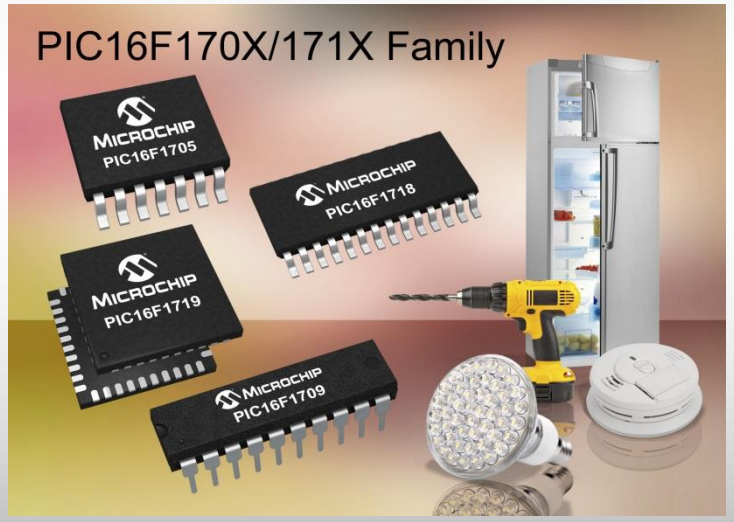
March 31, 2014

MICROCHIP



Announcing the PIC16(L)F170X/171X 8-bit MCU Family

PIC16(L)F170X/171X Family

Cost-Effective, Intelligent-Analog 8-bit MCUs

- **Intelligent Analog Integration reduces system BOM cost and board space**
  - Two internal Op Amps
    - Signal amplification/conditioning
  - Zero Cross Detect (ZCD) – *New!*
    - High-voltage AC signal interface
  - 10-bit ADC, 5-/8-bit DACs, High-Speed Comparators

- **Core Independent Peripherals handle tasks with no code or CPU supervision**
  - Configurable Logic Cell (CLC)
    - MUX for peripheral interconnection
  - Complementary Output Generator (COG)
    - Complementary waveforms with blanking/phase control
  - Numerically Controlled Oscillator (NCO)
    - Precision linear frequency control

