## 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: 480-792-7627  
Web Address: <http://www.microchip.com>

#### Rocky Mountain

2355 West Chandler Blvd.  
Chandler, AZ 85224-6199  
Tel: 480-792-7966 Fax: 480-792-7456

#### Atlanta

500 Sugar Mill Road, Suite 200B  
Atlanta, GA 30350  
Tel: 770-640-0034 Fax: 770-640-0307

#### Boston

2 Lan Drive, Suite 120  
Westford, MA 01886  
Tel: 978-692-3848 Fax: 978-692-3821

#### Chicago

333 Pierce Road, Suite 180  
Itasca, IL 60143  
Tel: 630-285-0071 Fax: 630-285-0075

#### Dallas

4570 Westgrove Drive, Suite 160  
Addison, TX 75001  
Tel: 972-818-7423 Fax: 972-818-2924

#### Detroit

Tri-Atria Office Building  
32255 Northwestern Highway, Suite 190  
Farmington Hills, MI 48334  
Tel: 248-538-2250 Fax: 248-538-2260

#### Kokomo

2767 S. Albright Road  
Kokomo, Indiana 46902  
Tel: 765-864-8360 Fax: 765-864-8387

#### Los Angeles

18201 Von Karman, Suite 1090  
Irvine, CA 92612  
Tel: 949-263-1888 Fax: 949-263-1338

#### New York

150 Motor Parkway, Suite 202  
Hauppauge, NY 11788  
Tel: 631-273-5305 Fax: 631-273-5335

#### San Jose

Microchip Technology Inc.  
2107 North First Street, Suite 590  
San Jose, CA 95131  
Tel: 408-436-7950 Fax: 408-436-7955

#### Toronto

6285 Northam Drive, Suite 108  
Mississauga, Ontario L4V 1X5, Canada  
Tel: 905-673-0699 Fax: 905-673-6509

### ASIA/PACIFIC

#### Australia

Microchip Technology Australia Pty Ltd  
Suite 22, 41 Rawson Street  
Epping 2121, NSW  
Australia  
Tel: 61-2-9868-6733 Fax: 61-2-9868-6755

#### China - Beijing

Microchip Technology Consulting (Shanghai)  
Co., Ltd., Beijing Liaison Office  
Unit 915  
Bei Hai Wan Tai Bldg.  
No. 6 Chaoyangmen Beidajie  
Beijing, 100027, No. China  
Tel: 86-10-85282100 Fax: 86-10-85282104

#### China - Chengdu

Microchip Technology Consulting (Shanghai)  
Co., Ltd., Chengdu Liaison Office  
Rm. 2401, 24th Floor,  
Ming Xing Financial Tower  
No. 88 TIDU Street  
Chengdu 610016, China  
Tel: 86-28-6766200 Fax: 86-28-6766599

#### China - Fuzhou

Microchip Technology Consulting (Shanghai)  
Co., Ltd., Fuzhou Liaison Office  
Unit 28F, World Trade Plaza  
No. 71 Wusi Road  
Fuzhou 350001, China  
Tel: 86-591-7503506 Fax: 86-591-7503521

#### China - Shanghai

Microchip Technology Consulting (Shanghai)  
Co., Ltd.  
Room 701, Bldg. B  
Far East International Plaza  
No. 317 Xian Xia Road  
Shanghai, 200051  
Tel: 86-21-6275-5700 Fax: 86-21-6275-5060

#### China - Shenzhen

Microchip Technology Consulting (Shanghai)  
Co., Ltd., Shenzhen Liaison Office  
Rm. 1315, 13/F, Shenzhen Kerry Centre,  
Renminnan Lu  
Shenzhen 518001, China  
Tel: 86-755-2350361 Fax: 86-755-2366086

#### Hong Kong

Microchip Technology Hongkong Ltd.  
Unit 901-6, Tower 2, Metroplaza  
223 Hing Fong Road  
Kwai Fong, N.T., Hong Kong  
Tel: 852-2401-1200 Fax: 852-2401-3431

#### India

Microchip Technology Inc.  
India Liaison Office  
Divyasree Chambers  
1 Floor, Wing A (A3/A4)  
No. 11, O'Shaugnessey Road  
Bangalore, 560 025, India  
Tel: 91-80-2290061 Fax: 91-80-2290062

### Japan

Microchip Technology Japan K.K.  
Benex S-1 6F  
3-18-20, Shinyokohama  
Kohoku-Ku, Yokohama-shi  
Kanagawa, 222-0033, Japan  
Tel: 81-45-471-6166 Fax: 81-45-471-6122

### Korea

Microchip Technology Korea  
168-1, Youngbo Bldg. 3 Floor  
Samsung-Dong, Kangnam-Ku  
Seoul, Korea 135-882  
Tel: 82-2-554-7200 Fax: 82-2-558-5934

### Singapore

Microchip Technology Singapore Pte Ltd.  
200 Middle Road  
#07-02 Prime Centre  
Singapore, 188980  
Tel: 65-6334-8870 Fax: 65-6334-8850

### Taiwan

Microchip Technology Taiwan  
11F-3, No. 207  
Tung Hua North Road  
Taipei, 105, Taiwan  
Tel: 886-2-2717-7175 Fax: 886-2-2545-0139

### EUROPE

#### Denmark

Microchip Technology Nordic ApS  
Regus Business Centre  
Lautrup hof 1-3  
Ballerup DK-2750 Denmark  
Tel: 45 4420 9895 Fax: 45 4420 9910

#### France

Microchip Technology SARL  
Parc d'Activite du Moulin de Massy  
43 Rue du Saule Trapu  
Batiment A - 1er Etage  
91300 Massy, France  
Tel: 33-1-69-53-63-20 Fax: 33-1-69-30-90-79

#### Germany

Microchip Technology GmbH  
Gustav-Heinemann Ring 125  
D-81739 Munich, Germany  
Tel: 49-89-627-144 0 Fax: 49-89-627-144-44

#### Italy

Microchip Technology SRL  
Centro Direzionale Colleoni  
Palazzo Taurus 1 V. Le Colleoni 1  
20041 Agrate Brianza  
Milan, Italy  
Tel: 39-039-65791-1 Fax: 39-039-6899883

#### United Kingdom

Arizona Microchip Technology Ltd.  
505 Eskdale Road  
Winnersh Triangle  
Wokingham  
Berkshire, England RG41 5TU  
Tel: 44 118 921 5869 Fax: 44-118 921-5820

03/01/02