
14/20-Pin Flash Microcontrollers with XLP Technology

High-Performance RISC CPU

- Only 49 Instructions to Learn:
 - All single-cycle instructions except branches
- Operating Speed:
 - DC – 32 MHz oscillator/clock input
 - DC – 125 ns instruction cycle
- Up to 8 Kbytes Linear Program Memory Addressing
- Up to 256 bytes Linear Data Memory Addressing
- 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

- Precision 32 MHz Internal Oscillator Block:
 - Factory calibrated to $\pm 1\%$, typical
 - Software selectable frequencies range of 31 kHz to 32 MHz
- 31 kHz Low-Power Internal Oscillator
- Four Crystal modes up to 32 MHz
- Three External Clock modes up to 32 MHz
- 4X Phase Lock Loop (PLL)
- Fail-Safe Clock Monitor:
 - Allows for safe shutdown if peripheral clock stops
- Two-Speed Oscillator Start-up
- Reference Clock module:
 - Programmable clock output frequency and duty-cycle

Special Microcontroller Features

- 1.8V-5.5V Operation – PIC16F1824/8
- 1.8V-3.6V Operation – PIC16LF1824/8
- Self-Programmable under Software Control
- Power-on Reset (POR), Power-up Timer (PWRT) and Oscillator Start-up Timer (OST)
- Programmable Brown-out Reset (BOR)
- 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-5.5V (PIC16F1824/8)
 - 1.8V-3.6V (PIC16LF1824/8)
- Programmable Code Protection
- Power-Saving Sleep mode

Extreme Low-Power Management PIC16LF1824/8 with XLP

- Sleep mode: 20 nA @ 1.8V, typical
- Watchdog Timer: 200 nA @ 1.8V, typical
- Timer1 Oscillator: 650 nA @ 32 kHz, 1.8V, typical
- Operating Current: 48 μ A/MHz @ 1.8V, typical

Analog Features

- Analog-to-Digital Converter (ADC) module:
 - 10-bit resolution, up to 12 channels
 - Auto acquisition capability
 - Conversion available during Sleep
- Analog Comparator module:
 - Two rail-to-rail analog comparators
 - 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

Peripheral Highlights

- Up to 17 I/O Pins and 1 Input Only Pin:
 - High current sink/source 25 mA/25 mA
 - Programmable weak pull-ups
 - Programmable interrupt-on-change pins
- Timer0: 8-bit Timer/Counter with 8-bit Prescaler
- Enhanced Timer1:
 - 16-bit timer/counter with prescaler
 - External Gate Input mode
 - Dedicated, low-power 32 kHz oscillator driver
- Three Timer2-types: 8-bit Timer/Counter with 8-bit Period Register, Prescaler and Postscaler
- Two Capture, Compare, PWM (CCP) modules
- Two Enhanced CCP (ECCP) modules:
 - Software selectable time bases
 - Auto-shutdown and auto-restart
 - PWM steering
- Master Synchronous Serial Port (MSSP) with SPI and I²C™ with:
 - 7-bit address masking
 - SMBus/PMBus™ compatibility
- Enhanced Universal Synchronous Asynchronous Receiver Transmitter (EUSART) module
- mTouch™ Sensing Oscillator module:
 - Up to 12 input channels
- Data Signal Modulator module:
 - Selectable modulator and carrier sources
- SR Latch:
 - Multiple Set/Reset input options
 - Emulates 555 Timer applications