PIC16(L)F170X/171X Family

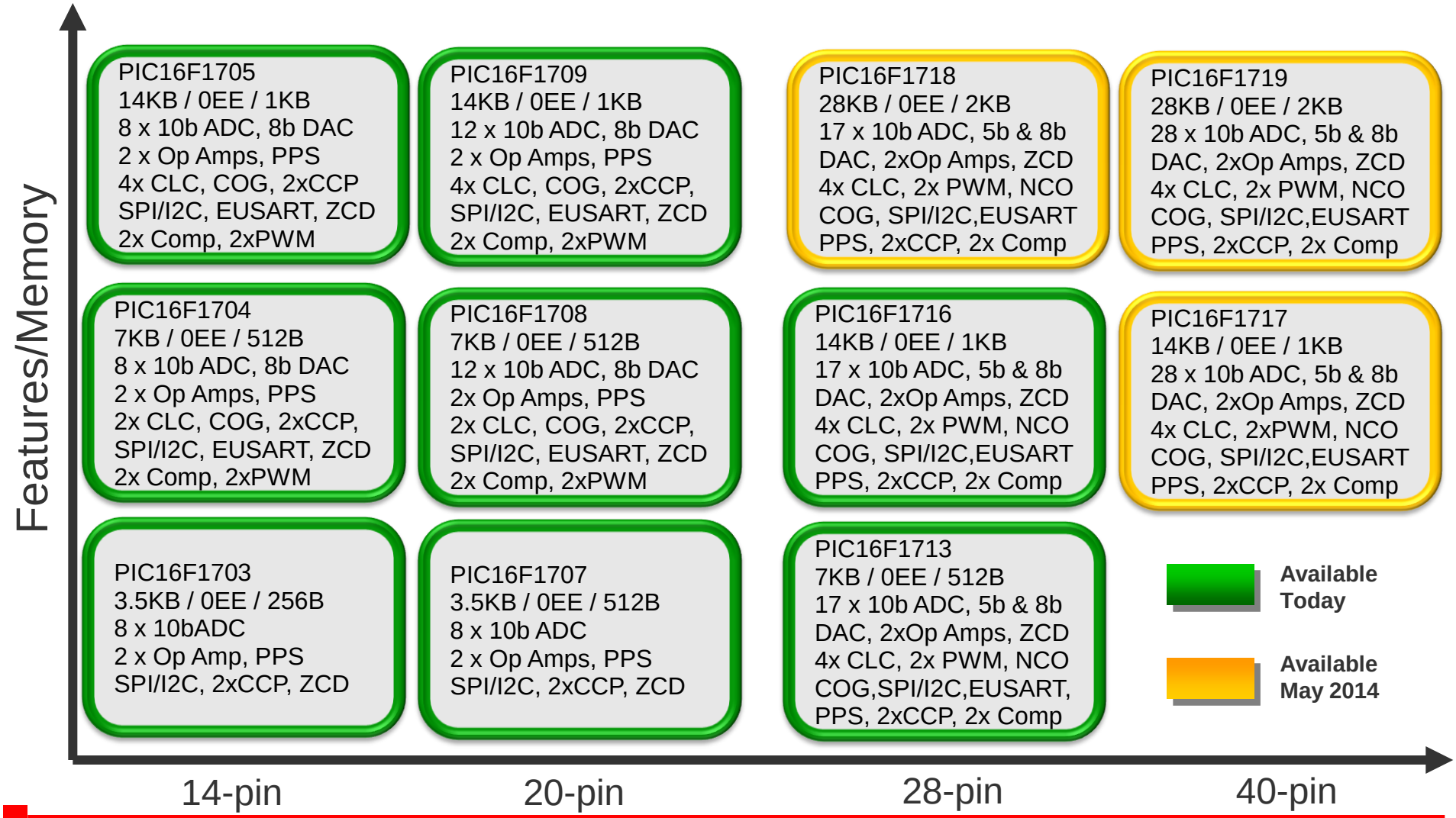
Continued…

- **Highly Flexible and Cost Effective for a wide variety of end equipment**
  - Peripheral Pin Select (PPS) – *1st for PIC16 MCUs!*
    - Map any digital peripheral to any I/O pin
  - 11 New MCUs Offer a Breadth of Pin Counts, Memory Sizes and Features
    - 14-, 20-, 28- and 40/44-pin packages
    - 3.5 KB to 28 KB Flash
    - 256 B to 2 KB RAM

- **eXtreme Low Power (XLP) for efficient line & battery powered applications**
  - 35 nA Sleep Current
  - 30 µA/MHz Active Current

