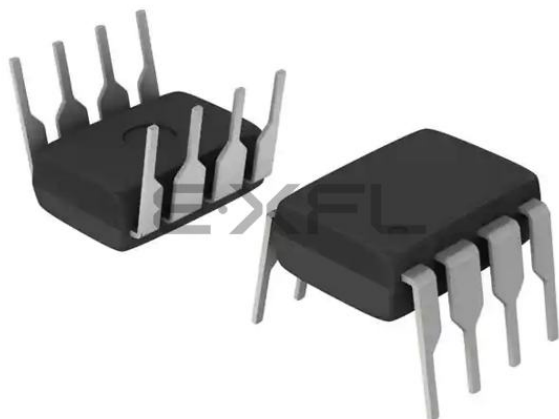




Welcome to E-XFL.COM

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	32MHz
Connectivity	I ² C, LINbus, SPI, UART/USART
Peripherals	Brown-out Detect/Reset, POR, PWM, WDT
Number of I/O	6
Program Memory Size	3.5KB (2K x 14)
Program Memory Type	FLASH
EEPROM Size	256 x 8
RAM Size	128 x 8
Voltage - Supply (Vcc/Vdd)	1.8V ~ 5.5V
Data Converters	A/D 4x10b; D/A 1x5b
Oscillator Type	Internal
Operating Temperature	-40°C ~ 125°C (TA)
Mounting Type	Through Hole
Package / Case	8-DIP (0.300", 7.62mm)
Supplier Device Package	8-PDIP
Purchase URL	https://www.e-xfl.com/product-detail/microchip-technology/pic12f1822-e-p



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 μ 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 I²C™ 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

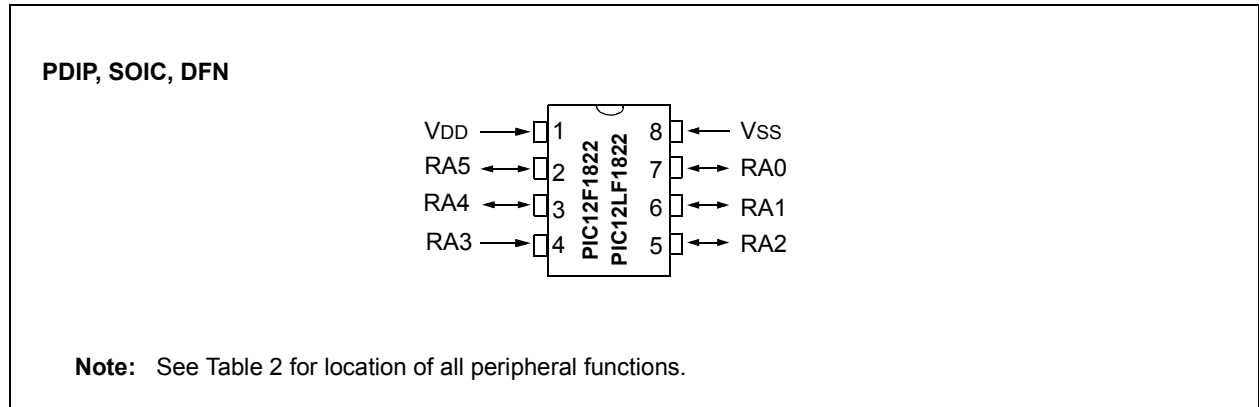


TABLE 2: 8-PIN ALLOCATION TABLE (PIC12F1822/LF1822)

