

PIC16(L)F161X Microcontrollers

Low Pin Count MCUs For Safety-Critical Applications

Summary

Designers are faced with the challenge of complying with safety standards in their design, while keeping cost and complexity to a minimum. The PIC16(L)F161X product family offers Microchip's Core Independent Peripherals (CIP), which offload timing-critical and core-intensive tasks from the CPU, allowing it to focus on other application tasks. Additionally, this family integrates fault-detecting hardware features to assist engineers in developing safety-critical applications. This high level of integration makes these MCUs suitable for many applications like home appliances, industrial machinery, motor and power supplies.

The 8-pin, 14-pin and 20-pin PIC16(L)F161X family offers up to 14 KB of self-write program memory and up to 1 KB of RAM. The PIC16(L)F161X provides a Windowed Watchdog Timer (WWDT), Cyclic Redundancy Check with Memory Scan (CRC/SCAN), and Hardware Limit Timer (HLT) which help ease implementation of safety standards or safety features. The higher-memory products include additional peripherals to support control and power management applications. These features eliminate code overhead and the need for external components, which helps to reduce design complexity, save costs and speed the time to market.

Base Features

- 32 MHz Internal oscillator
- High-Endurance Flash (HEF)
 - 128 B Non-volatile data storage
 - 100 K Erase/write cycles
- Up to twelve 10-bit ADC channels
- 8-bit DAC
- Up to two comparators
- eXtreme Low Power (XLP) technology

Peripherals

- **Angular Timer:** Phase angle timer for measurement and control of rotational and periodic events (motor, AC mains, TRIAC, etc.); minimal code needed to configure.
- **Math Accelerator:** Hardware accelerated math function (MULTIPLY, ADD, ACCUMULATE) utilizing 8-bit/16-bit values with 35-bit result. Additionally, the capability to calculate a 16-bit PID function based on configurable Kp, Ki, Kd constants with a 34-bit result.
- **10-bit PWM:** High resolution helps simplify drive control.
- **Configurable Logic Cell (CLC):** Integrated combinational and sequential logic functions and increases on-chip interconnections of peripherals and I/Os, saving board space and program code.
- **High Current Drive I/Os:** 100 mA I/Os help eliminate the need for a MOSFET driver, reducing overall BOM cost.

Designed for Safety-Critical Applications

Advanced Motor Control Capability



- **Communications:** EUSART and SPI/I²C™
- **Cyclic Redundancy Check with Memory Scan (CRC/SCAN):** Automatically calculates CRC checksum of Program/DataEE memory for non-volatile memory integrity. Additionally provides a general purpose 16-bit CRC for use with memory and communications data. Monitoring is done in hardware with no interruption to the CPU, reducing overall code.
- **Windowed Watchdog Timer (WWDT):** System supervisory circuit that generates a reset when software timing anomalies are detected within a configurable critical window. Gives you the flexibility and ease to add monitoring to design.
- **24-bit Signal Measurement Timer (SMT):** Performs high-resolution measurements of any digital signal in hardware, resulting in more precise and accurate measurements. This can be used as a standard timer, ideal for speed control, range finding and RPM indicators.
- **Hardware Limit Timer (HLT):** General purpose 8-bit timer/counter with hardware monitoring capabilities for missed periodic events and fault detection of external hardware.
- **Zero Cross Detect (ZCD):** Detects high-voltage AC signals at the lowest crossing. Simplifies TRIAC and switching control, eliminating the need for additional components.
- **Complementary Waveform Generator (CWG):** Provides non-overlapping complementary waveforms for various inputs including comparators and PWM, while offering enhanced features like deadband control, auto shutdown, auto reset, phase control and blanking control.
- **Capture Compare and PWM (CCP):** Includes a 10-bit PWM which can be utilized to implement a variety of motor control and lighting applications.



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Application and Function Examples

- Home appliances
- System monitoring
- Industrial machinery
- TRIAC control and lighting dimming
- Garage door systems
- Motor/fan control

PIC16F161X Product Family																				
Device	Program Memory (Kbytes)	HEF	Data RAM (bytes)	I/O Pins	8/16-bit Timers	Comparators	10-bit ADC (ch)	Zero Cross Detect	CCP/10-bit PWM	CWG	CLC	SMT/HLT	Angular Timer	Windowed Watchdog Timer	CRC Scan	Math Accelerator	Peripheral Pin Select (PPS)	EUSART	I ² C™/SPI	XLP
PIC12(L)F1612	3.5	128	256	6	4/1	1	4	1	2/0	1	0	2/1	0	✓	✓	0	–	0	0	✓
PIC16(L)F1613	3.5	128	256	12	4/1	2	8	1	2/0	1	0	2/1	0	✓	✓	0	–	0	0	✓
PIC16(L)F1614	7	128	512	12	4/3	2	8	1	2/2	1	2	2/1	1	✓	✓	1	✓	1	1	✓
PIC16(L)F1615	14	128	1024	12	4/3	2	8	1	2/2	1	4	2/1	1	✓	✓	1	✓	1	1	✓
PIC16(L)F1618	7	128	512	18	4/3	2	12	1	2/2	1	2	2/1	1	✓	✓	1	✓	1	1	✓
PIC16(L)F1619	14	128	1024	18	4/3	2	12	1	2/2	1	4	2/1	1	✓	✓	1	✓	1	1	✓

Development Made Easy

The PIC16F161X family provides a low-cost development experience from code creation to integration into the end application.

Develop Your Code – Using MPLAB® IDE with the integrated XC compiler allows you to develop code and simulate your application with zero initial investment.

Program and Debug – The PIC16F161X family supports In-Circuit Debug functionality without the use of an additional header. Connect the PICKit™ 3, MPLAB ICD 3 (In-Circuit Debugger) to get started.

Code Configuration – The MPLAB Code Configurator generates seamless, easy-to-understand C code that is inserted into your project. It enables, configures and utilizes a rich set of peripherals across a number of devices. It is integrated into MPLAB X IDE to provide a very powerful and extremely easy-to-use development platform.

Development Tools from Microchip

- PICKit 3 In-Circuit Debugger (PG164130)
- MPLAB ICD 3 In-Circuit Debugger (DV164035)
- Curiosity Development Board (DM164137)

Additional Information

- PIC12(L)F1612/PIC16F1613 Datasheet (DS40001737)
- 8-bit PIC® Microcontrollers Solutions Brochure (DS30009630)
- Corporate Focus Product Selector Guide (DS00001308)
- Quick Guide to Microchip Development Tools Brochure (DS50001894)
- Peripheral Pin Select Tech Brief (TB3098)
- Zero Cross Detect Tech Brief (TB3099)
- PIC16(L)F161X Product Brief (DS40001745)

Sample/Purchasing Information

- Online sampling: www.sample.microchip.com
- Online purchasing: www.microchipdirect.com



Visit our web site for additional product information and to locate your local sales office.

Microchip Technology Inc. • 2355 W. Chandler Blvd. • Chandler, AZ 85224-6199

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