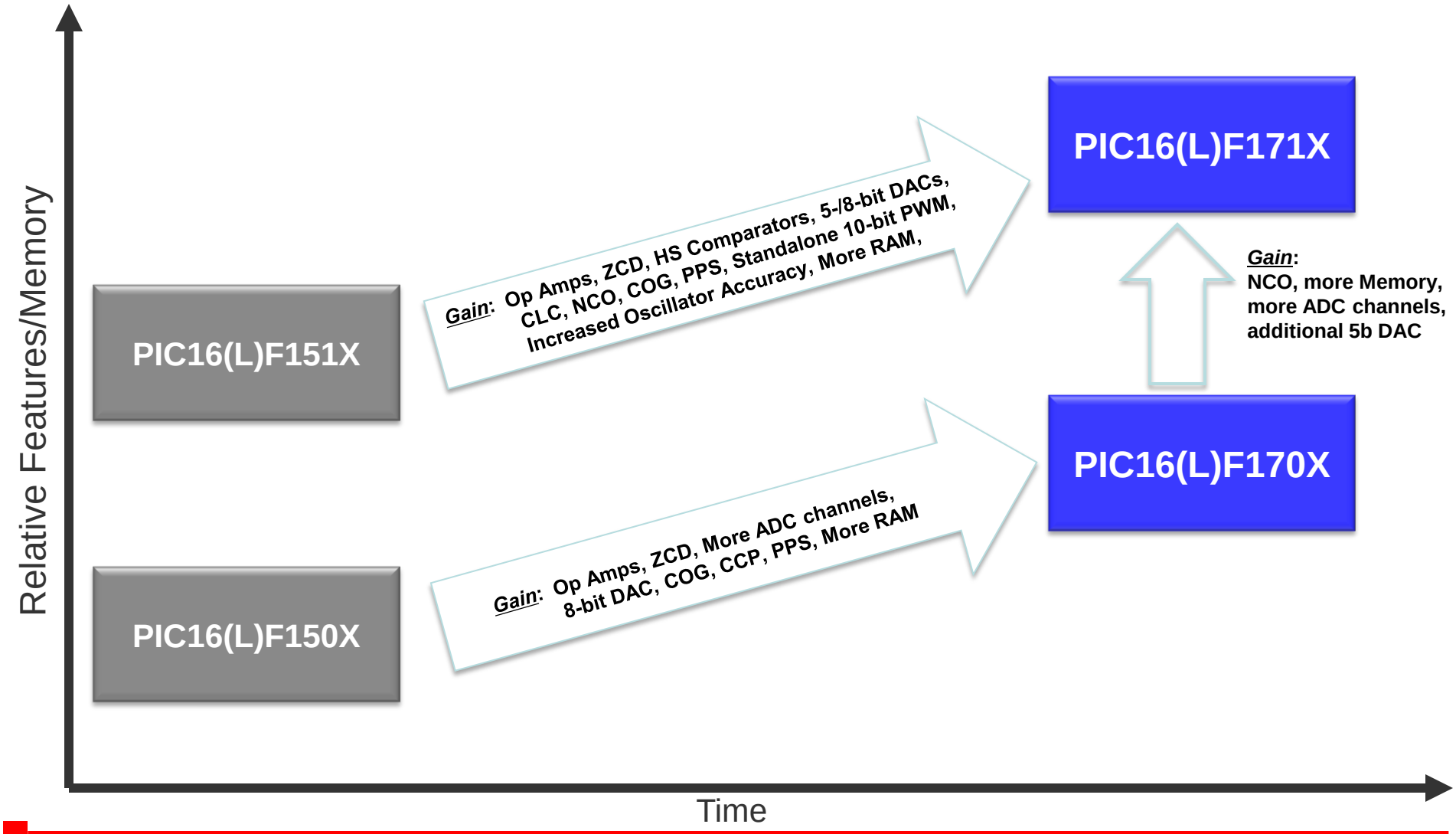
PIC16(L)F170X/171X Family

Breadth of Pin Counts, Memory Sizes & Features



PIC16(L)F170X/171X Family

Easy Migration to Additional Integration



PIC16(L)F170X/171X Family

Versatile Functionality to Address Broad Applications

Consumer

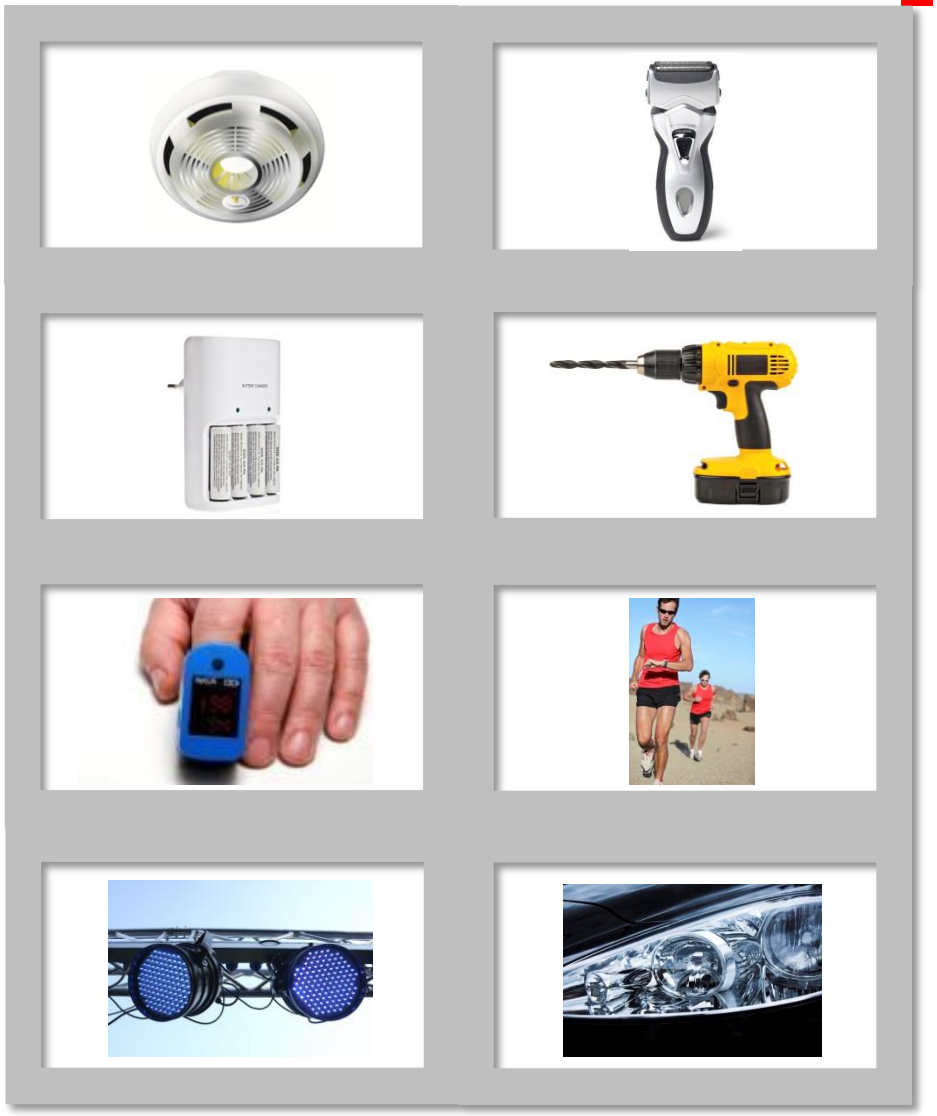
- Smoke Detectors
- Electric Razors
- Battery Chargers
- Power Drills
- Home Appliances

Medical

- Pulse Oximeters
- Wearable Exercise Monitors
- Glucose Meters
- Blood-Pressure Meters

