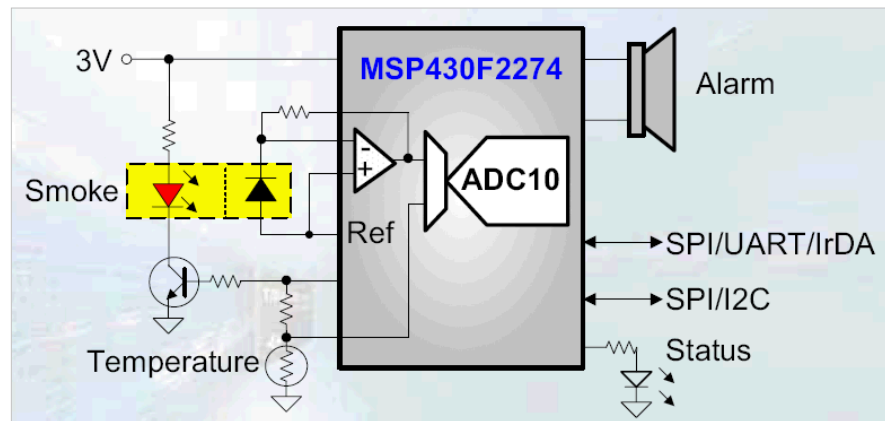


# Microcontrollers for Universities

## MSP430 tools for Laboratories and Projects

With so many microcontrollers available, why choose the MSP430?

Whether teaching in a lab or for use in a project, the MSP430 range is suitable for both. With a RISC-based instruction set and a von-Neumann architecture, the MSP430 is easy to program. The choice of programming in C or assembler is up to you. Develop code faster with a choice of software platforms, and debugging utilities included. With up to 16MIPS of performance available, on-chip flash memory and a completely integrated signal-chain, the MSP430 offers a genuine single-chip solution for academia.



*MSP430 Fire Detector*

### Key Features

- Ultra-low-power architecture
- Up to 16MIPS performance
- Complete signal chain on chip
- Modern 16-bit RISC CPU
- 27 single cycle instructions
- 7 addressing modes usable with all instructions
- Programmable in C or assembler
- Choice of development environments
- Complete debugging environment
  - Allows single stepping code
  - Watch memory locations, view registers
  - Set breakpoints
- Dedicated technical support
- Low-cost development tools



Complete USB  
development  
tool for only  
**\$20!**

## MSP430 Architecture & Features

### MSP430 Modular Architecture

A 16-bit RISC CPU, peripherals and flexible clock system are combined by using a von-Neumann common memory address bus (MAB) and memory data bus (MDB). The MSP430 partners a modern CPU with modular memory-mapped analog and digital peripherals.

### Modern 16-Bit RISC CPU

The MSP430 MCU's orthogonal architecture provides the flexibility of 16 fully addressable, single-cycle 16-bit CPU registers and the power of a RISC. The modern design of the CPU offers versatility through simplicity using only 27 easy-to-understand instructions and seven consistent addressing modes. This results in a 16-bit low-power CPU that has more effective processing, is smaller-sized, and more code-efficient than other 8-/16-bit microcontrollers.

### Intelligent Peripherals

With purely software-driven functions, the CPU is 100% active and consuming power. The intelligent peripherals allow the CPU to be turned off to save power or work on other activities to achieve the highest performance.

## MSP430 Product Portfolio

### MSP430x1xx

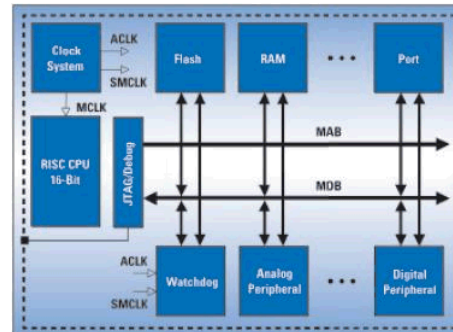
The MSP430x1xx family of MCUs offers a wide range of capabilities from a simple low power controller with a comparator, to complete systems on a chip including high-performance data converters, interfaces and a multiplier.

### MSP430x4xx

The ultra-low-power MSP430x4xx family has an integrated LCD controller for low power metering and medical applications. Several devices offer application-based peripherals to provide single-chip solutions for flow and electricity metering.

