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	20MHz
Connectivity	I²C, LINbus, SPI, UART/USART
Peripherals	Brown-out Detect/Reset, POR, PWM, WDT
Number of I/O	25
Program Memory Size	7KB (4K x 14)
Program Memory Type	FLASH
EEPROM Size	-
RAM Size	256 x 8
Voltage - Supply (Vcc/Vdd)	2.3V ~ 5.5V
Data Converters	A/D 17x10b
Oscillator Type	Internal
Operating Temperature	-40°C ~ 125°C (TA)
Mounting Type	Surface Mount
Package / Case	28-SSOP (0.209", 5.30mm Width)
Supplier Device Package	28-SSOP
Purchase URL	https://www.e-xfl.com/product-detail/microchip-technology/pic16f1513-e-ss

PIC16(L)F1512/3

28-Pin Flash Microcontrollers with XLP Technology

High-Performance RISC CPU:

- C Compiler Optimized Architecture
- Only 49 Instructions
- Up to 7 Kbytes Linear Program Memory Addressing
- Up to 256 Bytes Linear Data Memory Addressing
- Operating Speed:
  - DC – 20 MHz clock input @ 2.5V
  - DC – 16 MHz clock input @ 1.8V
  - DC – 200 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

Flexible Oscillator Structure:

- 16 MHz Internal Oscillator Block:
  - Factory calibrated to ± 1%, typical
  - Software selectable frequency range from 16 MHz to 31 kHz
- 31 kHz Low-Power Internal Oscillator
- External Oscillator Block with:
  - Four crystal/resonator modes up to 20 MHz
  - Three external clock modes up to 20 MHz
- Fail-Safe Clock Monitor:
  - Allows for safe shutdown if peripheral clock stops
- Two-Speed Oscillator Start-up
- Oscillator Start-up Timer (OST)

Analog Features:

- Analog-to-Digital Converter (ADC):
  - 10-bit resolution
  - Up to 17 channels
  - Special Event Triggers
  - Conversion available during Sleep
  - Hardware Capacitive Voltage Divider (CVD)
  - Double sample conversions
  - Two result registers
  - Inverted acquisition
  - 7-bit pre-charge timer
  - 7-bit acquisition timer
  - Two guard ring output drives
  - Adjustable sample and hold capacitor array
- Voltage Reference module:
  - Fixed Voltage Reference (FVR) with 1.024V, 2.048V and 4.096V output levels
- Integrated Temperature Indicator

Extreme Low-Power Management PIC16LF1512/3 with nanoWatt XLP:

- Sleep mode: 20 nA @ 1.8V, typical
- Watchdog Timer: 300 nA @ 1.8V, typical
- Secondary Oscillator: 600 nA @ 32 kHz, 1.8V, typical
- Operating Current: 30 μA/MHz @ 1.8V, typical

Special Microcontroller Features:

- Operating Voltage Range:
  - 2.3V-5.5V (PIC16F1512/3)
  - 1.8V-3.6V (PIC16LF1512/3)
- Self-Programmable under Software Control
- Power-on Reset (POR)
- Power-up Timer (PWRT)
- Programmable Low-Power Brown-out Reset (LPBOR)
- Extended Watchdog Timer (WDT)
- In-Circuit Serial Programming™ (ICSP™) via Two Pins
- In-Circuit Debug (ICD) via Two Pins
- Enhanced Low-Voltage Programming (LVP)
- Programmable Code Protection
- Low-Power Sleep mode
- 128 Bytes High-Endurance Flash:
  - 100,000 write Flash endurance (minimum)

Peripheral Highlights:

