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

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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.)

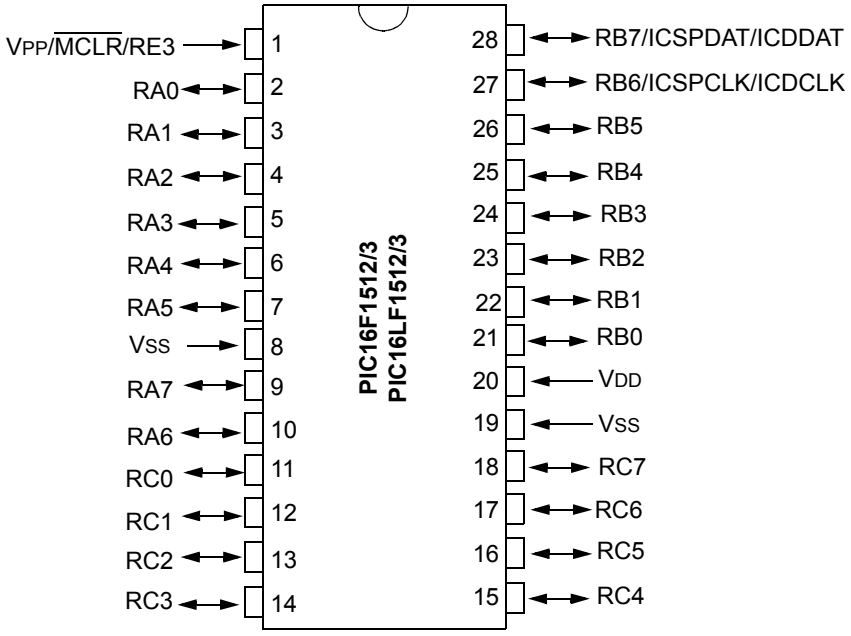
1: Future Product PIC16(L)F1512/13 Data Sheet, 28-Pin Flash, 8-bit Microcontrollers.

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



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

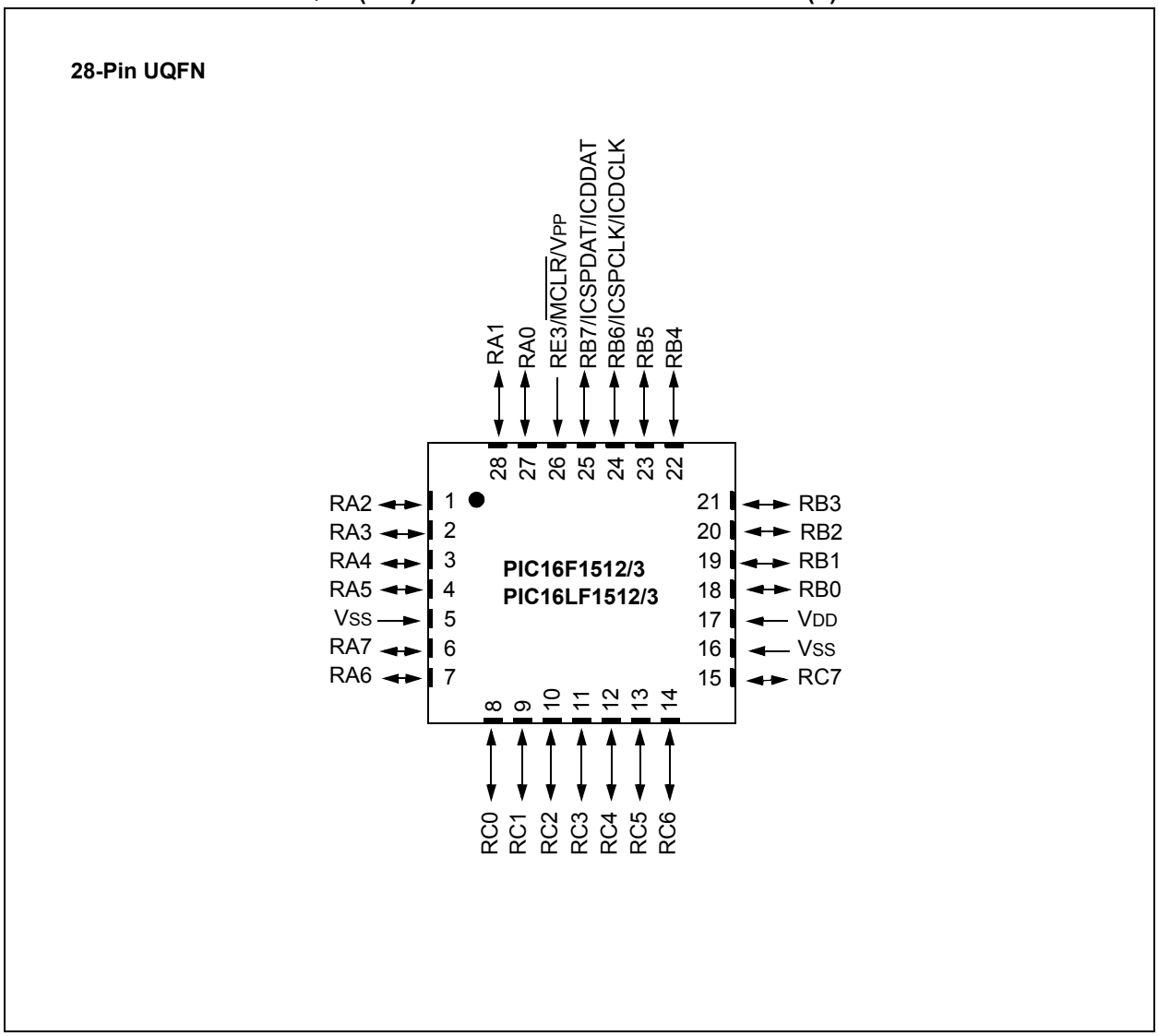


TABLE 1: 28-PIN ALLOCATION TABLE (PIC16(L)F1512/3)

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.

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