



Section 32. Configuration

HIGHLIGHTS

This section of the manual contains the following major topics:

32.1	Introduction	32-2
32.2	Modes of Operation	32-3
32.3	Effects of Various Resets	32-3
32.4	Related Application Notes.....	32-4
32.5	Revision History	32-5

Note: This family reference manual section is meant to serve as a complement to device data sheets. Depending on the device variant, this manual section may not apply to all PIC32 devices.

Please consult the note at the beginning of the “**Special Features**” chapter in the current device data sheet to check whether this document supports the device you are using.

Device data sheets and family reference manual sections are available for download from the Microchip Worldwide Web site at: <http://www.microchip.com>

32.1 INTRODUCTION

A PIC32 family device includes several nonvolatile (programmable) Configuration Words that define device behavior.

The device configuration features may vary according to PIC32 family variants; however, the following features are common to all PIC32 devices:

- System Clock Oscillator mode and Phase-Locked Loop (PLL)
- Secondary Oscillator (SOSC) enable/disable
- Watchdog Timer (WDT) enable/disable and postscaler
- Boot Flash and Program Flash write-protect regions
- User ID
- Debug mode

The PIC32 Configuration Words are located in Boot Flash memory and are programmed when the PIC32 Boot Flash region is programmed.

System clock oscillator and PLL bits provide a large selection of flexible clock source options and PLL prescalers/postscalers.

The SOSC bit enables or disables a low-power SOSC that can serve as a clock source for several peripherals, such as RTCC, Timer1 and CPU.

The WDT and postscaler bits allow the user to permanently disable or enable the WDT. When enabled, a postscaler can be selected to provide a wide range of WDT periods. A Windowed mode Watchdog feature is also available.

The Boot Flash and Program Flash write-protected bits provide write protection to all of Boot Flash memory and selected regions of Program Flash memory.

User ID bits are available for programming application-specific or product-specific identification information, such as product ID or serial numbers. Debug mode bits provide a selection of debugging modes and channels.

Note: For more information on the available device Configuration Words, refer to the specific device data sheet.

32.2 MODES OF OPERATION

32.2.1 Configuration Words

In the PIC32 device families, the Configuration Words select various device configurations, and are located in the last four Words (32-bit x 4 Words) of Boot Flash memory, DEVCFG0 to DEVCFG3.

During programming, a Configuration Word can be programmed a maximum of two times before a page erase must be performed. For example, during device programming, users can program the Configuration Word, DEVCFG1, with desired data, and then perform a verification or other integrity check. DEVCFG1 can then be programmed again, this time setting any remaining unprogrammed bits to '0'.

Note: The Configuration Word, DEVCFG0, can only be programmed once before a page erase must be performed. Each time the Boot Flash memory region is erased, the DEVCFG0<31> bit is automatically set to '0', leaving only one additional programming operation available, DEVCFG0.

After programming the Configuration Words, the user should reset the device to ensure the Configuration data is reloaded with the new programmed values.

32.2.1.1 CONFIGURATION REGISTER PROTECTION

To ensure the 128-bit data integrity of each Configuration Word, a comparison is continuously made between each Configuration bit and its stored complement. If a mismatch is detected, a Configuration Mismatch Reset is generated causing a device Reset.

32.3 EFFECTS OF VARIOUS RESETS

The Configuration data is reloaded from the corresponding Boot Flash memory Configuration Words on the following reset:

- Power-on Reset (POR)
- Brown-out Reset (BOR)
- External Reset ($\overline{\text{MCLR}}$)
- Configuration Mismatch Reset (CM)
- Watchdog Timer Reset (WDTR)
- Software Reset (SWR)

32.4 RELATED APPLICATION NOTES

This section lists application notes that are related to this section of the manual. These application notes may not be written specifically for the PIC32 device family, but the concepts are pertinent and could be used with modification and possible limitations. The current application notes related to Configuration are:

Title	Application Note #
No related application notes at this time.	N/A

Note: Please visit the Microchip web site (www.microchip.com) for additional application notes and code examples for the PIC32 device families.

32.5 REVISION HISTORY

Revision A (August 2007)

This is the initial released version of this document.

Revision B (October 2007)

Updated document to remove Confidential status.

Revision C (April 2008)

Revised status to Preliminary; Revised U-0 to r-x; Revised Section 32.3.2; Revised Table 32-1; Revised Configuration Word DEVID Register; Revised Configuration Word DEVCFG2 Register.

Revision D (June 2008)

Revised Register 31-1 (DEVCFG0); Change Reserved bits from “Maintain as” to “Write”.

Revision E (July 2009)

This revision includes the following updates:

- Minor updates to the text and formatting have been incorporated throughout the document.
- Added a note regarding Configuration Word availability in PIC32MX devices to “**Section 32. Configuration Words**”.
- Added the following bits to **Table 32-1: Configuration Word Summary** and to the related registers:
 - SIGN (see Register 32-1)
 - WINDIS (Register 32-2)
 - FVBUSIO (Register 32-4)
 - FUSBIDIO (Register 32-4)
 - FSCM1IO (Register 32-4)
 - FCANIO (Register 32-4)
 - FETHIO (Register 32-4)
 - FMIIEN (Register 32-4)
 - FSRSEL (Register 32-4)

Revision F (July 2011)

This revision includes the following updates:

- Notes:
 - Added a note with information to customers for utilizing family reference manual sections and data sheets as a joint reference (see note above [32.1 “Introduction”](#))
- Registers:
 - Removed Register 32-1 through Register 32-5
- Sections:
 - Removed **32.2 CONFIGURATION WORDS**
 - Updated [32.2.1 “Configuration Words”](#)
 - Removed **32.3.2 Device Code Protection**
 - Removed **32.3.3 Program Write Protection (PWP)**
- Tables:
 - Removed Table 32-1 through Table 32-3
- Updated all PIC32MX references to PIC32
- Updates to formatting and minor text changes were incorporated throughout the document

NOTES:

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.

