Product Bulletin

MSP430 Ultra-low-power Microcontrollers

Second Quarter, 1999

MSP430 Key Features
- Ultra-low power consumption
  - 400-µA active mode
  - 1.3-µA standby mode
  - 0.1-µA off mode
- High throughput processor
  - 16-bit orthogonal RISC architecture
  - Most instructions executed within a single 200-ns cycle operating at 5 MHz
  - Seven different address modes for 51 (27 core) instructions
- Hardware multiplier
- Integrated 14-bit A/D converter
- Integrated LCD driver
- Integrated USART
- Various timers

From the beginning, the design objective of the MSP430 team was to focus on the ultra-low power consumption of the complete system. The goal was to create a microcontroller which consumes very little current in the sleep modes and performs the given tasks in the active mode as fast as possible.

To reduce the current consumption of a system, the MSP430 allows designers the ability to influence the active current consumption and active time as well as sleep mode current consumption and sleep time.

The **active mode** current consumption of the MSP430 is 400 µA in a typical 3-V system. The time to **wake-up** from the sleep mode to a total functional system takes a maximum of **6 µs**. This allows the MSP430 to be in sleep modes longer and eliminates unnecessary energy use in the active mode. The powerful 16-bit CPU core ensures a **fast execution of the tasks** and therefore reduces the active time. This means that the higher the performance of the CPU core, the lower the system power

A full range of MSP430 evaluation and support tools are available and provide easy-to-use design solutions.

The 'Green' Microcontroller

In a modern household, many electronic applications like TV sets or stereo systems are permanently in a standby mode. Assuming the total standby power in a household is 10 W, a country with 40 million households requires 400 MW just to supply the standby energy. This means that a mid sized power plant is working only to supply the standby energy for these parts.

The MSP430 is an ultra-low-power microcontroller family and can help to reduce this standby current. The typical current consumption in low-power mode is 1.3 µA, where the device is still capable of displaying information on the LCD display or keeping a real-time clock updated.

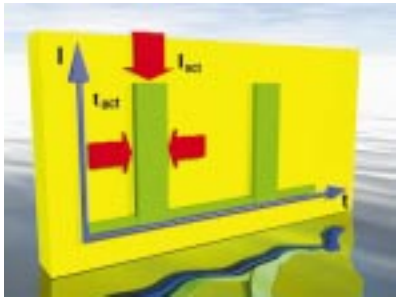
This ultra-low-power consumption is no limitation for the outstanding high processing capability. The 16-bit RISC CPU core can perform tasks like calculation of the energy, faster than conventional 4- and 8-bit microcontrollers.

This combination sets a new benchmark of processing capability versus energy consumption.

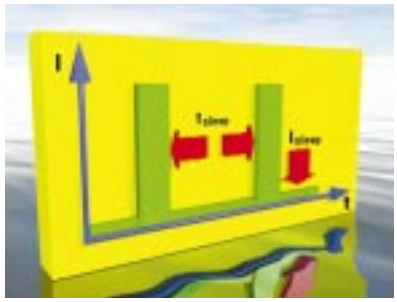
The MSP430 offers 1200 MIPS/Watt in active mode. Finally, the high integration of the MSP430 allows the user to build up a system with a minimum of external components. This leads to very cost competitive system solutions.

consumption. All MSP430 peripheral modules are specially designed to support these ultra-low power features.