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 ⁽¹⁾	TX ⁽¹⁾ CK ⁽¹⁾	SDO ⁽¹⁾ SS ⁽¹⁾	IOC	MDOUT	Y	ICSPDAT/ ICDDAT
RA1	6	AN1	VREF	CPS1	C1IN0-	SRI	—	—	RX ⁽¹⁾ DT ⁽¹⁾	SCL SCK	IOC	MDMIN	Y	ICSPCLK/ ICDCLK
RA2	5	AN2	—	CPS2	C1OUT	SRQ	T0CKI	CCP1 ⁽¹⁾ P1A ⁽¹⁾ FLT0	—	SDA SDI	INT/ IOC	MDCIN1	Y	—
RA3	4	—	—	—	—	—	T1G ⁽¹⁾	—	—	SS ⁽¹⁾	IOC	—	Y	MCLR VPP ICDMCLR
RA4	3	AN3	—	CPS3	C1IN1-	—	T1G ⁽¹⁾ T1OSO	P1B ⁽¹⁾	TX ⁽¹⁾ CK ⁽¹⁾	SDO ⁽¹⁾	IOC	MDCIN2	Y	OSC2 CLKOUT CLKR
RA5	2	—	—	—	—	SRNQ	T1CKI T1OSI	CCP1 ⁽¹⁾ P1A ⁽¹⁾	RX ⁽¹⁾ DT ⁽¹⁾	—	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

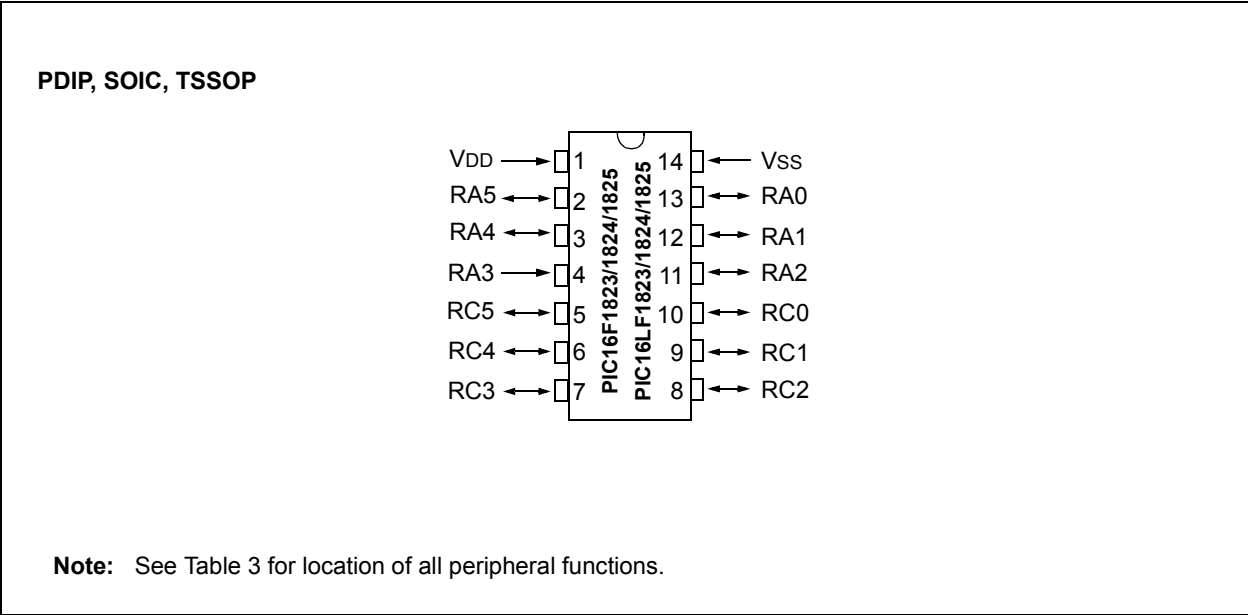
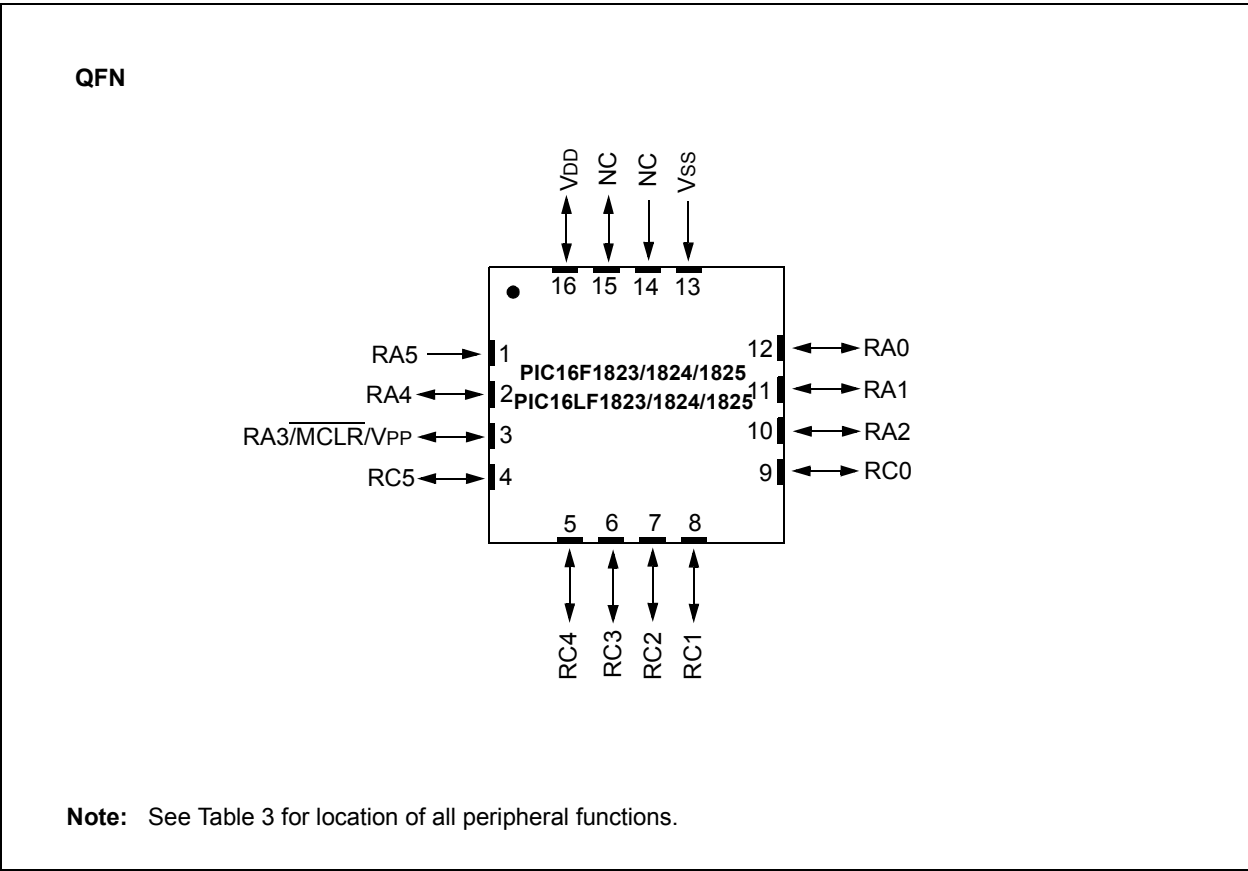


