PIC16(L)F1782/1783

28-Pin 8-Bit Advanced Analog Flash Microcontroller Product Brief

High-Performance RISC CPU:

- Only 49 Instructions
- 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

Extreme Low-Power (XLP) Management:

- Standby Current (PIC16LF1782/1783):
  - 50 nA @ 1.8V, typical
- Watchdog Timer Current (PIC16LF1782/1783):
  - 500 nA @ 1.8V, typical
- Timer1 (32.768 kHz Real-Time Clock) Oscillator Current (PIC16LF1782/1783):
  - 500 nA @ 1.8V, typical
- Operating Current (PIC16LF1782/1783):
  - 4 μA @ 32 kHz, 1.8V, typical
- Operating Current (PIC16LF1782/1783):
  - 150 μA @ 1 MHz, 1.8V, typical

Memory Features:

- Up to 4 KW Flash Program Memory:
  - Self-programmable under software control
  - Programmable code protection
  - Programmable write protection
- 256 Bytes of Data EEPROM
- Up to 512 Bytes of RAM

High-Performance PWM Controller:

- Two Programmable Switch Mode Controller (PSMC) modules:
  - Digital and/or analog feedback control of PWM frequency and pulse begin/end times
  - 16-bit Period, Duty Cycle and Phase
  - 16 ns clock resolution
  - Supports single PWM, complimentary, push-pull and three-phase modes of operation
  - Dead-band control with 8-bit counter
  - Auto-shutdown and restart
  - Leading and falling edge blanking
  - Burst mode

Analog Peripheral Features:

- Analog-to-Digital Converter (ADC):
  - Fully differential 12-bit converter
  - 100 ksps conversion rate
  - 11 single-ended channels
  - 5 differential channels
  - Positive and negative reference selection
- 8-bit Digital-to-Analog Converter (DAC):
  - Output available externally
  - Positive and negative reference selection
  - Internal connections to comparators, op amps, Fixed Voltage Reference (FVR) and ADC
- Three High-Speed Comparators:
  - 30 ns response time
  - Rail-to-rail inputs
  - Software selectable hysteresis
  - Internal connection to op amps, FVR and DAC
- Two Operational Amplifiers:
  - Rail-to-rail inputs/outputs
  - High/Low selectable Gain Bandwidth Product
  - Internal connection to DAC and FVR
- Fixed Voltage Reference (FVR):
  - 1.024V, 2.048V and 4.096V output levels
  - Internal connection to ADC, Comparators and DAC

Digital Peripheral Features:

- 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
- Timer2: 8-bit timer/counter with 8-bit period register, prescaler and postscaler
- Two Capture/Compare/PWM modules (CCP):
  - 16-bit Capture, maximum resolution 12.5 ns
  - 16-bit Compare, max resolution 31.25 ns
  - 10-bit PWM, max frequency 32 kHz
- Master Synchronous Serial Port (SSP) with SPI and I^2C™ 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

Oscillator Features:

- Operate up to 32 MHz from Precision Internal Oscillator:
  - Factory calibrated to ±1%, typical
  - Software selectable frequency range from 32 MHz to 31 kHz
- 31 kHz Low-Power Internal Oscillator
- 32.768 kHz Timer1 Oscillator:
  - available as system clock
  - Low power RTC
- External Oscillator Block with:
  - 4 crystal/resonator modes up to 32 MHz using 4x PLL
  - 3 external clock modes up to 32 MHz
- 4x Phase-Locked Loop (PLL)
- Fail-Safe Clock Monitor:
  - Detect and recover from external oscillator failure
- Two-Speed Start-up:
  - Minimize latency between code execution and external oscillator start-up

I/O Features:

- Up to 24 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
  - Individual input level selection
  - Slew rate control on selected output pins
  - Open drain outputs on selected output pins

General Microcontroller Features:

- 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™)
- In-Circuit Debug (ICD)
- Enhanced Low-Voltage Programming (LVP)
- Operating Voltage Range:
  - 1.8V to 3.6V (PIC16LF1782/1783)
  - 2.3V to 5.5V (PIC16F1782/1783)