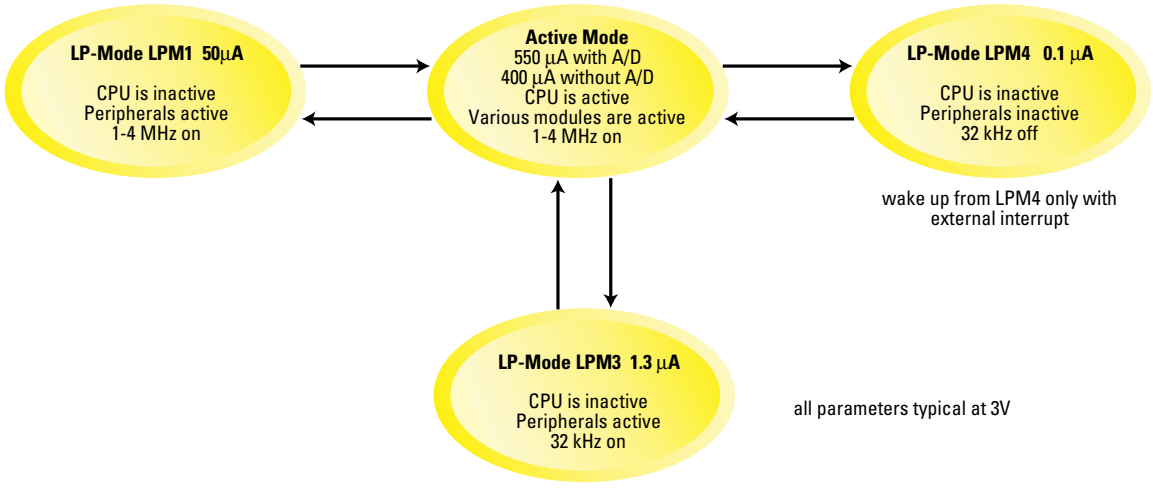
The **sleep modes** offer a reduced current consumption even when some peripherals are still active. For example, in a simple real time clock (RTC), it is **not** necessary to keep the device in active mode. Another example, the system can operate from the 32-kHz (ACLK) clock instead of 1-4 MHz (MCLK) with the timers and LCD still active. These examples are benefits of the most often used low-power mode 3 (LPM3) which consumes 1.3 µA typically. The current consumption can be reduced down to 0.1 µA in LPM4 where the MSP430 is still capable of processing external interrupts, for example from a connected keyboard. The sleep time can be maximized due to the fast wake-up from the low-power modes.



Current consumption in active mode



Current consumption in sleep mode



System Cost Saving with the MSP430 Family

The MSP430 offers a variety of possibilities to reduce the cost of the complete system to a minimum.

- The use of the 32-kHz XTAL and the internal DCO/FLL eliminates the need for a second XTAL for the system frequency. Furthermore, a ceramic resonator can be used in place of the 32-kHz XTAL; or, the system can be operated without any external component for the clock generation at all.
- The low-power features of the MSP430 make it possible to choose a smaller battery for the application and still increase the system life due to the various power saving modes.
- High code efficiency leads to smaller memory sizes and drives cost down.
- The high integration of the device makes an external LCD driver or an external ADC unnecessary. This high level of integration saves system cost and lowers the failure rate of the system by reducing the device count.
- The ease-of-use MSP430 architecture and the development tools significantly improve the development time and speed up the time-to-market.

The MSP430 RISC Core

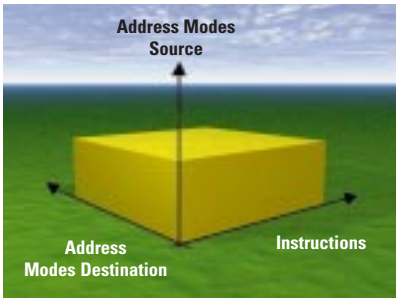
16-bit RISC CPU

The MSP430 CPU offers you much more than standard 4- and 8-bit microcontrollers. The 16-bit RISC core is built with a highly orthogonal structure.

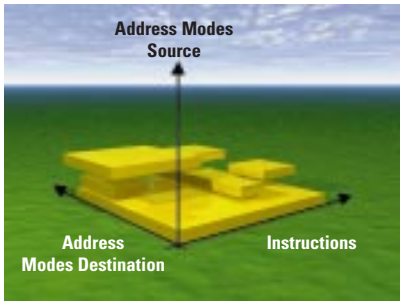
Every instruction can be used with each of the seven different addressing modes. The reduced instruction set consists of only 27 core instructions. However, the user has, due to the 24 additional emulated instructions the capability of using highly familiar instructions. For example, a familiar instruction like INC R4 is available to the firmware programmer and automatically emulated by the assembler with ADD #1,R4. This instruction will be executed like all other register to register instructions in only one cycle.

The orthogonal architecture of the MSP430 CPU core makes the device extremely easy-to-use.