PIC16(L)F1824/8

PIC12(L)F1822/1840/PIC16(L)F182x/1847 Family Types

Device	Data Sheet Index	Program Memory Flash (words)	Data EEPROM (bytes)	Data SRAM (bytes)	I/O's ⁽²⁾	10-bit ADC (ch)	CapSense (ch)	Comparators	Timers (8/16-bit)	EUSART	MSSP (I ² C™/SPI)	ECCP (Full-Bridge) ECCP (Half-Bridge) CCP	SR Latch	Debug ⁽¹⁾	XLP
PIC12(L)F1822	(1)	2K	256	128	6	4	4	1	2/1	1	1	0/1/0	Y	I/H	Y
PIC12(L)F1840	(2)	4K	256	256	6	4	4	1	2/1	1	1	0/1/0	Y	I/H	Y
PIC16(L)F1823	(1)	2K	256	128	12	8	8	2	2/1	1	1	1/0/0	Y	I/H	Y
PIC16(L)F1824	(3)	4K	256	256	12	8	8	2	4/1	1	1	1/1/2	Y	I/H	Y
PIC16(L)F1825	(4)	8K	256	1024	12	8	8	2	4/1	1	1	1/1/2	Y	I/H	Y
PIC16(L)F1826	(5)	2K	256	256	16	12	12	2	2/1	1	1	1/0/0	Y	I/H	Y
PIC16(L)F1827	(5)	4K	256	384	16	12	12	2	4/1	1	2	1/1/2	Y	I/H	Y
PIC16(L)F1828	(3)	4K	256	256	18	12	12	2	4/1	1	1	1/1/2	Y	I/H	Y
PIC16(L)F1829	(4)	8K	256	1024	18	12	12	2	4/1	1	2	1/1/2	Y	I/H	Y
PIC16(L)F1847	(6)	8K	256	1024	16	12	12	2	4/1	1	2	1/1/2	Y	I/H	Y

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

2: One pin is input-only.

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

- 1: DS41413 [PIC12\(L\)F1822/PIC16\(L\)F1823 Data Sheet, 8/14-Pin Flash Microcontrollers.](#)
- 2: DS41441 [PIC12\(L\)F1840 Data Sheet, 8-Pin Flash Microcontrollers.](#)
- 3: DS41419 [PIC16\(L\)F1824/1828 Data Sheet, 28/40/44-Pin Flash Microcontrollers.](#)
- 4: DS41440 [PIC16\(L\)F1825/1829 Data Sheet, 14/20-Pin Flash Microcontrollers.](#)
- 5: DS41391 [PIC16\(L\)F1826/1827 Data Sheet, 18/20/28-Pin Flash Microcontrollers.](#)
- 6: DS41453 [PIC16\(L\)F1847 Data Sheet, 18/20/28-Pin Flash Microcontrollers.](#)

Note: For other small form-factor package availability and marking information, please visit www.microchip.com/packaging or contact your local sales office.

PIC16(L)F1824/8

FIGURE 1: 14-PIN DIAGRAM FOR PIC16(L)F1824



FIGURE 2: 16-PIN DIAGRAM FOR PIC16(L)F1824



PIC16(L)F1824/8

TABLE 1: 14-PIN AND 16-PIN ALLOCATION TABLE (PIC16(L)F1824)

I/O	14-Pin PDIP/SOIC/TSSOP	16-Pin QFN/UQFN	A/D	Reference	Cap Sense	Comparator	SR Latch	Timers	ECCP	EUSART	MSSP	Interrupt	Modulator	Pull-up	Basic
RA0	13	12	AN0	VREF-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 FLT0	—	—	INT/ IOC	—	Y	—
RA3	4	3	—	—	—	—	—	T1G ⁽¹⁾	—	—	SS ⁽¹⁾	IOC	—	Y	MCLR VPP
RA4	3	2	AN3	—	CPS3	—	—	T1G ⁽¹⁾ T1OSO	P2B ⁽¹⁾	—	SDO ⁽¹⁾	IOC	—	Y	OSC2 CLKOUT CLKR
RA5	2	1	—	—	—	—	—	T1CKI T1OSI	CCP2 P2A ⁽¹⁾	—	—	IOC	—	Y	OSC1 CLKIN
RC0	10	9	AN4	—	CPS4	C2IN+	—	—	P1D ⁽¹⁾	—	SCL SCK	—	—	Y	—
RC1	9	8	AN5	—	CPS5	C12IN1-	—	—	CCP4 P1C ⁽¹⁾	—	SDA SDI	—	—	Y	—
RC2	8	7	AN6	—	CPS6	C12IN2-	—	—	P1D ⁽¹⁾ P2B ⁽¹⁾	—	SDO ⁽¹⁾	—	MDCIN1	Y	—
RC3	7	6	AN7	—	CPS7	C12IN3-	—	—	CCP2 ⁽¹⁾ P1C ⁽¹⁾ P2A ⁽¹⁾	—	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	—
VDD	1	16	—	—	—	—	—	—	—	—	—	—	—	—	VDD
VSS	14	13	—	—	—	—	—	—	—	—	—	—	—	—	VSS