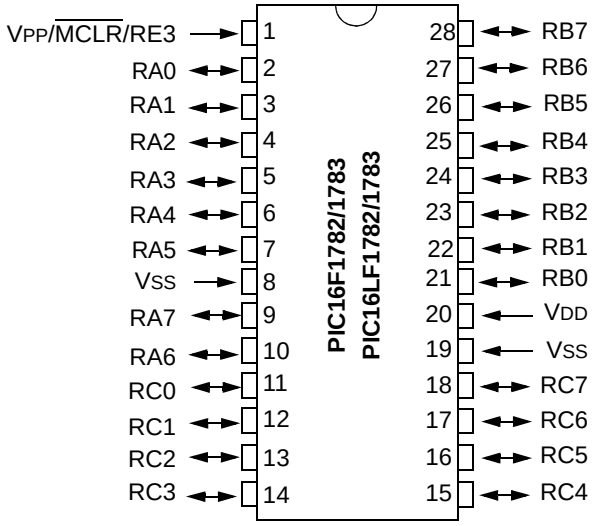
TABLE 1: PIC16(L)F1782/1783 FAMILY TYPES

Device	Program Memory Flash (words)	Data EEPROM (bytes)	SRAM (bytes)	I/Os	12-bit A/D (ch)	Comparators	Operational Amplifiers	8-bit DAC	Timers 8/16-bit	Programmable Switch Mode Controllers (PSMC)	CCP	EUSART	MSSP (I^2C™/SPI)
PIC16F1782	2048	256	256	25	11	3	2	1	2/1	2	2	1	1
PIC16LF1782	2048	256	256	25	11	3	2	1	2/1	2	2	1	1
PIC16F1783	4096	256	512	25	11	3	2	1	2/1	2	2	1	1
PIC16LF1783	4096	256	512	25	11	3	2	1	2/1	2	2	1	1

Note: Pin details are subject to change.

FIGURE 1: 28-PIN DIAGRAM FOR PIC16(L)F1782/1783

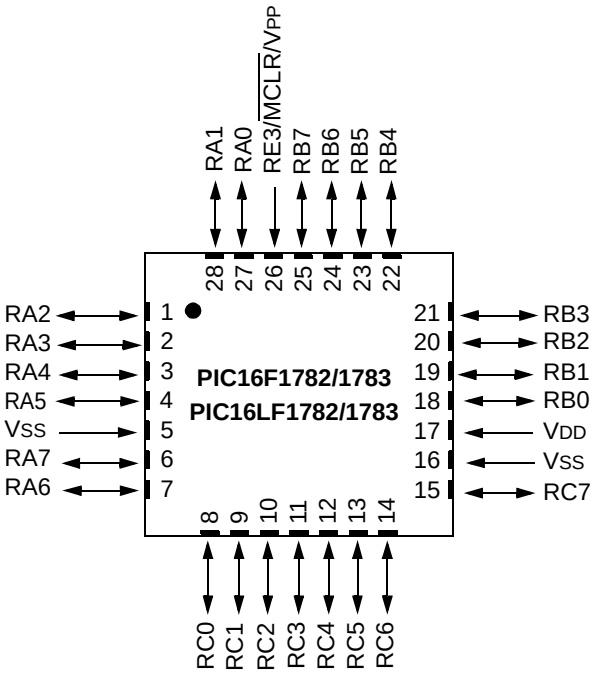
SPDIP, SOIC, SSOP



Note: See Table 2 for the location of all peripheral functions.

FIGURE 2: 28-PIN DIAGRAM FOR PIC16(L)F1782/1783

UQFN



Note: See Table 2 for the location of all peripheral functions.