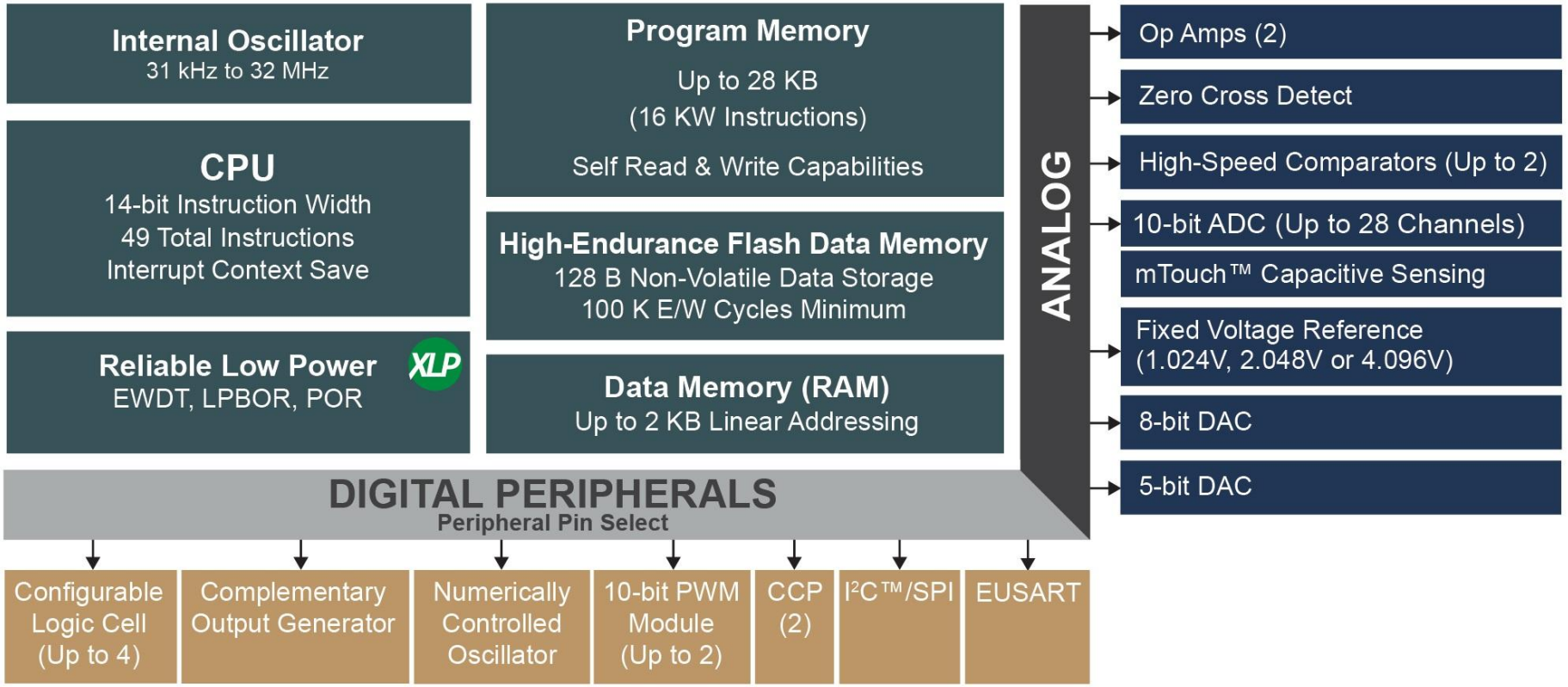
Lighting Control

- Indoor/Outdoor
- Automotive Lighting
- Portable Lighting
- Specialty Lighting



PIC16(L)F170X/171X Family

Block Diagram



PIC16(L)F170X/171X Family

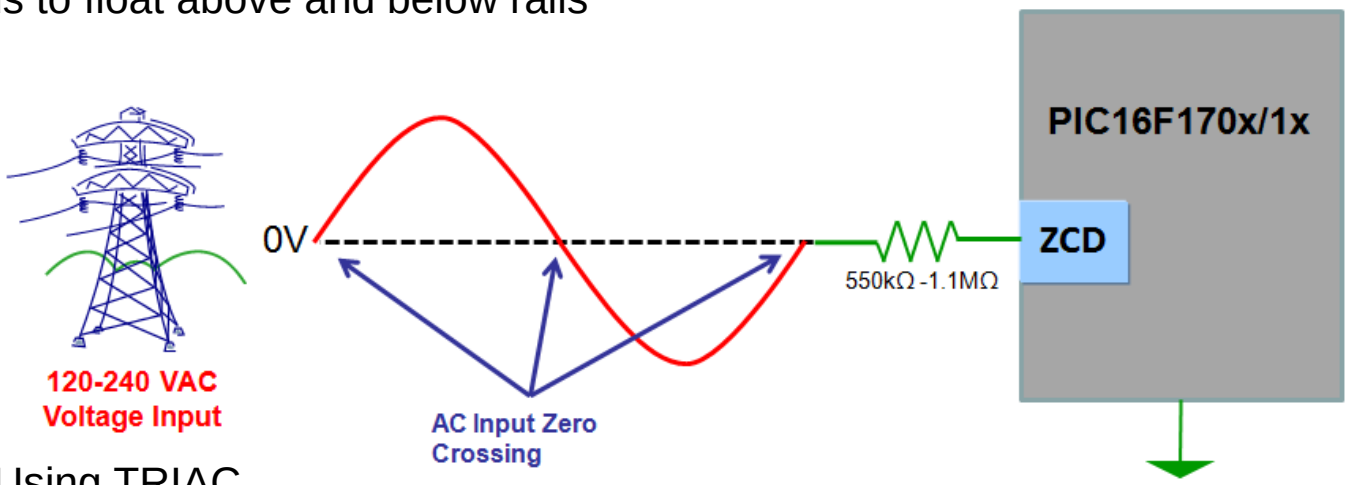
Zero Cross Detect – New PIC® MCU feature!

About Zero Cross Detect (ZCD)

- Senses when high-voltage AC signal on pin crosses through ground
- Simplifies TRIAC control
- Minimizes EMI caused by switching transients
  - Switching power “ON” or “OFF” when VAC is low
- Can be used as long-term time reference
  - Senses how often the high-voltage AC line crosses ground
- Pin is held at constant 1 Vdc;
  - Usually, pin needs to float above and below rails

For Use In

- AC Power Supplies
- Frequency Counters
- White Goods
  - TRIAC Control
- Light-Dimming Control Using TRIAC



PIC16(L)F170X/171X Family

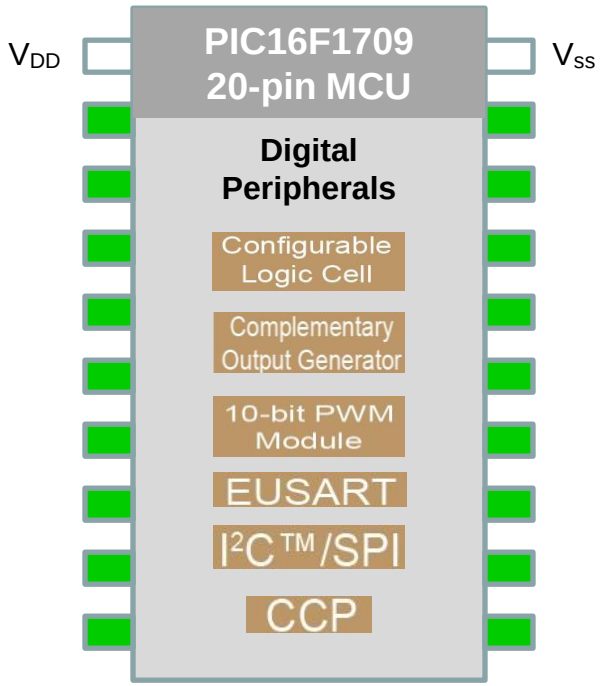
Peripheral Pin Select – First Time on a PIC16!