Trademarks

The Microchip name and logo, the Microchip logo, dsPIC, KEELOQ, KEELOQ logo, MPLAB, PIC, PICmicro, PICSTART, PIC³² logo, rPIC and UNI/O are registered trademarks of Microchip Technology Incorporated in the U.S.A. and other countries.


FilterLab, Hampshire, HI-TECH C, Linear Active Thermistor, MXDEV, MXLAB, SEEVAL and The Embedded Control Solutions Company are registered trademarks of Microchip Technology Incorporated in the U.S.A.

Analog-for-the-Digital Age, Application Maestro, chipKIT, chipKIT logo, CodeGuard, dsPICDEM, dsPICDEM.net, dsPICworks, dsSPEAK, ECAN, ECONOMONITOR, FanSense, HI-TIDE, In-Circuit Serial Programming, ICSP, Mindi, MiWi, MPASM, MPLAB Certified logo, MPLIB, MPLINK, mTouch, Omniscent Code Generation, PICC, PICC-18, PICDEM, PICDEM.net, PICkit, PICtail, REAL ICE, rLAB, Select Mode, Total Endurance, TSHARC, UniWinDriver, WiperLock 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.

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

© 2011, Microchip Technology Incorporated, Printed in the U.S.A., All Rights Reserved.

 Printed on recycled paper.

ISBN: 978-1-61341-348-7

QUALITY MANAGEMENT SYSTEM
CERTIFIED BY DNV
== ISO/TS 16949:2009 ==

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.



MICROCHIP

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

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

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

Cleveland
Independence, OH
Tel: 216-447-0464
Fax: 216-447-0643

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

Detroit
Farmington Hills, MI
Tel: 248-538-2250
Fax: 248-538-2260

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

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

Santa Clara
Santa Clara, CA
Tel: 408-961-6444
Fax: 408-961-6445

Toronto
Mississauga, Ontario,
Canada
Tel: 905-673-0699
Fax: 905-673-6509

ASIA/PACIFIC

Asia Pacific Office
Suites 3707-14, 37th Floor
Tower 6, The Gateway
Harbour City, Kowloon
Hong Kong
Tel: 852-2401-1200
Fax: 852-2401-3431

Australia - Sydney
Tel: 61-2-9868-6733
Fax: 61-2-9868-6755

China - Beijing
Tel: 86-10-8569-7000
Fax: 86-10-8528-2104

China - Chengdu
Tel: 86-28-8665-5511
Fax: 86-28-8665-7889

China - Chongqing
Tel: 86-23-8980-9588
Fax: 86-23-8980-9500

China - Hangzhou
Tel: 86-571-2819-3180
Fax: 86-571-2819-3189

China - Hong Kong SAR
Tel: 852-2401-1200
Fax: 852-2401-3431

China - Nanjing
Tel: 86-25-8473-2460
Fax: 86-25-8473-2470

China - Qingdao
Tel: 86-532-8502-7355
Fax: 86-532-8502-7205

China - Shanghai
Tel: 86-21-5407-5533
Fax: 86-21-5407-5066

China - Shenyang
Tel: 86-24-2334-2829
Fax: 86-24-2334-2393

China - Shenzhen
Tel: 86-755-8203-2660
Fax: 86-755-8203-1760

China - Wuhan
Tel: 86-27-5980-5300
Fax: 86-27-5980-5118

China - Xian
Tel: 86-29-8833-7252
Fax: 86-29-8833-7256

China - Xiamen
Tel: 86-592-2388138
Fax: 86-592-2388130

China - Zhuhai
Tel: 86-756-3210040
Fax: 86-756-3210049

ASIA/PACIFIC

India - Bangalore
Tel: 91-80-3090-4444
Fax: 91-80-3090-4123

India - New Delhi
Tel: 91-11-4160-8631
Fax: 91-11-4160-8632

India - Pune
Tel: 91-20-2566-1512
Fax: 91-20-2566-1513

Japan - Yokohama
Tel: 81-45-471- 6166
Fax: 81-45-471-6122

Korea - Daegu
Tel: 82-53-744-4301
Fax: 82-53-744-4302

Korea - Seoul
Tel: 82-2-554-7200
Fax: 82-2-558-5932 or
82-2-558-5934

Malaysia - Kuala Lumpur
Tel: 60-3-6201-9857
Fax: 60-3-6201-9859

Malaysia - Penang
Tel: 60-4-227-8870
Fax: 60-4-227-4068

Philippines - Manila
Tel: 63-2-634-9065
Fax: 63-2-634-9069

Singapore
Tel: 65-6334-8870
Fax: 65-6334-8850

Taiwan - Hsin Chu
Tel: 886-3-6578-300
Fax: 886-3-6578-370

Taiwan - Kaohsiung
Tel: 886-7-213-7830
Fax: 886-7-330-9305

Taiwan - Taipei
Tel: 886-2-2500-6610
Fax: 886-2-2508-0102

Thailand - Bangkok
Tel: 66-2-694-1351
Fax: 66-2-694-1350

EUROPE

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

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

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

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

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

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

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

UK - Wokingham
Tel: 44-118-921-5869
Fax: 44-118-921-5820

05/02/11