Note 1: Pin function is selectable via the APFCON0 or APFCON1 registers.

PIC16(L)F1824/8

FIGURE 3: 20-PIN DIAGRAM FOR PIC16(L)F1828

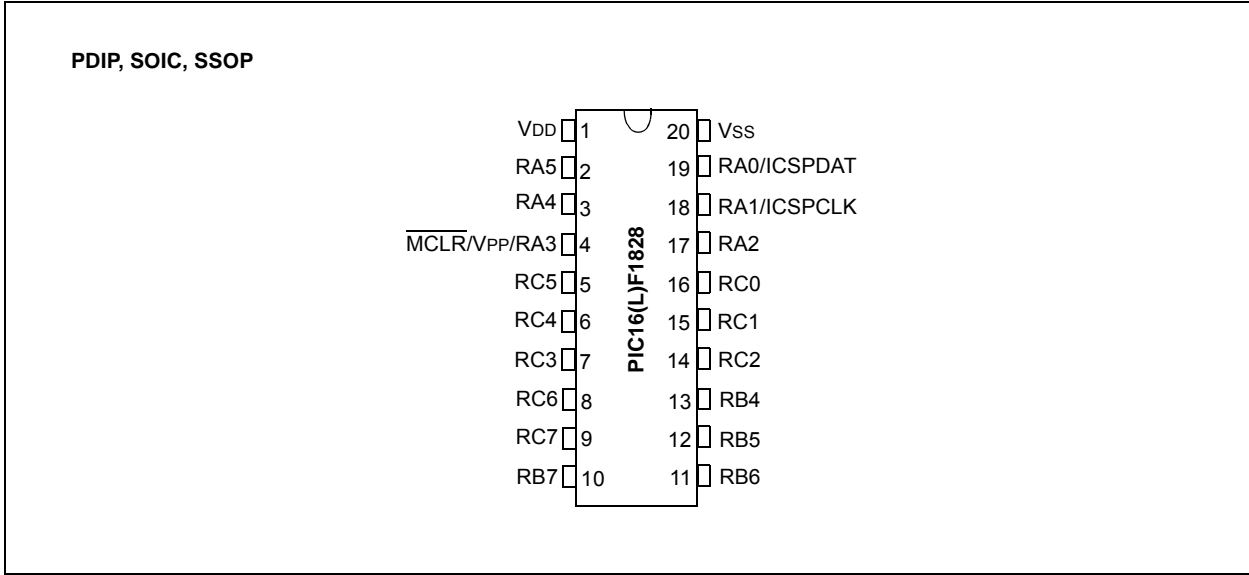
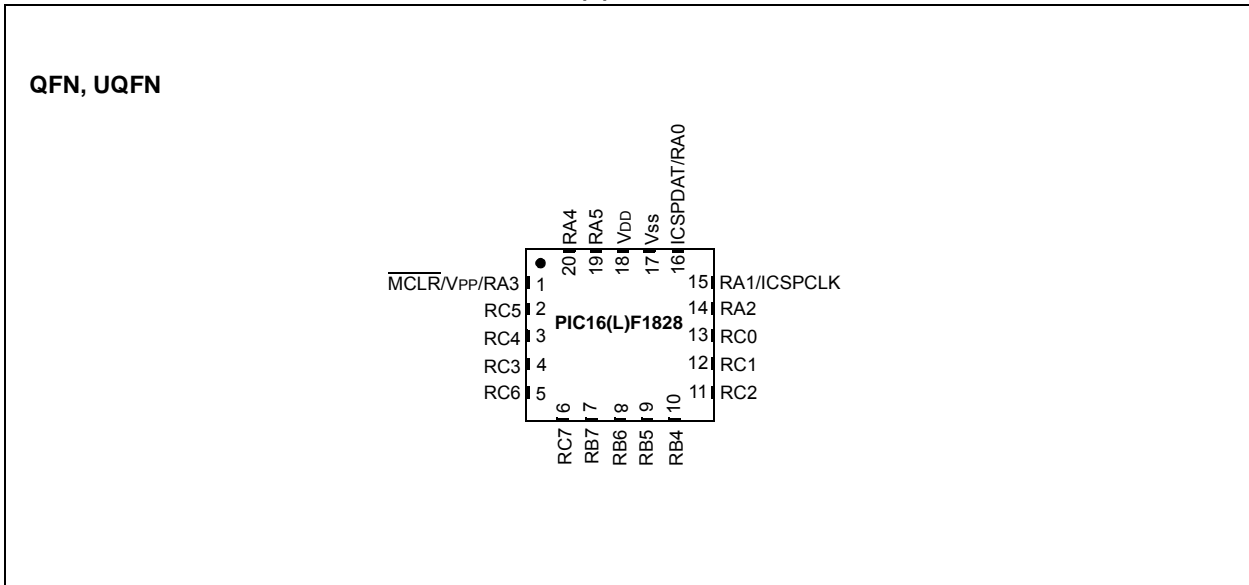