About Peripheral pin Select (PPS)

- More flexible than previous PPS implementation
  - Configure any digital peripheral to any I/O pin via an internal MUX
- Ensures layout flexibility
  - Allows routing of PCB traces to minimize EMC effects
- Completely eliminates “pin overlap”
  - Total optimization of MCU resources

For Use In

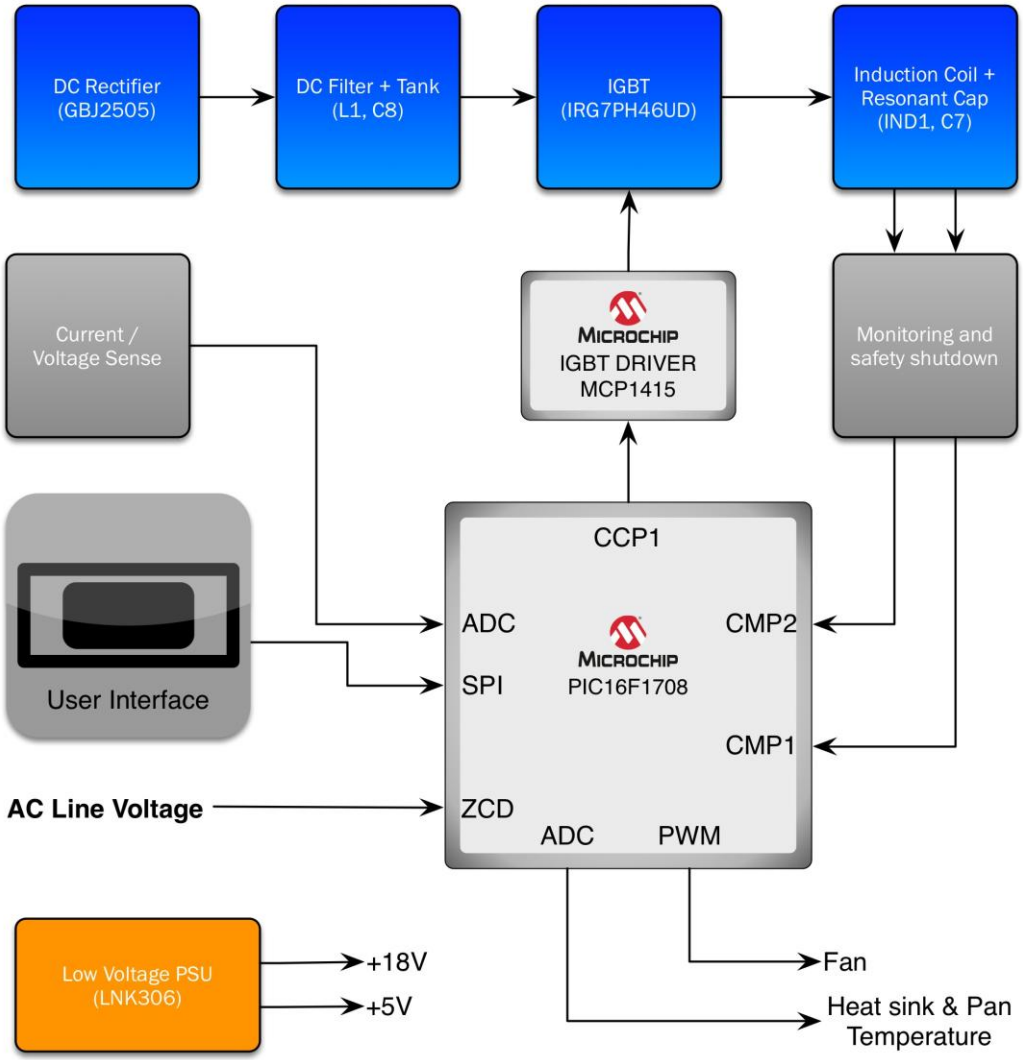
- Space-constrained applications
- Legacy system upgrades
- Anywhere flexibility is needed