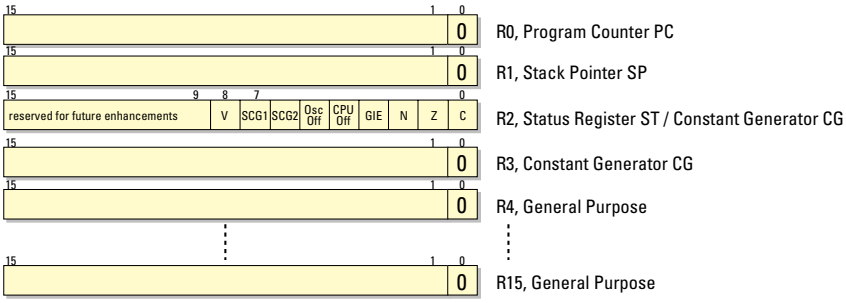
Sixteen (16) registers are implemented in the CPU itself and contain the Program counter, the stack pointer, the Status Register and the Constant Generator (which contains the highly used constants -1, 0, 1, 2, 4 and 8). This feature makes the MSP430 an extremely code efficient device using a lot less of the code space than conventional CISC machines. The remaining 12 registers are available for general usage.



Example: orthogonality to operand instructions



Example: non-orthogonality to operand instructions



The hardware multiplication module in the MSP430x33x configuration provides multiplications in less than one cycle. The two operands are moved into registers inside the multiplier module, and in the next cycle, the result can be read out.

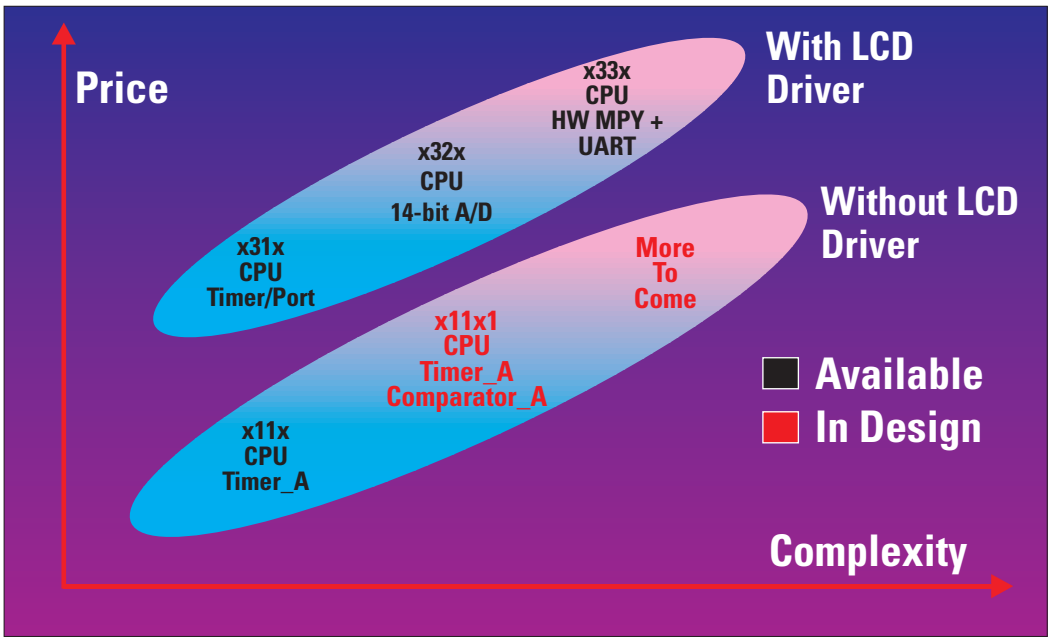
Oscillator / FLL Module

The clock network of the MSP430 offers the designer flexibility. The Digital Controlled Oscillator (DCO) generates the system frequency of 1 to 4 MHz. The 32-kHz oscillator, which operates with only a single 32-kHz crystal, can be used to provide a stable frequency over temperature and operating voltage. The integrated Frequency Locked Loop (FLL) regulates the system frequency MCLK with the stable 32-kHz crystal frequency. It is even possible to operate the MSP430 without any crystal at all, disable the FLL and just use the DCO to generate the system clock.

