



# PIC12F1822/16F182X

---

---

## 8/14/20-Pin 8-Bit Flash Microcontroller Product Brief

---

---

### High-Performance RISC CPU:

- Only 49 Instructions to learn
- Operating Speed:
  - DC – 32 MHz clock input
  - DC – 125 ns instruction cycle
- Interrupt Capability with Automatic Context Saving
- 16-Level Deep Hardware Stack with Optional Overflow/Underflow Reset
- Direct, Indirect and Relative Addressing modes:
  - Two full 16-bit File Select Registers (FSRs)
  - FSRs can read program and data memory

### Special Microcontroller Features:

- Precision Internal Oscillator:
  - Factory calibrated to  $\pm 1\%$ , typical
  - Software selectable frequency range from 32 MHz to 31 kHz
- 31 kHz Low-Power Internal Oscillator
- External Oscillator Block with:
  - 4 crystal/resonator modes up to 32 MHz using 4xPLL
  - 3 external clock modes up to 32 MHz
- 4x Phase Locked Loop (PLL)
- Fail-Safe Clock Monitor
- Two-Speed Start-up
- Power-Saving Sleep mode
- Power-on Reset (POR)
- Power-up Timer (PWRT)
- Oscillator Start-Up Timer (OST)
- Brown-out Reset (BOR) with Selectable Trip Point
- Extended Watchdog Timer (WDT)
- In-Circuit Serial Programming™ (ICSP™) via two pins
- In-Circuit Debug (ICD) via Two Pins
- Enhanced Low-Voltage Programming (LVP)
- Operating Voltage Range:
  - 1.8V to 3.6V (PIC1XLF182X)
  - 1.8V to 5.5V (PIC1XF182X)
- Programmable Code Protection
- Self-Programmable under Software Control

### Low-Power Features:

- Standby Current (PIC1XLF182X):
  - 30 nA @ 1.8V, typical
- Operating Current (PIC1XLF182X):
  - 75  $\mu$ A @ 1 MHz, 1.8V, typical
- Low-Power Watchdog Timer Current (PIC1XLF182X):
  - 500 nA @ 1.8V, typical

### Peripheral Features:

- Up to 17 I/O Pins and 1 Input-only Pin:
  - High current sink/source for LED drivers
  - Individually programmable interrupt-on-change pins
  - Individually programmable weak pull-ups
- Timer0: 8-Bit Timer/Counter with 8-Bit Programmable Prescaler
- Enhanced Timer1:
  - 16-bit timer/counter with prescaler
  - External Gate Input mode
  - Dedicated low-power 32 kHz oscillator driver
- Up to three Timer2 modules (Timer2,4,6): 8-Bit Timer/Counter with 8-Bit Period Register, Prescaler and Postscaler
- Up to two Enhanced Capture, Compare, PWM modules (ECCP):
  - Software selectable time-bases
  - Auto-shutdown and auto-restart
  - PWM steering
- Up to two Capture, Compare, PWM modules (CCP):
  - Software selectable time-bases
- Up to two Master Synchronous Serial Port (MSSP) with SPI and I<sup>2</sup>C™ with:
  - 7-bit address masking
  - SMBus/PMBus™ compatibility
- Enhanced Universal Synchronous Asynchronous Receiver Transmitter (EUSART):
  - RS-232, RS-485 and LIN compatible
  - Auto-Baud Detect
  - Auto-wake-up on start
- SR Latch (Integrated 555 Timer):
  - Multiple Set/Reset input options
- Analog-to-Digital Converter (ADC):
  - 10-bit resolution
  - Up to 12 channels
- Up to 2 Comparators:
  - Rail-to-rail inputs
  - Power mode control
  - Software controllable hysteresis
- Voltage Reference module:
  - Fixed voltage reference (FVR) with 1.024V, 2.048V and 4.096V output levels
  - 5-bit rail-to-rail resistive DAC with positive and negative reference selection
- Capacitive Touch oscillator module:
  - Up to 12 channels
- Data Signal Modulator:
  - Select modulator and carrier sources from various module outputs.