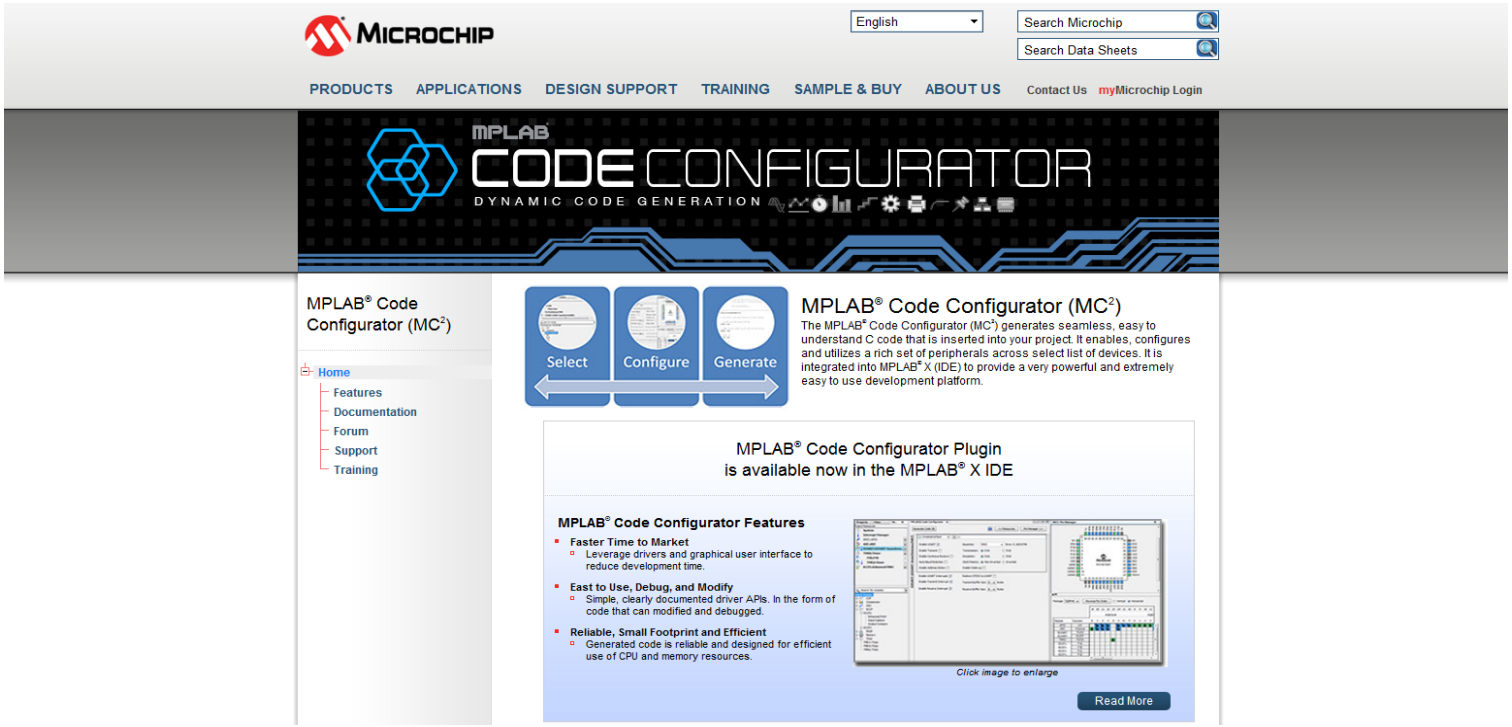
PPS enables flexible mapping of any digital peripheral to any I/O pin (green)

Inductive Cooktop Demo

Design Based on PIC16F1708 MCU



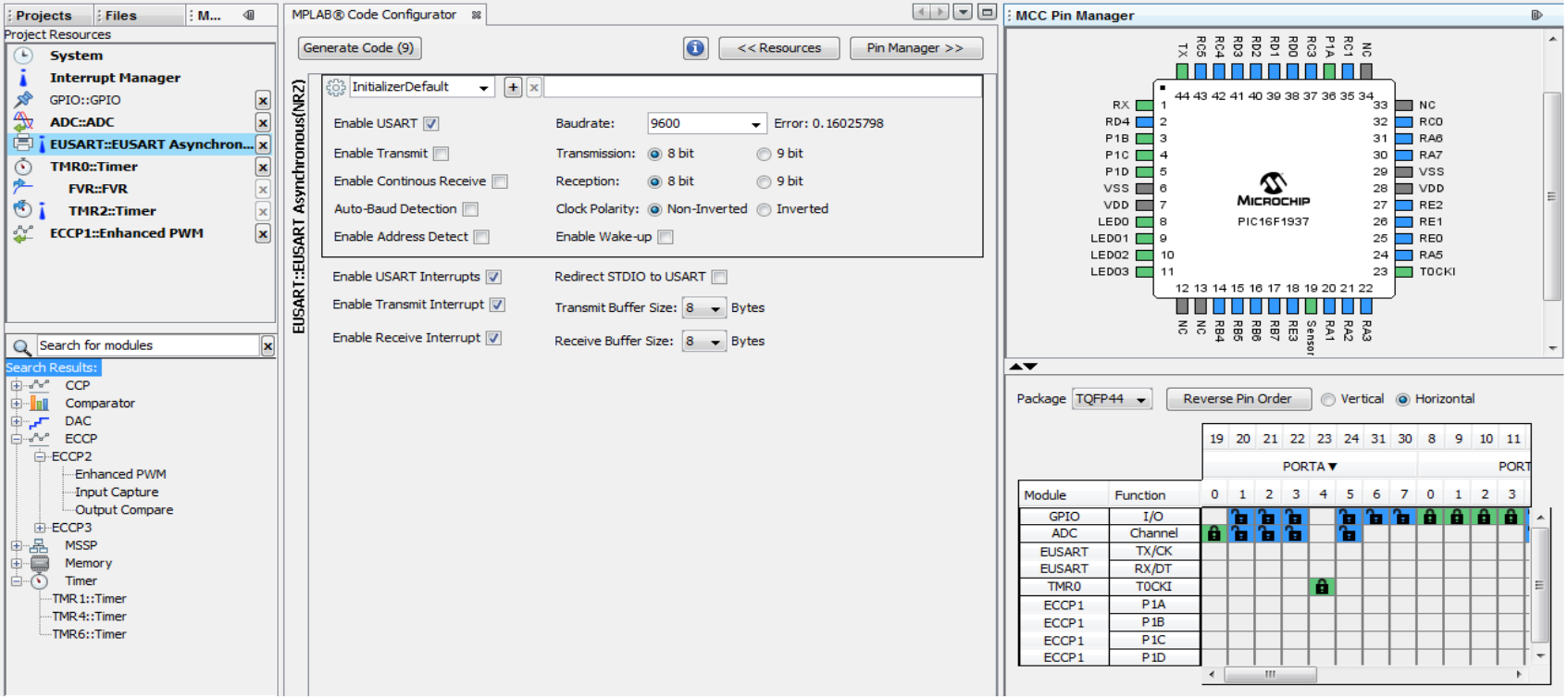
MPLAB® Code Configurator



- Innovative, new and easy to use plug-in tool for MPLAB® X IDE
- Generates seamless, easy-to-understand drivers and intializers that are inserted into your project
- Easy migration between similar MCUs and peripherals
- Supports PIC16F1704/08 today, PIC16F1713/16 in April ‘14, all others in C2Q ‘14