TABLE 2: 28-PIN ALLOCATION TABLE (PIC16(L)F1782/1783)

I/O	28-Pin SPDIP, SOIC, SSOP	28-Pin QFN	ADC	Reference	Comparator	Operation Amplifiers	8-bit DAC	Timers	PSMC	CCP	EUSART	MSSP	Interrupt	Pull-up	Basic
RA0	2	27	AN0+ AN0-	—	C1IN0- C2IN0- C3IN0-	—	—	—	—	—	—	—	IOC	Y	—
RA1	3	28	AN1+ AN1-	—	C1IN1- C2IN1- C3IN1-	OPA1OUT	—	—	—	—	—	—	IOC	Y	—
RA2	4	1	AN2+ AN2-	VREF-	C1IN0+ C2IN0+ C3IN0+	—	DAC1OUT1 DAC1VREF-	—	—	—	—	—	IOC	Y	—
RA3	5	2	AN3+ AN3-	VREF+(1)	C1IN1+	—	DAC1VREF+	—	—	—	—	—	IOC	Y	—
RA4	6	3	—	—	C1OUT	OPA1IN+	—	T0CKI	—	—	—	—	IOC	Y	—
RA5	7	4	AN4+ AN4-	—	C2OUT(1)	OPA1IN-	—	—	—	—	—	$\overline{SS}$	IOC	Y	—
RA6	10	7	—	—	C2OUT(1)	—	—	—	—	—	—	—	IOC	Y	OSC2/ CLKOUT
RA7	9	6	—	VREF+(1)	—	—	—	—	PSMC1CLK PSMC2CLK	—	—	—	IOC	Y	OSC1/ CLKIN
RB0	21	18	AN12+ AN12-	—	C2IN1+	—	—	—	PSMC1IN PSMC2IN	CCP1(1)	—	—	INT/ IOC	Y	—
RB1	22	19	AN10+ AN10-	—	C1IN3- C2IN3- C3IN3-	OPA2OUT	—	—	—	—	—	—	IOC	Y	—
RB2	23	20	AN8+ AN8-	—	—	OPA2IN-	—	—	—	—	—	—	IOC	Y	CLKR
RB3	24	21	AN9+ AN9-	—	C1IN2- C2IN2- C3IN2-	OPA2IN+	—	—	—	CCP2(1)	—	—	IOC	Y	—
RB4	25	22	AN11+ AN11-	—	C3IN1+	—	—	—	—	—	—	—	IOC	Y	—
RB5	26	23	AN13+ AN13-	—	C3OUT	—	—	T1G	—	—	—	SDO(1)	IOC	Y	—
RB6	27	24	—	—	—	—	—	—	—	—	TX(1) CK(1)	SDI(1) SDA(1)	IOC	Y	ICSPCLK
RB7	28	25	—	—	—	—	DAC1OUT2	—	—	—	RX(1) DT(1)	SCK(1) SCL(1)	IOC	Y	ICSPDAT
RC0	11	8	—	—	—	—	—	T1OSO T1CKI	PSMC1A	—	—	—	IOC	Y	—
RC1	12	9	—	—	—	—	—	T1OSI	PSMC1B	CCP2(1)	—	—	IOC	Y	—
RC2	13	10	—	—	—	—	—	—	PSMC1C	CCP1(1)	—	—	IOC	Y	—
RC3	14	11	—	—	—	—	—	—	PSMC1D	—	—	SCK(1) SCL(1)	IOC	Y	—
RC4	15	12	—	—	—	—	—	—	PSMC1E	—	—	SDI(1) SDA(1)	IOC	Y	—
RC5	16	13	—	—	—	—	—	—	PSMC1F	—	—	SDO(1)	IOC	Y	—
RC6	17	14	—	—	—	—	—	—	PSMC2A	—	TX(1) CK(1)	—	IOC	Y	—
RC7	18	15	—	—	—	—	—	—	PSMC2B	—	RX(1) DT(1)	—	IOC	Y	—
RE3	1	26	—	—	—	—	—	—	—	—	—	—	IOC	Y	$\overline{MCLR}$/ VPP
VDD	20	17	—	—	—	—	—	—	—	—	—	—	—	—	VDD
VSS	8, 19	5, 16	—	—	—	—	—	—	—	—	—	—	—	—	VSS

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

NOTES:

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