# PIC12F1822/16F182X

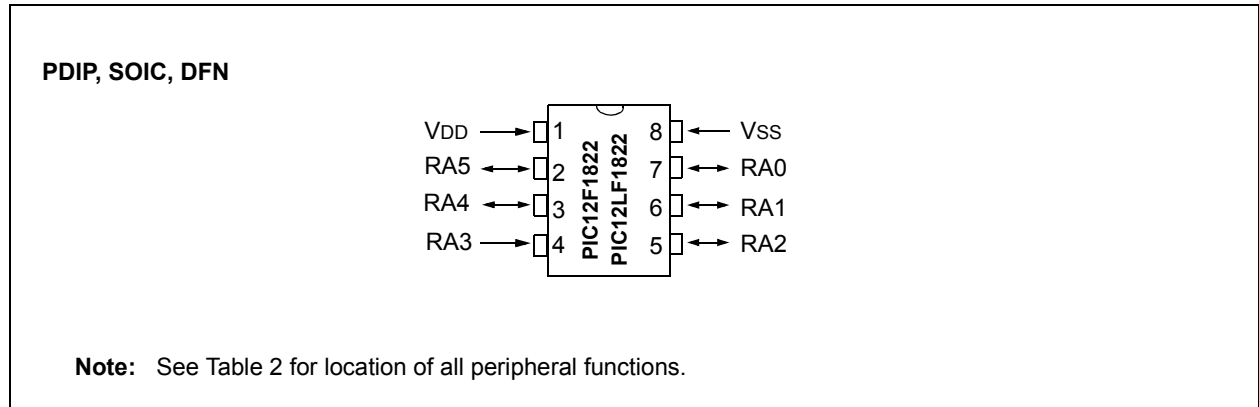
**TABLE 1: PIC12F1822/16F182X AND PIC12LF1822/16LF1823 FAMILY TYPES**

Device	Program Memory Flash (words)	Data EEPROM (bytes)	SRAM (bytes)	I/Os	10-bit A/D (ch)	Timers 8/16-bit	EUSART	MSSP	ECCP/ CCP	Cap Touch Channels
PIC12F1822	2048	256	128	6	4	2/1	1	1	1/0	4
PIC12LF1822	2048	256	128	6	4	2/1	1	1	1/0	4
PIC16F1823	2048	256	128	12	8	2/1	1	1	1/0	8
PIC16LF1823	2048	256	128	12	8	2/1	1	1	1/0	8
PIC16F1824	4096	256	256	12	8	4/1	1	1	2/2	8
PIC16LF1824	4096	256	256	12	8	4/1	1	1	2/2	8
PIC16F1825	8192	256	1024	12	8	4/1	1	1	2/2	8
PIC16LF1825	8192	256	1024	12	8	4/1	1	1	2/2	8
PIC16F1828	4096	256	256	18	12	4/1	1	1	2/2	12
PIC16LF1828	4096	256	256	18	12	4/1	1	1	2/2	12
PIC16F1829	8192	256	1024	18	12	4/1	1	2	2/2	12
PIC16LF1829	8192	256	1024	18	12	4/1	1	2	2/2	12

# PIC12F1822/16F182X

**Note:** Pin details are subject to change.

**FIGURE 1: 8-PIN DIAGRAM FOR PIC12F1822/LF1822**



**TABLE 2: 8-PIN ALLOCATION TABLE (PIC12F1822/LF1822)**

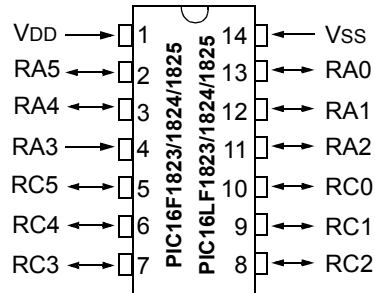
I/O	8-Pin PDIP/SOIC/DFN	A/D	Reference	Cap Sense	Comparator	SR Latch	Timers	CCP	EUSART	MSSP	Interrupt	Modulator	Pull-up	Basic
RA0	7	AN0	DACOUT	CPS0	C1IN+	—	—	P1B <sup>(1)</sup>	TX <sup>(1)</sup> CK <sup>(1)</sup>	SDO <sup>(1)</sup> SS <sup>(1)</sup>	IOC	MDOUT	Y	ICSPDAT/ ICDDAT
RA1	6	AN1	VREF	CPS1	C1IN0-	SRI	—	—	RX <sup>(1)</sup> DT <sup>(1)</sup>	SCL SCK	IOC	MDMIN	Y	ICSPCLK/ ICDCLK
RA2	5	AN2	—	CPS2	C1OUT	SRQ	T0CKI	CCP1 <sup>(1)</sup> P1A <sup>(1)</sup> FLT0	—	SDA SDI	INT/ IOC	MDCIN1	Y	—
RA3	4	—	—	—	—	—	T1G <sup>(1)</sup>	—	—	SS <sup>(1)</sup>	IOC	—	Y	MCLR V <sub>PP</sub> ICDMCLR
RA4	3	AN3	—	CPS3	C1IN1-	—	T1G <sup>(1)</sup> T1OSO	P1B <sup>(1)</sup>	TX <sup>(1)</sup> CK <sup>(1)</sup>	SDO <sup>(1)</sup>	IOC	MDCIN2	Y	OSC2 CLKOUT CLKR
RA5	2	—	—	—	—	SRNQ	T1CKI T1OSI	CCP1 <sup>(1)</sup> P1A <sup>(1)</sup>	RX <sup>(1)</sup> DT <sup>(1)</sup>	—	IOC	—	Y	OSC1 CLKIN
VDD	1	—	—	—	—	—	—	—	—	—	—	—	—	VDD
Vss	8	—	—	—	—	—	—	—	—	—	—	—	—	Vss