### MSP430F2xx

The new ultra-low-power MSP430F2xx family increases performance up to 16 MHz. Additional enhancements of MSP430F2xx, include a software-selectable integrated  $\pm 1\%$  on-chip digitally controlled oscillator, internal pull-up/pull-down resistors and increased number of analog inputs. The in-system programmable Flash has also been improved with smaller 64-byte segments and a lower 2.2-V programming voltage allowing the elimination of external EEPROMs in most systems.



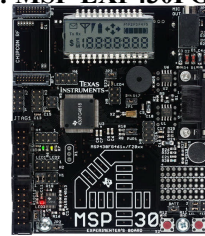
MSP430 Von-Neumann architecture

## Hardware Development Tools

### MSP430 "Experimenter's Board"

Part Number: MSP-EXP430FG4618

Price: \$99



This versatile MSP430 Experimenter Board features a tiny MSP430F2013 and the highly-integrated MSP430FG4618, providing nearly every combination of peripherals available from the MSP430 family. The integrated TI wireless evaluation module header and the large amounts of RAM on the MSP430FG4618 makes it an ideal platform for wireless applications. The wide range of integrated peripherals and hardware connectivity allows for nearly infinite development possibilities and makes it the ideal learning platform the MSP430 MCU architecture.

### Features

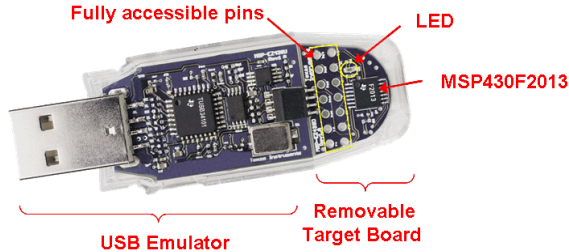
- Integrated peripherals: 12-bit DAC, 12-bit SAR ADC, 16-bit  $\Sigma\Delta$  ADC, Operational Amplifiers, DMA, Multiplier, LCD Controller, Comms Interfaces: SPI, UART, I2C, IrDA
- Wireless expansion: Compatible with TI Wireless CCxx0EMK Evaluation Modules
- Board Features: Microphone, buzzer, LCD, capacitive touch-pad, 2x push buttons, prototyping space, RS232 connector, 2x JTAG Programming Interfaces, 3.5mm headphone jack (audio output)

A TI Flash Emulation Tool, like the MSP-FET430FUIF, is required to program and debug the MSP430 devices on the experimenter board.



For more information about the University Program  
<http://www.ti.com/europe/university>

**MSP430 “USB Stick” Development Tool**  
**Part Number: EZ430-F2013**  
**Price: \$20**

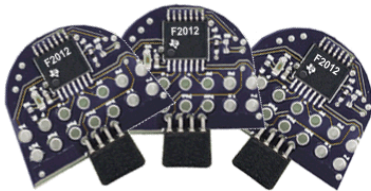


The eZ430-F2013 is a complete MSP430 development tool including all the hardware and software to evaluate the MSP430F2013 and develop a complete project in a convenient USB stick form factor. The eZ430-F2013 uses the IAR Embedded Workbench Integrated Development Environment (IDE) to provide full emulation with the option of designing with a stand-alone system or detaching the removable target board to integrate into an existing design. The USB port provides enough power to operate the ultra-low-power MSP430 so no external power supply is required

**Features**

- eZ430-F2013 development tool including a USB debugging interface and detachable MSP430F2013 target board
- LED indicator
- Removable USB stick enclosure
- Debugging interface supports development with all MSP430F20xx devices
- Integrated IAR Kickstart user interface which includes an assembler, linker, simulator, source-level debugger and limited C-compiler
- Full documentation on CD-ROM

**MSP430 “USB Stick” Target Board**  
**Part Number: EZ430-T2012**  
**Price: \$10**



The eZ430-T2012 includes three MSP430F2012-based target boards for the eZ430-F2013 Development Tool. The T2012 can be used to develop your personal project or to evaluate the MSP430 MCU. The T2012 gives you all the same capabilities and peripherals of the MSP430F2013 on the eZ430, but includes a high-speed, 8-channel 10-bit ADC.

**MSP430 USB Debugging Interface**  
**Part Number: MSP-FET430Uxx**  
**Price: \$49.50 to \$74.50**



The MSP-FET430U14 is a powerful tool that includes all the hardware and software required to complete your project work on programs up to 4K. The flash memory can be erased and programmed in seconds with only a few keystrokes, and since the MSP430 flash is extremely low power, no external power supply is required. The tool has an integrated software environment and connects directly to the USB port of a PC which greatly simplifies the set-up and use of the tool. The flash development tool supports development with the MSP430 flash parts in 14 pin TSSOP packages. This also includes USB Connector, USB Programmer and also a JTAG header in the package.

