

# PIC16F170X/171X 8-bit Microcontrollers

*Cost-Efficient, Intelligent Analog MCUs with eXtreme Low Power (XLP) Technology*

## Summary

PIC16F170X/171X microcontrollers (MCUs) combine Intelligent Analog integration with low cost and eXtreme Low Power (XLP) to suit a variety of cost-sensitive general-purpose applications. These devices deliver on-chip analog features (op amps, ADC and DAC) along with other Core Independent Peripherals (CIP) in 14-, 20-, 28- and 40-pin packages. PIC16F170X/171X MCUs also feature Peripheral Pin Select (PPS) and Zero Cross Detect, to provide increased design flexibility.

The eleven members of the PIC16F170X/171X family are based on Microchip's Enhanced Mid-Range Core architecture and offer up to 16 Kwords of Flash program memory, up to 2 KB of RAM, SPI/I<sup>2</sup>C™. These MCUs, with their low cost and Intelligent Analog integration, are designed for applications that would benefit from both the board space and design cost savings.

## Key Features

- **Intelligent Analog:** Integrates up to two op amps, up to two high speed comparators, up to 28 input channels of 10-bit ADC and up to one 5-bit/8-bit DAC, saving both board space and design BOM costs.
- **Configurable Logic Cell (CLC):** Create custom combinational and sequential logic using this integrated configurable logic cell module. Using CLC, you can also bring external gates and state functions into the MCU itself.
- **Numerically Controlled Oscillator (NCO):** Linearly adjusts the frequency output with very fine steps. The NCO provides high-resolution oscillator capabilities to control applications such as lighting ballast, radio and tone generator.
- **Complementary Output Generator (COG):** Provides a complementary waveform with rising and falling edge dead band control, enabling high-efficiency synchronous switching with no processor overhead. The COG also incorporates auto shutdown and auto restart and can directly interface with other peripherals/external inputs. It also incorporates blanking and phase control.
- **Zero Cross Detect (ZCD):** AC high-voltage zero crossing detection for simplifying TRIAC control, synchronized switching control and timing.
- **Peripheral Pin Select (PPS):** Configure any digital peripheral to any pin via an internal MUX to ensure layout flexibility and completely eliminate pin overlap.
- **High-Endurance Flash (HEF)**
  - 128 B Non-volatile data storage
  - 100 K Erase/write cycles



## Why PIC16F170X/171X?

- **Flexible Intelligence:** Wide array of analog features, Core Independent Peripherals and traditional peripherals to enable thousands of applications in consumer electronics, lighting, medical, safety/security, home appliance, industrial and other markets.
- **eXtreme Low Power (XLP):** With 35 nA standby current and 30  $\mu$ A/MHz active current typical, these MCUs are highly suitable for battery-powered applications.
- **Low Cost:** Designed to enable highly efficient applications while promoting cost savings.

## Additional Information

- *PIC16(L)170X/1X Product Brief*, (DS40001708)
- *PIC16(L)1703/7 Datasheet*, (DS40001722)
- *PIC16(L)1704/8 Datasheet*, (DS40001715)
- *PIC16(L)1705/9 Datasheet*, (DS40001729)
- *PIC16(L)1713/6 Datasheet*, (DS40001726)
- *PIC16(L)1717/8/9 Datasheet*, (DS40001740)
- *8-bit PIC® Microcontroller Solutions Brochure*, DS30009630
- *Focus Product Selector Guide*, DS00001308
- *Quick Guide to Microchip Development Tools Brochure*, DS50001894



**MICROCHIP**

| PIC16F170X/171X Microcontrollers |                        |         |              |          |                 |                        |        |                 |              |            |     |     |     |                              |        |     |     |     |     |
|----------------------------------|------------------------|---------|--------------|----------|-----------------|------------------------|--------|-----------------|--------------|------------|-----|-----|-----|------------------------------|--------|-----|-----|-----|-----|
| Device                           | Program Memory (words) | HEF (B) | SRAM (Bytes) | I/O Pins | 8/16-bit Timers | High Speed Comparators | Op Amp | 10-bit ADC (ch) | 5-/8-bit DAC | Zero Cross | CCP | PWM | COG | MSSP (I <sup>2</sup> C™/SPI) | EUSART | PPS | CLC | NCO | XLP |
| PIC16(L)F1703                    | 2K                     | 128     | 256          | 12       | 2/1             | 0                      | 2      | 8               | 0            | 1          | 2   | 0   | 0   | 1                            | 0      | ✓   | 0   | 0   | ✓   |
| PIC16(L)F1704                    | 4K                     | 128     | 512          | 12       | 4/1             | 2                      | 2      | 8               | 0/1          | 1          | 2   | 2   | 1   | 1                            | 1      | ✓   | 3   | 0   | ✓   |
| PIC16(L)F1705                    | 8K                     | 128     | 1K           | 12       | 4/1             | 2                      | 2      | 8               | 0/1          | 1          | 2   | 2   | 1   | 1                            | 1      | ✓   | 3   | 0   | ✓   |
| PIC16(L)F1707                    | 2K                     | 128     | 256          | 18       | 2/1             | 0                      | 2      | 8               | 0            | 1          | 2   | 0   | 0   | 1                            | 0      | ✓   | 0   | 0   | ✓   |
| PIC16(L)F1708                    | 4K                     | 128     | 512          | 18       | 4/1             | 2                      | 2      | 12              | 0/1          | 1          | 2   | 2   | 1   | 1                            | 1      | ✓   | 3   | 0   | ✓   |
| PIC16(L)F1709                    | 8K                     | 128     | 1K           | 18       | 4/1             | 2                      | 2      | 12              | 0/1          | 1          | 2   | 2   | 1   | 1                            | 1      | ✓   | 3   | 0   | ✓   |
| PIC16(L)F1713                    | 4K                     | 128     | 512          | 25       | 4/1             | 2                      | 2      | 17              | 1/1          | 1          | 2   | 2   | 1   | 1                            | 1      | ✓   | 4   | 1   | ✓   |
| PIC16(L)F1716                    | 8K                     | 128     | 1K           | 25       | 4/1             | 2                      | 2      | 17              | 1/1          | 1          | 2   | 2   | 1   | 1                            | 1      | ✓   | 4   | 1   | ✓   |
| PIC16(L)F1717                    | 8K                     | 128     | 1K           | 36       | 4/1             | 2                      | 2      | 28              | 1/1          | 1          | 2   | 2   | 1   | 1                            | 1      | ✓   | 4   | 1   | ✓   |
| PIC16(L)F1718                    | 16K                    | 128     | 2K           | 25       | 4/1             | 2                      | 2      | 17              | 1/1          | 1          | 2   | 2   | 1   | 1                            | 1      | ✓   | 4   | 1   | ✓   |
| PIC16(L)F1719                    | 16K                    | 128     | 2K           | 36       | 4/1             | 2                      | 2      | 28              | 1/1          | 1          | 2   | 2   | 1   | 1                            | 1      | ✓   | 4   | 1   | ✓   |

## Development Made Easy

The PIC16F170X/171X family provides a low-cost development experience from code creation to integration into the end application.

### Development Tools from Microchip

- PICKIT™ 3 In-Circuit Debugger (PG164130)
- Curiosity Development Board (DM164137)
- MPLAB® ICD 3 In-Circuit Debugger (DV164035)
- F1 Evaluation Platform (DM164130-1)
- F1 Evaluation Kit (DV164132)
- PICDEM™ Lab Development Kit (DM163045)
- PICDEM 2 Plus Demonstration Board (DM163022-1)
- MPLAB PM3 Universal Device Programmer (DV007004)



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

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