- Up to 25 I/O Pins (1 input-only pin):
  - High current sink/source 25 mA/25 mA
  - Individually programmable weak pull-ups
  - Individually programmable interrupt-on-change (IOC) pins
- Timer0: 8-Bit Timer/Counter with 8-Bit Prescaler
- Enhanced Timer1:
  - 16-bit timer/counter with prescaler
  - External Gate Input mode
  - Low-power 32 kHz secondary oscillator driver
- Timer2: 8-Bit Timer/Counter with 8-Bit Period Register, Prescaler and Postscaler
- Two Capture/Compare (CCP) modules:
- Master Synchronous Serial Port (MSSP) with SPI and I^2C^{TM} with:
  - 7-bit address masking
  - SMBus/PMBus™ compatibility
- Enhanced Universal Synchronous Asynchronous Receiver Transmitter (EUSART) module:
  - RS-232, RS-485 and LIN compatible
  - Auto-Baud Detect
  - Auto-wake-up on start

PIC16(L)F151X/152X Family Types

Device	Data Sheet Index	Program Memory Flash (words)	Data SRAM (bytes)	I/O's(2)	ADC		Timers (8/16-bit)	EUSART	MSSP (I^2C™/SPI)	CCP	Debug(1)	XLP
					10-bit (ch)	Advanced Control						
PIC16(L)F1512	(1)	2048	128	25	17	Y	2/1	1	1	2	I	Y
PIC16(L)F1513	(1)	4096	256	25	17	Y	2/1	1	1	2	I	Y
PIC16(L)F1516	(2)	8192	512	25	17	N	2/1	1	1	2	I	Y
PIC16(L)F1517	(2)	8192	512	36	28	N	2/1	1	1	2	I	Y
PIC16(L)F1518	(2)	16384	1024	25	17	N	2/1	1	1	2	I	Y
PIC16(L)F1519	(2)	16384	1024	36	28	N	2/1	1	1	2	I	Y
PIC16(L)F1526	(3)	8192	768	54	30	N	6/3	2	2	10	I	Y
PIC16(L)F1527	(3)	16384	1536	54	30	N	6/3	2	2	10	I	Y

Note 1: I - Debugging, Integrated on Chip; H - Debugging, Requires Debug Header.

2: One pin is input-only.

Data Sheet Index: (Unshaded devices are described in this document.)

1: Future Product PIC16(L)F1512/13 Data Sheet, 28-Pin Flash, 8-bit Microcontrollers.

2: DS41452 PIC16(L)F1516/7/8/9 Data Sheet, 28/40/44-Pin Flash, 8-bit MCUs.

3: DS41458 PIC16(L)F1526/27 Data Sheet, 64-Pin Flash, 8-bit MCUs.