**Features**

- FET development board with a ZIF socket fitting MSP430 derivatives in 14 pin TSSOP packages, LED indicator, USB to JTAG adapter, cables and header pinouts for prototyping
- Two MSP430F2013IPW flash devices
- Integrated IAR Kickstart user interface which includes an assembler, linker, simulator, source-level debugger and limited C-compiler
- Full documentation on CD-ROM

<b>USB Interface only</b>	<b>\$ 49.50</b>
<b>Device</b>	<b>used for:</b>
MSP-FET430U1F	All

<b>USB Interface and target board</b>	<b>\$ 74.50</b>
<b>Device</b>	<b>Used for:</b>
MSP-FET430U14	14-pin TSSOP
MSP-FET430U28	20/28-pin SOP
MSP-FET430U38	38-pin TSSOP
MSP-FET430U23x0	40-pin QFN
MSP-FET430U48	48-pin SOP
MSP-FET430U64	64-pin QFP
MSP-FET430U80	80-pin QFP
MSP-FET430U100	100-pin QFP

*\*University prices shown as of 31-March-2007*



Find out more about the MSP430  
<http://www.ti.com/msp430>

## Software Development Tools

### Code Composer Essentials

**Price: \$249.50**

Code Composer Essentials (“CCE”) is a powerful and easy-to-use integrated programming and debugging environment for the industry-leading MSP430 ultra-low power microcontrollers. Based on the industry standard Eclipse open source platform, CCE is enabled to grow into evolving academic needs. Adapted specifically for MSP430 by TI, CCE is stable, intuitive and provides world class code density for MSP430 microcontrollers. Software development in both C and assembly language is supported

#### Features:

CCE fully integrated Host Tools include:

- MSP430 C compiler, assembler and linker
- Source Code Debugger
- Integrated Visual Project Manager
- Virtual and hardware breakpoints
- Integrated editor

Debug views:

- Watch
- Memory
- Registers

Enhancements in v2.0:

- Improved usability of IDE
- Project wizard simplifies getting started in CCE
- Increased stability of debugger
- Support of F461x devices with memory over 64k
- Advanced MSP430 Breakpoints

A multi-user authorization for academic projects and labs can be arranged on request. Contact the Product Information Centers for more details.

There is a free Code Composer Essentials Evaluation v2.0 available for download which is a fully Integrated MSP430 Development Environment with up to 8K Bytes code space.

[www.ti.com/cce](http://www.ti.com/cce)

## Product Information Centers Americas

<http://support.ti.com/sc/pic/americas.htm>

## Europe, Middle East, and Africa

[www.ti.com/sc/epic](http://www.ti.com/sc/epic)

## Asia

[www.ti.com/sc/apic](http://www.ti.com/sc/apic)

## Japan

[www.ti.com/sc/jpic](http://www.ti.com/sc/jpic)

### IAR Embedded Workbench Kickstart

IAR is a leading member of our third party program. Their Embedded Workbench Kickstart for MSP430 is an integrated development environment (IDE) for building and debugging embedded applications for MSP430 microcontrollers.

#### Features

- Integrated development environment with project management tools and editor
- Highly optimizing MSP430 compiler supporting C and C++
- Configuration files for all MSP430 devices, including MSP430X
- FET debugger support
- Run-time libraries
- Relocating MSP430 assembler
- Linker and librarian tools
- C-SPY debugger with MSP430 simulator and support for RTOS-aware debugging on hardware
- Example projects for MSP430 and code templates
- User and reference guides, both printed and in PDF format
- Context-sensitive online help

The IDE includes a 4K limited C-Compiler/Unlimited Assembler/FET Debugger/Simulator. The FET Debugger is a fully integrated debugger for source and disassembly level debugging with support for complex code and data breakpoints.

[www.ti.com/iarkickstart](http://www.ti.com/iarkickstart)

We also provide code examples and function libraries in both C and Assembly for the Code Composer Essential and the IAR kick start which makes starting up very easy. For more information: [www.ti.com/msp430codeexamples](http://www.ti.com/msp430codeexamples)

**Texas Instruments and third party developers offer Integrated Development Environments (IDE) to program all MSP430 devices. Full C-compilers are available enabling customers to develop and debug code in seconds.**

[www.iar.com](http://www.iar.com)

[www.ti.com/cce](http://www.ti.com/cce)

[mspgcc.sourceforge.net](http://mspgcc.sourceforge.net)

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