FIGURE 3: 16-PIN DIAGRAM FOR PIC16F/LF1823/1824/1825



PIC12F1822/16F182X

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

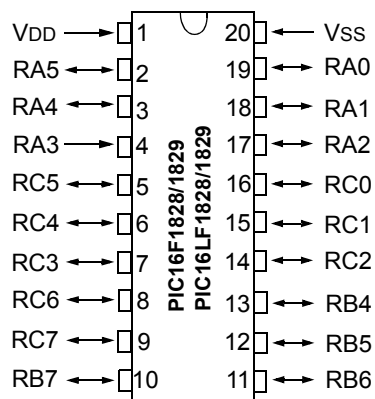
I/O	14-Pin PDIP/SOIC/TSSOP	16-Pin QFN	A/D	Reference	Cap Sense	Comparator	SR Latch	Timers	CCP	EUSART	MSSP	Interrupt	Modulator	Pull-up	Basic
RA0	13	7	AN0	DACOUT	CPS0	C1IN+	—	—	—	TX ⁽¹⁾ CK ⁽¹⁾	—	IOC	—	Y	ICSPDAT/ ICDDAT
RA1	12	11	AN1	VREF	CPS1	C12IN0-	SRI	—	—	RX ⁽¹⁾ DT ⁽¹⁾	—	IOC	—	Y	ICSPCLK ICDCLK
RA2	11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