FIGURE 1: 28-PIN SPDIP, SOIC, SSOP PACKAGE DIAGRAM FOR PIC16(L)F1512/3

28-Pin SPDIP, SOIC, SSOP

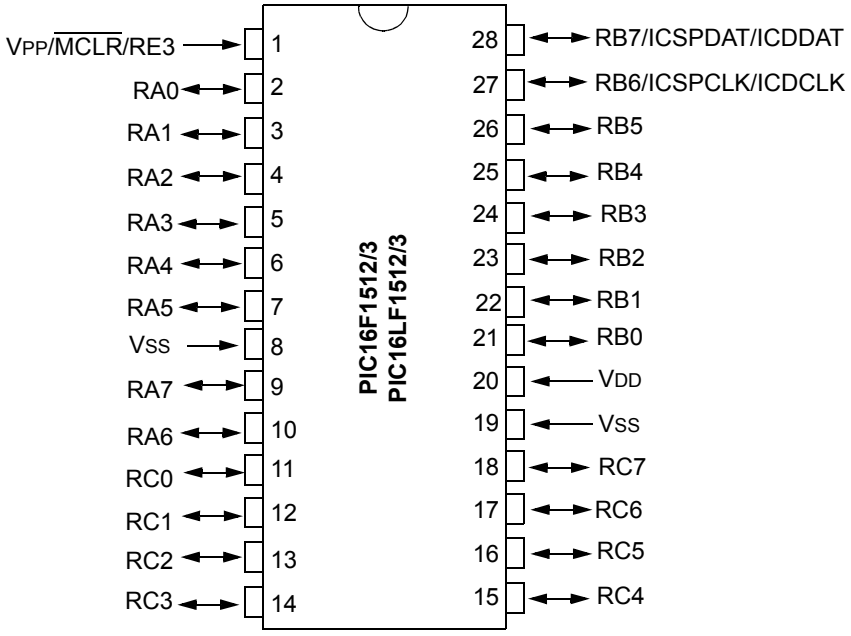

FIGURE 2: 28-PIN UQFN (4X4) PACKAGE DIAGRAM FOR PIC16(L)F1512/3

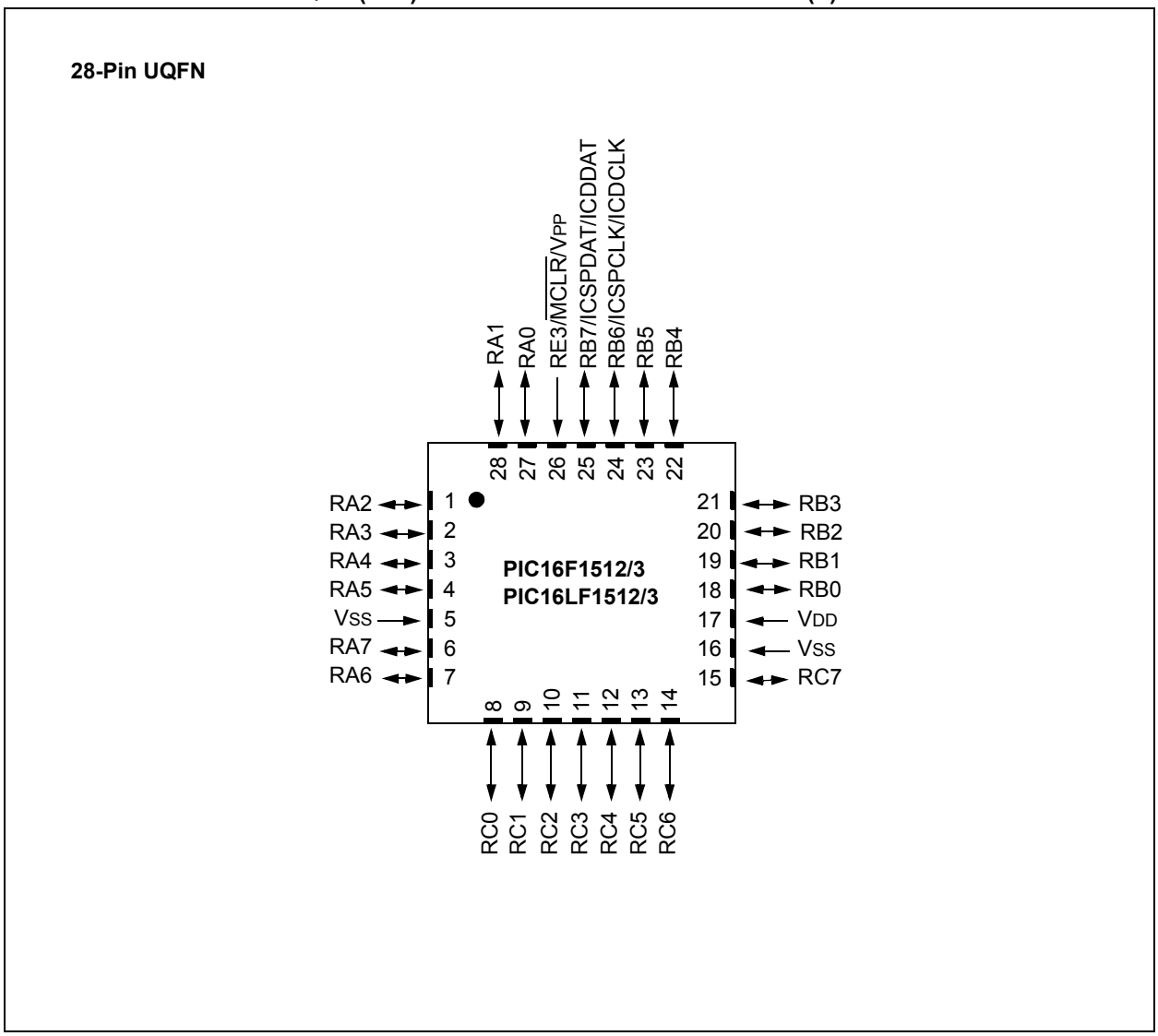

TABLE 1: 28-PIN ALLOCATION TABLE (PIC16(L)F1512/3)

I/O	28-Pin SPDIP, SOIC, SSOP	28-Pin UQFN	A/D	Timers	CCP	EUSART	MSSP	Interrupt	Pull-up	Basic
RA0	2	27	AN0	—	—	—	$\overline{SS}$(2)	—	—	—
RA1	3	28	AN1	—	—	—	—	—	—	—
RA2	4	1	AN2	—	—	—	—	—	—	—
RA3	5	2	AN3/VREF+	—	—	—	—	—	—	—
RA4	6	3	—	T0CKI	—	—	—	—	—	—
RA5	7	4	AN4	—	—	—	$\overline{SS}$(1)	—	—	VCAP
RA6	10	7	—	—	—	—	—	—	—	OSC2/CLKOUT
RA7	9	6	—	—	—	—	—	—	—	OSC1/CLKIN
RB0	21	18	AN12	—	—	—	—	INT/IOC	Y	—
RB1	22	19	AN10	—	—	—	—	IOC	Y	—
RB2	23	20	AN8	—	—	—	—	IOC	Y	—
RB3	24	21	AN9	—	CCP2(2)	—	—	IOC	Y	—
RB4	25	22	AN11 ADOUT	—	—	—	—	IOC	Y	—
RB5	26	23	AN13	T1G	—	—	—	IOC	Y	—
RB6	27	24	ADGRDA	—	—	—	—	IOC	Y	ICSPCLK/ICDCLK
RB7	28	25	ADGRDB	—	—	—	—	IOC	Y	ICSPDAT/ICDDAT
RC0	11	8	—	SOSCO/T1CKI	—	—	—	—	—	—
RC1	12	9	—	SOSCI	CCP2(1)	—	—	—	—	—
RC2	13	10	AN14	—	CCP1	—	—	—	—	—
RC3	14	11	AN15	—	—	—	SCK/SCL	—	—	—
RC4	15	12	AN16	—	—	—	SDI/SDA	—	—	—
RC5	16	13	AN17	—	—	—	SDO	—	—	—
RC6	17	14	AN18	—	—	TX/CK	—	—	—	—
RC7	18	15	AN19	—	—	RX/DT	—	—	—	—
RE3	1	26	—	—	—	—	—	—	Y	$\overline{MCLR}$/VPP
VDD	20	17	—	—	—	—	—	—	—	—
VSS	8,19	5,16	—	—	—	—	—	—	—	—
NC	—	—	—	—	—	—	—	—	—	—

Note 1: Peripheral pin location selected using APFCON register. Default location.
2: Peripheral pin location selected using APFCON register. Alternate location.

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.

Trademarks

ISBN: 9781620761021

QUALITY MANAGEMENT SYSTEM
CERTIFIED BY DNV
ISO/TS 16949

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.

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: 86-571-2819-3187
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 - Osaka
Tel: 81-66-152-7160
Fax: 81-66-152-9310

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: 886-3-5778-366
Fax: 886-3-5770-955

Taiwan - Kaohsiung
Tel: 886-7-536-4818
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 - 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

11/29/11

Advance Information