**Note 1:** Pin functions can be assigned to one of two pin locations via software.

# PIC12F1822/16F182X

FIGURE 2: 14-PIN DIAGRAM FOR PIC16F/LF1823/1824/1825

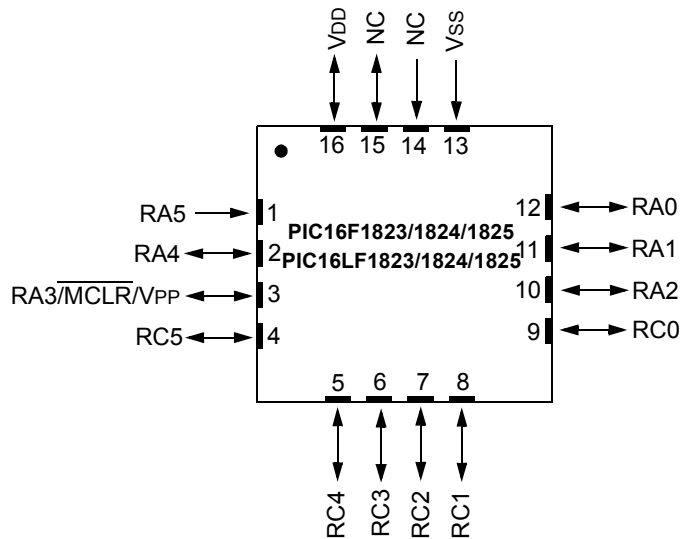
PDIP, SOIC, TSSOP



**Note:** See Table 3 for location of all peripheral functions.

FIGURE 3: 16-PIN DIAGRAM FOR PIC16F/LF1823/1824/1825

QFN



**Note:** See Table 3 for location of all peripheral functions.

# PIC12F1822/16F182X

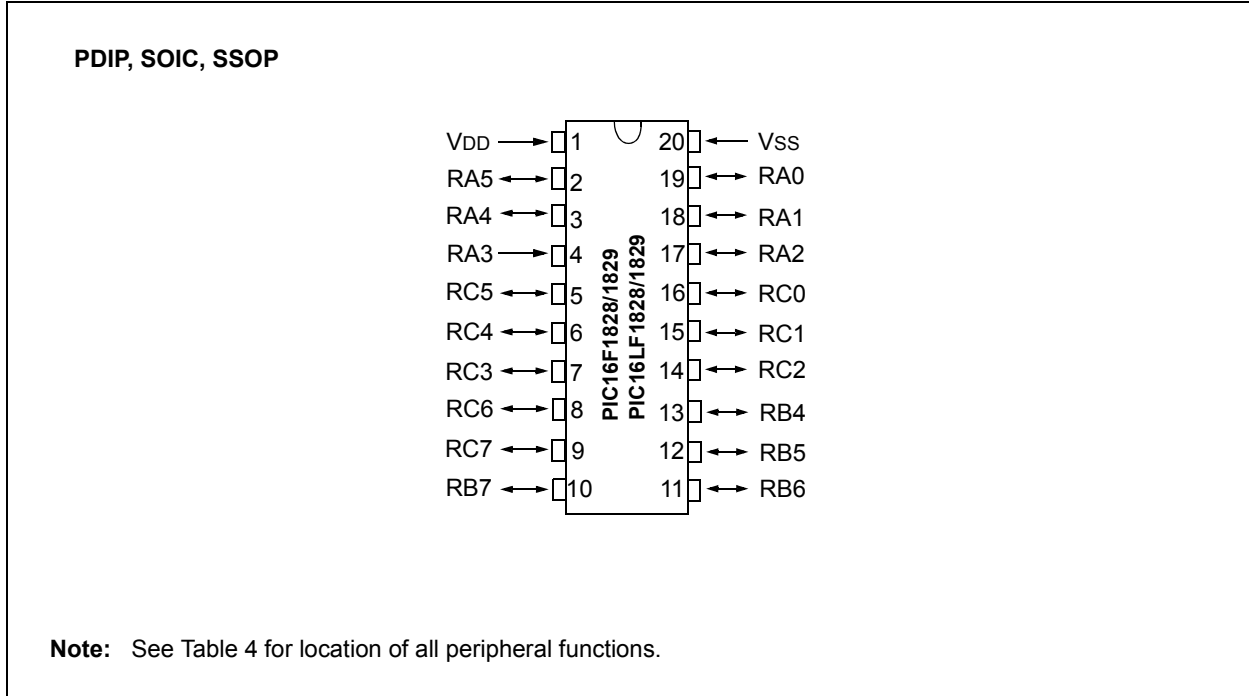
**TABLE 3: 14-PIN AND 16-PIN ALLOCATION TABLE (PIC16F/LF1823/1824/1825)**