www.microchip.com/mcc

MPLAB® Code Configurator
Continued…



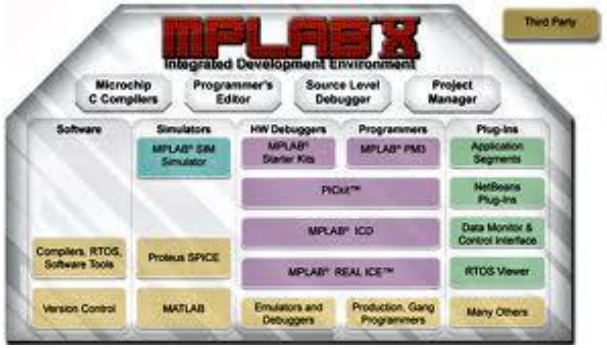
- Easy-to-use GUI that dynamically generates code for integrated peripherals, MCU configurations and I/Os
- Integrated into MPLAB® X IDE to provide a very powerful and extremely easy to use development platform
- Simplifies MCU device initialization and helps drastically reduce time to market

PIC16(L)F170X/171X Family

Development Tool Support (All Available Now)

- **Development Platform**
  - PICkit™ 3 Low Pin Count Demo Board (DM164130-9, $25.99)
  - PICDEM™ Lab Development Kit (DM163045, $134.99)
  - PICDEM 2 Plus (DM163022-1, $99.99)

- **Programmers/Debuggers**
  - PICkit 3 (PG164130)
  - MPLAB® ICD3 (DV164035)
  - MPLAB PM3 (DV007004)



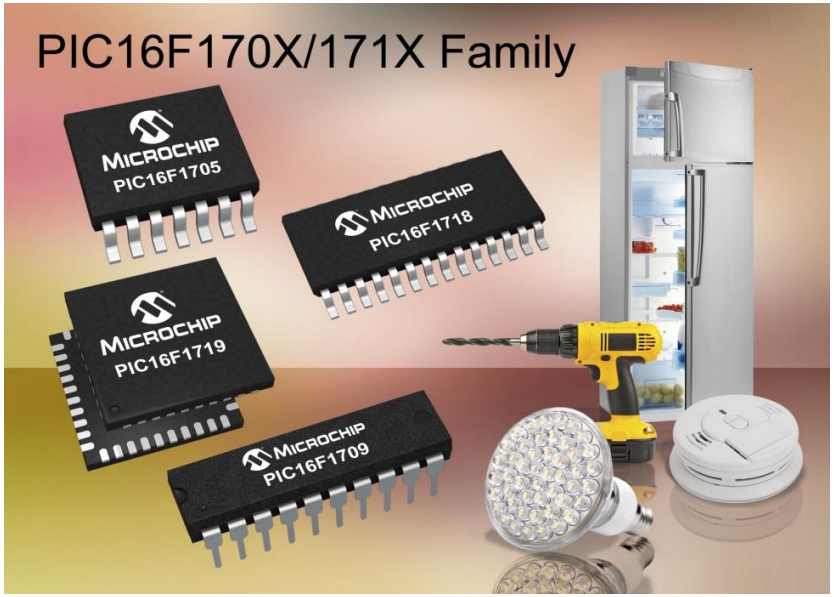
- **IDE/Compiler**
  - MPLAB X IDE
  - MPLAB Code Configurator
  - MPLAB XC8 Compiler

All Available Now!

Summary

Cost-Effective, Intelligent-Analog 8-bit PIC® MCUs

- **Intelligent Analog Integration**
  - Two internal Op Amps, 10-bit ADC
  - Zero Cross Detect – New!
  - 5/8-bit DACs, High-Speed Comparators
- **Core Independent Peripherals**
  - Configurable Logic Cell
  - Complementary Output Generator
  - Numerically Controlled Oscillator
- **Highly Flexible and Cost Effective**
  - Peripheral Pin Select – 1st for PIC16s!
  - 11 New MCUs Offer a Breadth of Pin Counts, Memory Sizes and Features
- **eXtreme Low Power Technology**
  - 30 µA/MHz active and 35 nA sleep



www.microchip.com/8bit

www.microchip.com/intelligentanalog

www.microchip.com/cip

Thank you!

