PIC16LF1554/1559

14/20-Pin, 8-Bit Flash Microcontroller Product Brief

Description:

The PIC16LF1554/1559 microcontrollers with Microchip enhanced mid-range core deliver unique on-chip features for the design of mTouch™ solutions and general purpose applications in 14/20-pin count packages. Up to 17 analog channels connecting to two 10-bit ADCs with automated hardware CVD modules, two PWMs and multiple communication peripherals offer an excellent solution to implement capacitive sensing and other front-end sampling applications with minimal software overhead.

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 16 MHz Internal Oscillator:
  - Factory calibrated to ±1%, typical
  - Software selectable frequency range from 32 MHz to 31 kHz
- 31 kHz Low-Power Internal Oscillator
- 4x Phase-Locked Loop (PLL)
- Power-Saving Sleep mode
- Power-on Reset (POR)
- Power-up Timer (PWRT)
- BOR with Selectable Trip Point
- 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)
- Operating Voltage Range:
  - 1.8V to 3.6V
- Programmable Code Protection
- Self-Programmable under Software Control

Low-Power Features:

- Standby Current:
  - 30 nA @ 1.8V, typical
- Operating Current:
  - 75 μA @ 1 MHz, 1.8V, typical
- Low-Power Watchdog Timer Current:
  - 500 nA @ 1.8V, typical

Peripheral Features:

- Up to 17 I/O Pins and One 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
- Timer2 modules: 8-Bit Timer/Counter with 8-Bit Period Register, Prescaler and Postscaler
- Two PWM modules
- Two Analog-to-Digital Converters (ADC):
  - 10-bit resolution
  - Up to 17 channels
  - Simultaneous sampling on two ADCs
  - Connect multiple channels together for sampling
  - External conversion trigger
  - Flexible analog channel selection
  - Conversion during Sleep
  - Fixed Voltage Reference as channel
  - External pin as ADC positive reference
  - Temp sensor channel input
- Voltage Reference module:
  - Fixed Voltage Reference (FVR) with 1.024V and 2.048V output levels
- Hardware Capacitive Voltage Divider (CVD):
  - Double-sample conversions
  - Two sets of result registers
  - Inverted acquisition
  - 7-bit pre-charge timer
  - 7-bit acquisition timer
  - Two guard ring output drives
  - 30 pF adjustable sample and hold capacitor array
- Master Synchronous Serial Port (MSSP) 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

TABLE 1: PIC16LF1554/1559 FAMILY TYPES

Device	Data Sheet Index	Program Memory Flash (words)	Data EEPROM (bytes)	SRAM (bytes)	I/Os	10-bit A/D (ch)(1)	Timers 8/16-Bit	EUSART	MSSP	PWM	Cap Touch Channels	Debug(2)
PIC16LF1554	**(A)**	4096	0	256	12	11	2/1	1	1	2	11	I
PIC16LF1559	**(A)**	8192	0	512	18	17	2/1	1	1	2	17	I

Note 1: 11/17 analog channels are connected to two ADC modules.

2: Debugging Methods: (I) – Integrated on Chip; (H) – available using Debug Header

Data Sheet Index:

A. Future Release PIC16LF1554/1559 Data Sheet, 14/20-Pin, 8-Bit Flash Microcontrollers.

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

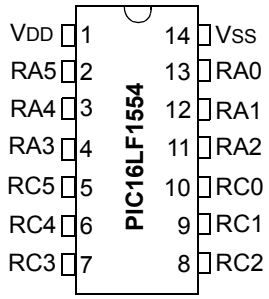
TABLE 2: PACKAGES

Packages	PDIP	SOIC	QFN	SSOP	TSSOP
PIC16LF1554	X	X	X		X
PIC16LF1559	X		X	X	

Note: Pin details are subject to change.

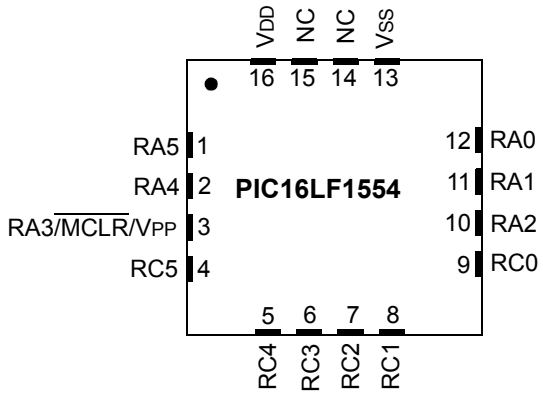
PIN DIAGRAMS

FIGURE 1: 14-PIN PDIP, SOIC, TSSOP



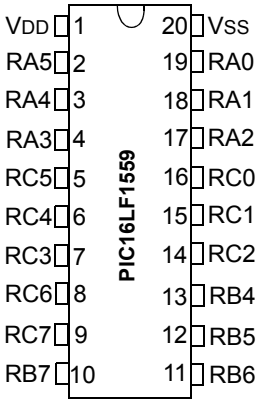
Note: See Table 3 for location of all peripheral functions.