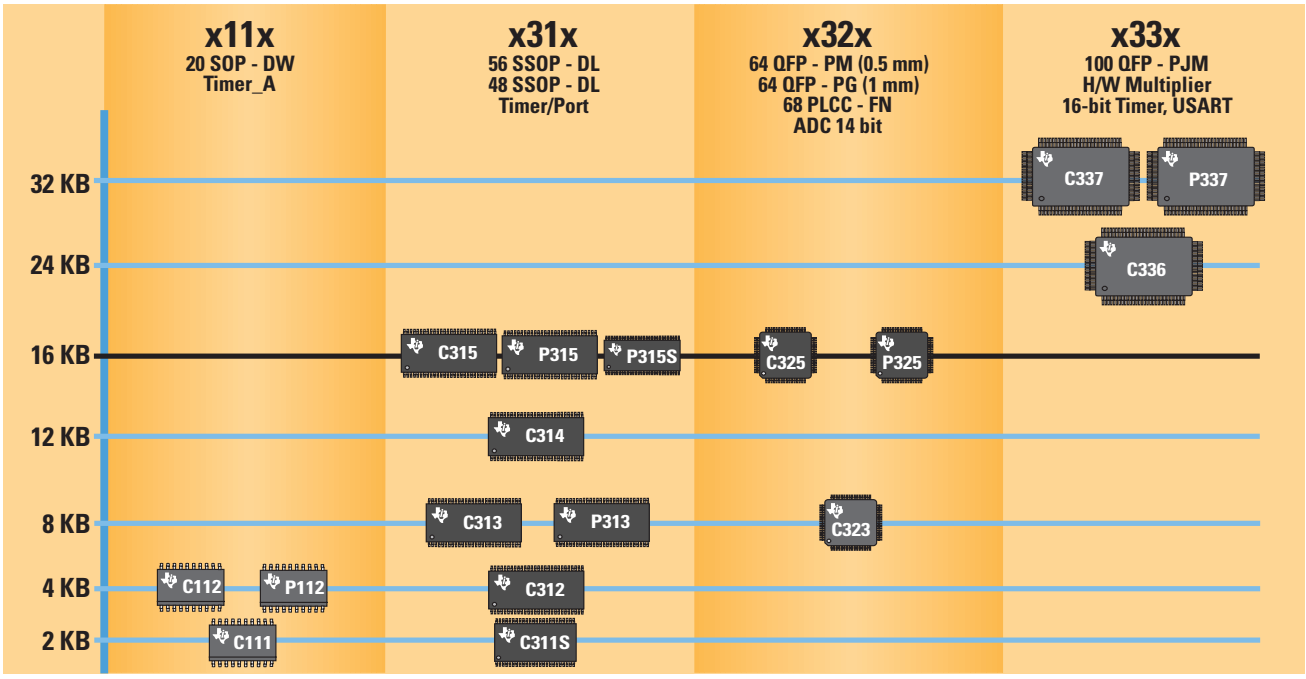
The product offers a fail-safe feature. If the crystal connection is broken, the MSP430 continues operation with the lowest possible frequency.

The DCO starts operation a maximum of 6 µs after a reset or interrupt occurs. This provides a working system in a fraction of the time needed with conventional microcontrollers.

The MSP430 Mixed-Signal Processor Roadmap



The MSP430 Mixed-Signal Processor Family



The MSP430 family offers you flexibility. Choose from several members out of four configurations:

- MSP430x11x devices – Basic version with Timer_A
- MSP430x31x devices – A/D conversion with the Timer/Port module
- MSP430x32x devices – A/D conversion with 14-bit ADC module
- MSP430x33x devices – High-end version with Timer_A, USART and H/W multiplier