FIGURE 4: 20-PIN DIAGRAM FOR PIC16(L)F1828



PIC16(L)F1824/8

TABLE 2: 20-PIN ALLOCATION TABLE (PIC16(L)F1828)

I/O	20-Pin DIP/SOIC/SSOP	20-Pin QFN/JUQFN	A/D	Reference	Cap Sense	Comparator	SR Latch	Timers	CCP	EUSART	SSP	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 ⁽⁴⁾	MCLR VPP
RA4	3	20	AN3	—	CPS3	—	—	T1G ⁽¹⁾ T1OSO	P2B ⁽¹⁾	—	—	IOC	—	Y	OSC2 CLKOUT CLKR
RA5	2	19	—	—	—	—	—	T1CKI T1OSI	CCP2 ⁽¹⁾ P2A ⁽¹⁾	—	—	IOC	—	Y	OSC1 CLKIN
RB4	13	10	AN10	—	CPS10	—	—	—	—	—	SDA1 SDI1	IOC	—	Y	—
RB5	12	9	AN11	—	CPS11	—	—	—	—	RX ⁽¹⁾ DT ⁽¹⁾	—	IOC	—	Y	—
RB6	11	8	—	—	—	—	—	—	—	—	SCL1 SCK1	IOC	—	Y	—
RB7	10	7	—	—	—	—	—	—	—	TX ⁽¹⁾ CK ⁽¹⁾	—	IOC	—	Y	—
RC0	16	13	AN4	—	CPS4	C2IN+	—	—	P1D ⁽¹⁾	—	—	—	—	Y	—
RC1	15	12	AN5	—	CPS5	C12IN1-	—	—	P1C ⁽¹⁾	—	—	—	—	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	—	\overline{SS}	—	—	Y	—
RC7	9	6	AN9	—	CPS9	—	—	—	—	—	SDO	—	—	Y	—
VDD	1	18	—	—	—	—	—	—	—	—	—	—	—	—	VDD
VSS	20	17	—	—	—	—	—	—	—	—	—	—	—	—	VSS

Note 1: Pin function is selectable via the APFCON0 or APFCON1 registers.