I/O	14-Pin PDIP/SOIC/TSSOP		A/D	Reference	Cap Sense	Comparator	SR Latch	Timers	CCP	EUSART	MSSP	Interrupt	Modulator	Pull-up	Basic
	16-Pin QFN														
RA0	13	7	AN0	DACOUT	CPS0	C1IN+	—	—	—	TX <sup>(1)</sup> CK <sup>(1)</sup>	—	IOC	—	Y	ICSPDAT/ ICDDAT
RA1	12	11	AN1	VREF	CPS1	C12IN0-	SRI	—	—	RX <sup>(1)</sup> DT <sup>(1)</sup>	—	IOC	—	Y	ICSPCLK ICDCLK
RA2	11	10	AN2	—	CPS2	C1OUT	SRQ	T0CKI	CCP3 <sup>(2)</sup> FLT0	—	—	INT/ IOC	—	Y	—
RA3	4	3	—	—	—	—	—	T1G <sup>(1)</sup>	—	—	$\overline{SS}^{(1)}$	IOC	—	Y	$\overline{MCLR}$ VPP
RA4	3	2	AN3	—	CPS3	—	—	T1G <sup>(1)</sup> T1OSO	P2B <sup>(1,2)</sup>	—	SDO <sup>(1)</sup>	IOC	—	Y	OSC2 CLKOUT CLKR
RA5	2	1	—	—	—	—	—	T1CKI T1OSI	CCP2 <sup>(1,2)</sup> P2A <sup>(1,2)</sup>	—	—	IOC	—	Y	OSC1 CLKIN
RC0	10	9	AN4	—	CPS4	C2IN+	—	—	P1D <sup>(1,2)</sup>	—	SCL SCK	—	—	Y	—
RC1	9	8	AN5	—	CPS5	C12IN1-	—	—	P1C <sup>(1,2)</sup> CCP4 <sup>(2)</sup>	—	SDA SDI	—	—	Y	—
RC2	8	7	AN6	—	CPS6	C12IN2-	—	—	P1D <sup>(1)</sup> P2B <sup>(1,2)</sup>	—	SDO <sup>(1)</sup>	—	MDCIN1	Y	—
RC3	7	6	AN7	—	CPS7	C12IN3-	—	—	P1C <sup>(1)</sup> CCP2 <sup>(1,2)</sup> P2A <sup>(1,2)</sup>	—	$\overline{SS}^{(1)}$	—	MDMIN	Y	—
RC4	6	5	—	—	—	C2OUT	SRNQ	—	P1B	TX <sup>(1)</sup> CK <sup>(1)</sup>	—	—	MDOUT	Y	—
RC5	5	4	—	—	—	—	—	—	CCP1 P1A	RX <sup>(1)</sup> DT <sup>(1)</sup>	—	—	MDCIN2	Y	—
VDD	1	16	—	—	—	—	—	—	—	—	—	—	—	—	VDD
VSS	14	13	—	—	—	—	—	—	—	—	—	—	—	—	VSS