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

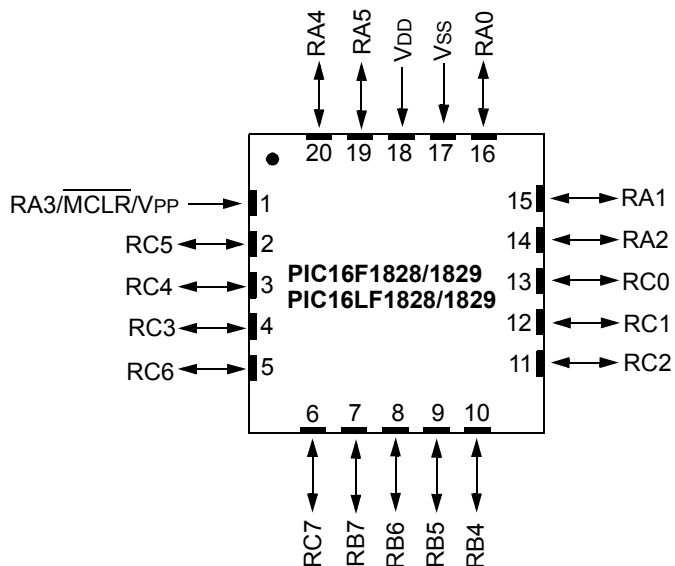
PDIP, SOIC, SSOP



Note: See Table 4 for location of all peripheral functions.

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

QFN 4x4



Note: See Table 4 for location of all peripheral functions.

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 ⁽¹⁾	—	—	—	IOC	—	Y	MCLR V _{PP}
RA4	3	20	AN3	—	CPS3	—	—	T1G ⁽¹⁾ T1OSO	P2B ⁽¹⁾	—	SS ^{2(1,2)}	IOC	—	Y	OSC2 CLKOUT
RA5	2	19	—	—	—	—	—	T1CKI T1OSI	CCP2 ⁽¹⁾ P2A ⁽¹⁾	—	SDO2 ^(1,2)	IOC	—	Y	OSC1 CLKIN
RB4	13	10	AN10	—	CPS10	—	—	—	—	—	SDA1 SDI1	IOC	—	Y	—
RB5	12	9	AN11	—	CPS11	—	—	—	—	RX ⁽¹⁾ DT ⁽¹⁾	SDA2 ⁽²⁾ SDI2 ⁽²⁾	IOC	—	Y	—
RB6	11	8	—	—	—	—	—	—	—	—	SCL1 SCK1	IOC	—	Y	—
RB7	10	7	—	—	—	—	—	—	—	TX ⁽¹⁾ CK ⁽¹⁾	SCL2 ⁽²⁾ SCK2 ⁽²⁾	IOC	—	Y	—
RC0	16	13	AN4	—	CPS4	C2IN+	—	—	P1D ⁽¹⁾	—	SS ^{2(1,2)}	—	—	Y	—
RC1	15	12	AN5	—	CPS5	C12IN1-	—	—	P1C ⁽¹⁾	—	SDO2 ^(1,2)	—	—	Y	—
RC2	14	11	AN6	—	CPS6	C12IN2-	—	—	P1D ⁽¹⁾ P2B ⁽¹⁾	—	—	—	MDCIN1	Y	—
RC3	7	4	AN7	—	CPS7	C12IN3-	—	—	P1C ⁽¹⁾ CCP2 ⁽¹⁾ P2A ⁽¹⁾	—	—	—	MDMIN	Y	—
RC4	6	3	—	—	—	C2OUT	SRNQ	—	P1B	TX ⁽¹⁾ CK ⁽¹⁾	—	—	MDOUT	Y	—
RC5	5	2	—	—	—	—	—	—	CCP1 P1A	RX ⁽¹⁾ DT ⁽¹⁾	—	—	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, PIC³² 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

QUALITY MANAGEMENT SYSTEM
CERTIFIED BY DNV
== ISO/TS 16949:2002 ==

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.



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

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