MSP430 Mixed-Signal Processor Selection Guide

DEVICE	ROM	OTP	EPROM	RAM	ADC	LCD^	PERIPHERALS	PACKAGE
MSP430**C**111	2KB			128B	slope	N/A	WDT, P1, P2, T_A	20 SOP
MSP430**C**112	4KB			256B	slope	N/A	WDT, P1, P2, T_A	20 SOP
MSP430**P**112		4KB		256B	slope	N/A	WDT, P1, P2, T_A	20 SOP
PMS430**E**112			4KB	256B	slope	N/A	WDT, P1, P2, T_A	20 DIL
MSP430**C**311S	2KB			128B	slope	64seg	WDT, BT, T/P, P0, 8bT/C	48 SSOP
MSP430**C**312	4KB			256B	slope	92seg	WDT, BT, T/P, P0, 8bT/C	56 SSOP
MSP430**C**313	8KB			256B	slope	92seg	WDT, BT, T/P, P0, 8bT/C	56 SSOP
MSP430**C**314	12KB			512B	slope	92seg	WDT, BT, T/P, P0, 8bT/C	56 SSOP
MSP430**C**315	16KB			512B	slope	92seg	WDT, BT, T/P, P0, 8bT/C	56 SSOP
MSP430**P**313		8KB		256B	slope	92seg	WDT, BT, T/P, P0, 8bT/C	56 SSOP
PMS430**E**313			8KB	256B	slope	92seg	WDT, BT, T/P, P0, 8bT/C	68 CLCC
MSP430**P**315		16KB		512B	slope	92seg	WDT, BT, T/P, P0, 8bT/C	56 SSOP
MSP430**P**315S		16KB		512B	slope	64seg	WDT, BT, T/P, P0, 8bT/C	48 SSOP
PMS430**E**315			16KB	512B	slope	92seg	WDT, BT, T/P, P0, 8bT/C	68 CLCC
MSP430**C**323	8KB			256B	14 bit & slope	84seg	WDT, BT, T/P, P0, 8bT/C	64 QFP/68 PLCC
MSP430**C**325	16KB			512B	14 bit & slope	84seg	WDT, BT, T/P, P0, 8bT/C	64 QFP/68 PLCC
MSP430**P**325		16KB		512B	14 bit & slope	84seg	WDT, BT, T/P, P0, 8bT/C	64 QFP/68 PLCC
PMS430**E**325			16KB	512B	14 bit & slope	84seg	WDT, BT, T/P, P0, 8bT/C	68 CLCC
MSP430**C**336	24KB			1KB	slope	120seg	31x + T_A, MPY, USART, P1, P2, P3, P4	100 QFP
MSP430**C**337	32KB			1KB	slope	120seg	31x + T_A, MPY, USART, P1, P2, P3, P4	100 QFP
MSP430**P**337		32KB		1KB	slope	120seg	31x + T_A, MPY, USART, P1, P2, P3, P4	100 QFP
PMS430**E**337			32KB	1KB	slope	120seg	31x + T_A, MPY, USART, P1, P2, P3, P4	100 CQFP

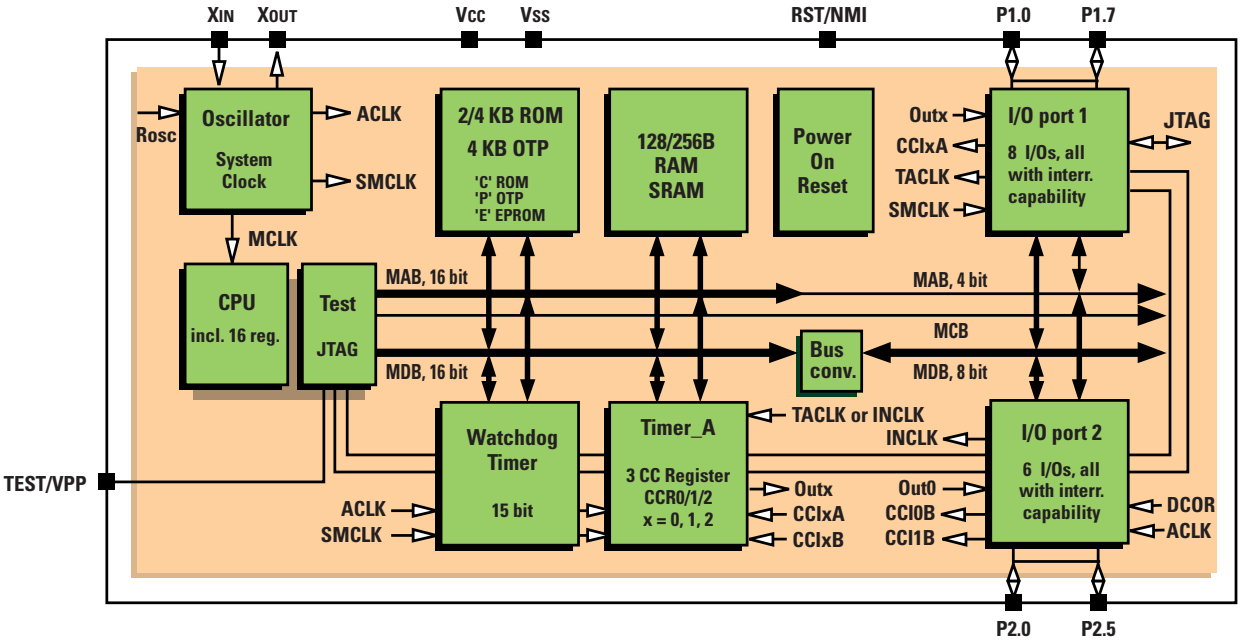
C=ROM, P=OTP, E=UV EPROM (prototyping only)