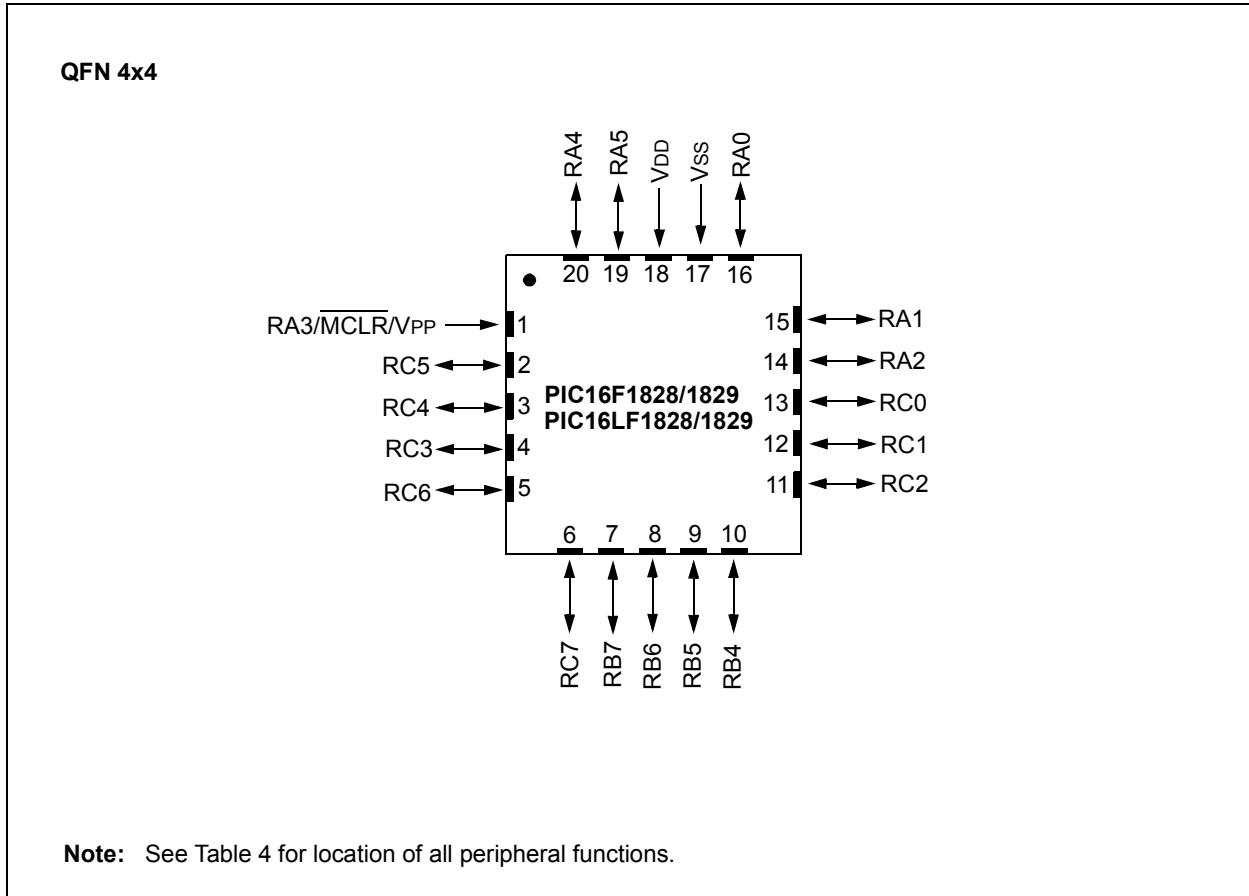
**Note** 1: Pin functions can be assigned to one of two pin locations via software.  
 2: Pin function only available on PIC16F1824 and PIC16F1825.