Back Up

PIC16(L)F170X/171X Family

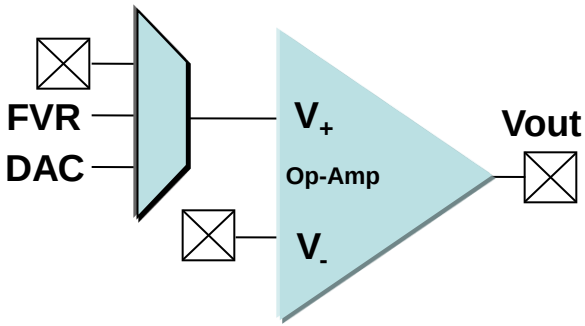
Intelligent Analog Integration

Feature	Benefit	Result
Integrated Operational Amplifiers	Increased analog integration with flexible design options	Ability to create powerful signal-conditioning solutions with minimal external components
Zero Cross Detect	New feature that simplifies TRIAC control and reduces switching transients, thereby reducing voltage spikes, EMI, spark across the contacts and extending relay life	Integrated solution for home appliances and other applications that plug into wall AC power
High-speed Comparators with rail-to-rail input/output and hysteresis	Increased voltage detection ranges with no output jitter	Greater flexibility in system design with low-power enhancements
10-bit ADC	Monitor application using feedback from the system, mTouch™ capacitive-sensing capability	Versatile input source for increased control and intelligence
Fixed Voltage Reference and 5-/8-bit DAC	Increased resolution and stable references, independent of V_{DD} (not susceptible to supply-voltage drifting)	Integrated solution, reducing external components and system costs

Internal Dual Operation Amplifiers

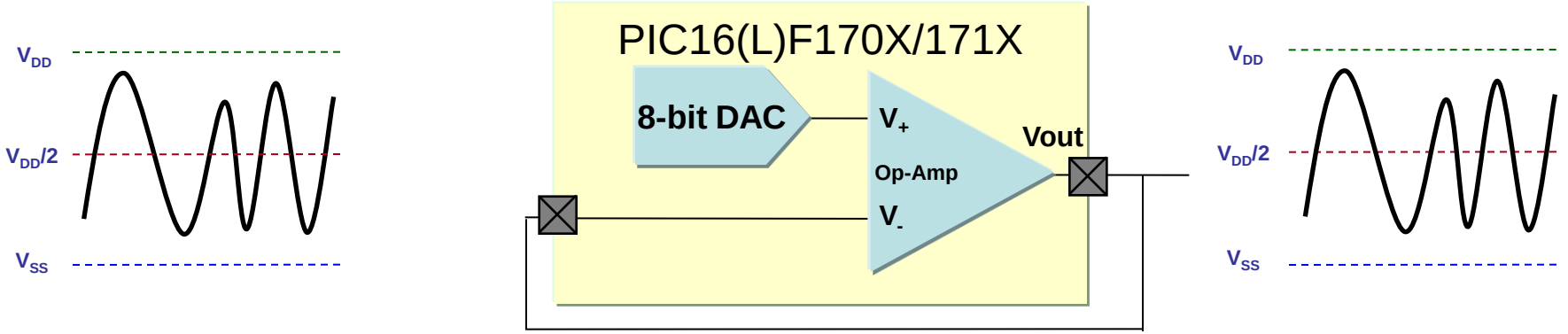
- Rail-to-Rail Input/Output
- Gain Bandwidth Product (GBWP)
  - 2 MHz typical
- Multiple Input Sources
  - External Pin
  - Fixed Voltage Reference (FVR)
  - 8-bit Digital to Analog Converter (DAC)
- All pins available externally

Two (2) Op-Amps integrated on each PIC16(L)F170X/170X MCU



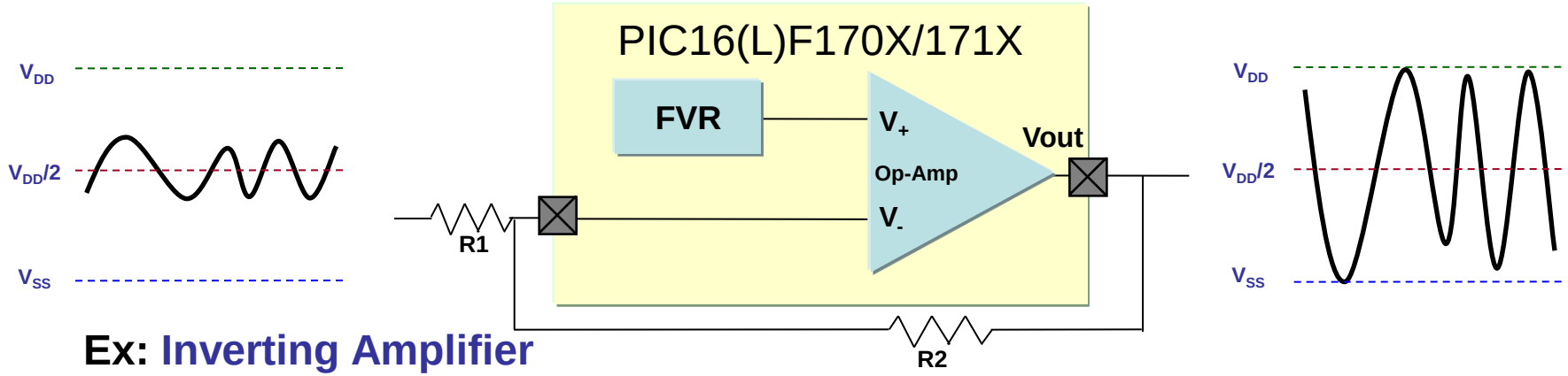
PIC16(L)F170X/171X Family

Dual Operational Amplifiers (cont'd)



Ex: Voltage Follower

- *Utilize the DAC with Op-amp to create a "true" DAC with output buffer*
- *Op-amp in 'unity gain' configuration for stronger 1:1 output voltage*



Ex: Inverting Amplifier

- *Utilize the FVR with Op-amp to create a inverted analog signal amplifier*
- *FVR set to Vdd/2 with signal gain based on ration of 'R2/R1'*