FIGURE 2: 16-PIN QFN



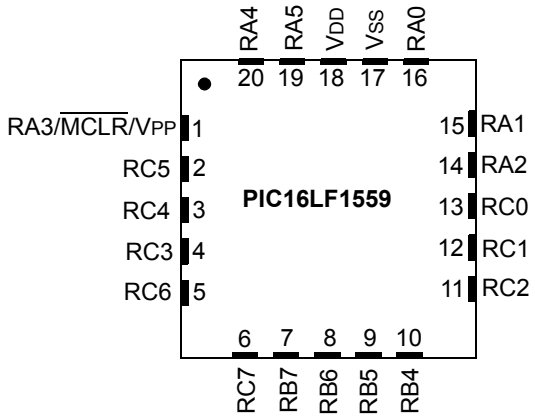
Note: See Table 3 for location of all peripheral functions.

FIGURE 3: 20-PIN PDIP, SSOP



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

FIGURE 4: 20-PIN QFN (4x4)



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

PIN ALLOCATION TABLES

TABLE 3: 14-PIN AND 16-PIN ALLOCATION TABLE (PIC16LF1554)

I/O	14-Pin PDIP/SOIC/TSSOP	16-Pin QFN	A/D	Reference	Timers	PWM	EUSART	MSSP	Interrupt	Pull-up	Basic
RA0	13	12	AN0	—	—	—	—	—	IOC	Y	ICSPDAT/ ICDDAT
RA1	12	11	AN1	VREF	—	—	—	—	IOC	Y	ICSPCLK ICDCLK
RA2	11	10	AN2	—	T0CKI	—	—	—	INT/ IOC	Y	—
RA3	4	3	—	—	—	—	—	$\overline{SS}$(1) SDA(1) SDI(1)	IOC	Y	$\overline{MCLR}$ VPP
RA4	3	2	AN10 ADTRIG	—	T1G	—	RX(1) DT(1)	SDO(1)	IOC	Y	CLKOUT
RA5	2	1	AN20	—	T1CKI	—	—	—	IOC	Y	CLKIN
RC0	10	9	AN13	—	—	—	—	SCL SCK	—	Y	—
RC1	9	8	AN23	—	—	—	—	SDA(1) SDI(1)	—	Y	—
RC2	8	7	AN12 AD1GRDB AD2GRDB(1)	—	—	PWM1	—	SDO(1)	—	Y	—
RC3	7	6	AN22 AD1GRDB(1) AD2GRDB	—	—	PWM2	TX(1) CK(1)	$\overline{SS}$(1)	—	Y	—
RC4	6	5	AN11 AD1GRDA AD2GRDA(1)	—	—	—	TX(1) CK(1)	—	—	Y	—
RC5	5	4	AN21 AD1GRDA(1) AD2GRDA	—	—	—	RX(1) DT(1)	—	—	Y	—
VDD	1	16	—	—	—	—	—	—	—	—	VDD
VSS	14	13	—	—	—	—	—	—	—	—	VSS

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

TABLE 4: 20-PIN ALLOCATION TABLE (PIC16LF1559)

I/O	20-Pin PDIP/SSOP	20-Pin QFN	A/D	Reference	Timers	PWM	EUSART	MSSP	Interrupt	Pull-up	Basic
RA0	19	16	AN0	—	—	—	—	—	IOC	Y	ICSPDAT/ ICDDAT
RA1	18	15	AN1	V_{REF+}	—	—	—	—	IOC	Y	ICSPCLK/ ICDCLK
RA2	17	14	AN2	—	T0CKI	—	—	—	INT/ IOC	Y	—
RA3	4	1	—	—	—	—	—	SDA(1) SDI(1) $\overline{SS}$(1)	IOC	Y	$\overline{MCLR}$ V_{PP}
RA4	3	20	AN10 ADTRIG	—	T1G	—	—	—	IOC	Y	CLKOUT
RA5	2	19	AN20	—	T1CKI	—	—	—	IOC	Y	CLKIN
RB4	13	10	AN26	—	—	—	—	SDA(1) SDI(1)	IOC	Y	—
RB5	12	9	AN16	—	—	—	RX DT	—	IOC	Y	—
RB6	11	8	AN25	—	—	—	—	SCL SCK	IOC	Y	—
RB7	10	7	AN15	—	—	—	TX CK	—	IOC	Y	—
RC0	16	13	AN13	—	—	—	—	—	—	Y	—
RC1	15	12	AN23	—	—	—	—	—	—	Y	—
RC2	14	11	AN12 AD1GRDB AD2GRDB(1)	—	—	PWM1	—	—	—	Y	—
RC3	7	4	AN22 AD1GRDB(1) AD2GRDB	—	—	PWM2	—	—	—	Y	—
RC4	6	3	AN11 AD1GRDA AD2GRDA(1)	—	—	—	—	—	—	Y	—
RC5	5	2	AN21 AD1GRDA(1) AD2GRDA	—	—	—	—	—	—	Y	—
RC6	8	5	AN14	—	—	—	—	$\overline{SS}$(1)	—	Y	—
RC7	9	6	AN24	—	—	—	—	SDO	—	Y	—
V_{DD}	1	18	—	—	—	—	—	—	—	—	V_{DD}
V_{SS}	20	17	—	—	—	—	—	—	—	—	V_{SS}

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

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