# PIC12F1822/16F182X

**FIGURE 4: 20-PIN DIAGRAM FOR PIC16F/LF1828/1829**



**FIGURE 5: 20-PIN DIAGRAM FOR PIC16F/LF1828/1829**



# PIC12F1822/16F182X

**TABLE 4: 20-PIN ALLOCATION TABLE (PIC16F/LF1828/1829)**

I/O	20-Pin PDIP/SOIC/SSOP	20-Pin QFN	A/D	Reference	Cap Sense	Comparator	SR Latch	Timers	CCP	EUSART	MSSP	Interrupt	Modulator	Pull-up	Basic
RA0	19	16	AN0	VREF-DACOUT	CPS0	C1IN+	—	—	—	—	—	IOC	—	Y	ICSPDAT/ICDDAT
RA1	18	15	AN1	VREF+	CPS1	C12IN0-	SRI	—	—	—	—	IOC	—	Y	ICSPCLK/ICDCLK
RA2	17	14	AN2	—	CPS2	C1OUT	SRQ	T0CKI	CCP3 FLT0	—	—	INT/IOC	—	Y	—
RA3	4	1	—	—	—	—	—	T1G <sup>(1)</sup>	—	—	—	IOC	—	Y	MCLR V <sub>PP</sub>
RA4	3	20	AN3	—	CPS3	—	—	T1G <sup>(1)</sup> T1OSO	P2B <sup>(1)</sup>	—	SS <sup>2(1,2)</sup>	IOC	—	Y	OSC2 CLKOUT
RA5	2	19	—	—	—	—	—	T1CKI T1OSI	CCP2 <sup>(1)</sup> P2A <sup>(1)</sup>	—	SDO2 <sup>(1,2)</sup>	IOC	—	Y	OSC1 CLKIN
RB4	13	10	AN10	—	CPS10	—	—	—	—	—	SDA1 SDI1	IOC	—	Y	—
RB5	12	9	AN11	—	CPS11	—	—	—	—	RX <sup>(1)</sup> DT <sup>(1)</sup>	SDA2 <sup>(2)</sup> SDI2 <sup>(2)</sup>	IOC	—	Y	—
RB6	11	8	—	—	—	—	—	—	—	—	SCL1 SCK1	IOC	—	Y	—
RB7	10	7	—	—	—	—	—	—	—	TX <sup>(1)</sup> CK <sup>(1)</sup>	SCL2 <sup>(2)</sup> SCK2 <sup>(2)</sup>	IOC	—	Y	—
RC0	16	13	AN4	—	CPS4	C2IN+	—	—	P1D <sup>(1)</sup>	—	SS <sup>2(1,2)</sup>	—	—	Y	—
RC1	15	12	AN5	—	CPS5	C12IN1-	—	—	P1C <sup>(1)</sup>	—	SDO2 <sup>(1,2)</sup>	—	—	Y	—
RC2	14	11	AN6	—	CPS6	C12IN2-	—	—	P1D <sup>(1)</sup> P2B <sup>(1)</sup>	—	—	—	MDCIN1	Y	—
RC3	7	4	AN7	—	CPS7	C12IN3-	—	—	P1C <sup>(1)</sup> CCP2 <sup>(1)</sup> P2A <sup>(1)</sup>	—	—	—	MDMIN	Y	—
RC4	6	3	—	—	—	C2OUT	SRNQ	—	P1B	TX <sup>(1)</sup> CK <sup>(1)</sup>	—	—	MDOUT	Y	—
RC5	5	2	—	—	—	—	—	—	CCP1 P1A	RX <sup>(1)</sup> DT <sup>(1)</sup>	—	—	MDCIN2	Y	—
RC6	8	5	AN8	—	CPS8	—	—	—	CCP4	—	SS	—	—	Y	—
RC7	9	6	AN9	—	CPS9	—	—	—	—	—	SDO	—	—	Y	—
VDD	1	18	—	—	—	—	—	—	—	—	—	—	—	—	VDD
VSS	20	20	—	—	—	—	—	—	—	—	—	—	—	—	VSS

**Note 1:** Pin functions can be assigned to one of two pin locations via software.

# PIC12F1822/16F182X

---

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, 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, 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, Octopus, Omniscient Code Generation, PICC, PICC-18, PICDEM, PICDEM.net, PICkit, PICtail, PIC<sup>32</sup> logo, 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.

© 2009, Microchip Technology Incorporated, Printed in the U.S.A., All Rights Reserved.

 Printed on recycled paper.

ISBN: 978-1-60932-055-3

*Microchip received ISO/TS-16949:2002 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 16949:2002 ==**



---

---

## 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://support.microchip.com>  
Web Address:  
[www.microchip.com](http://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

**Kokomo**  
Kokomo, IN  
Tel: 765-864-8360  
Fax: 765-864-8387

**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: 86-10-8528-2100  
Fax: 86-10-8528-2104

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

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

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

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

### ASIA/PACIFIC

**India - Bangalore**  
Tel: 91-80-3090-4444  
Fax: 91-80-3090-4080

**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: 886-7-536-4818  
Fax: 886-7-536-4803

**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 - Drunen**  
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

03/26/09