ADC: slope = slope measurements for resistive sensors, 14-bit = hardwired A/D converter with 14-bit resolution.

LCD = LCD Driver for 1-4 MUX, WDT = Watchdog Timer, BT = Basic Timer, T/P = Timer/Port Module, 8bT/C = 8-bit Timer/Counter, T_A = 16-bit Timer, MPY = Hardware Multiplier, USART = UART/SPI, P0 – P2 = I/O Ports.

^ If not used for LCD, the LCD segment lines can be used as outputs.

MSP430x11x Configuration



The newest member in the MSP430 microcontroller family offers an unmatched ratio of ultra-low power consumption, 16-bit RISC performance, and low cost. The MSP430x11x family features an ultra-low power consumption rating of 350 µA in active mode, 1.5 µA in standby mode and 0.1 µA in (RAM-retention) off mode. With volume pricing as low as $1 for ROM versions, the 11x devices are quickly becoming the benchmark in this price/performance range.

The 16-bit RISC core operates up to 5 MHz, allowing most of the 27 core instructions to be executed within one 200-ns cycle. This combination of 27 core instructions and the orthogonal architecture allows every instruction to be used in each addressing mode, making the MSP430x11x easy to program. It's also completely code compatible with TI's other MSP430 families.

Among the peripherals integrated into the new device are: a 16-bit timer with three capture/compare, 14 individual I/O signals, a new basic clock system, watchdog timer and JTAG interface. The new basic clock system makes it possible to increase the maximum standby time to 128 seconds. The memory sizes are 2 or 4 KB with the ROM version and 4 KB with the low-power OTP version. The OTP version (MSP430P112IDW) is available now.

Typical applications

The MSP430x11x is ideally suited for portable instrumentation equipment such as:

- Real-time clock
- Communication
- Digital motor control
- Home automation
- Alarm systems
- Data loggers

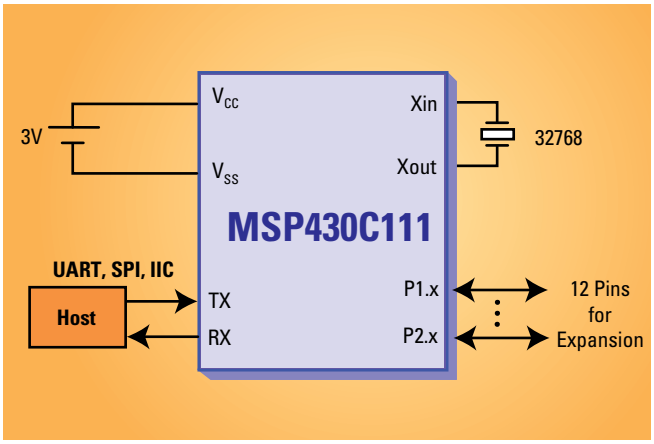
Development tools

Development tools for the MSP430x11x include an Evaluation Kit from TI, and in-circuit emulators and C-Compilers are available from third-party development tool vendors.

MSP430x11x Application Example

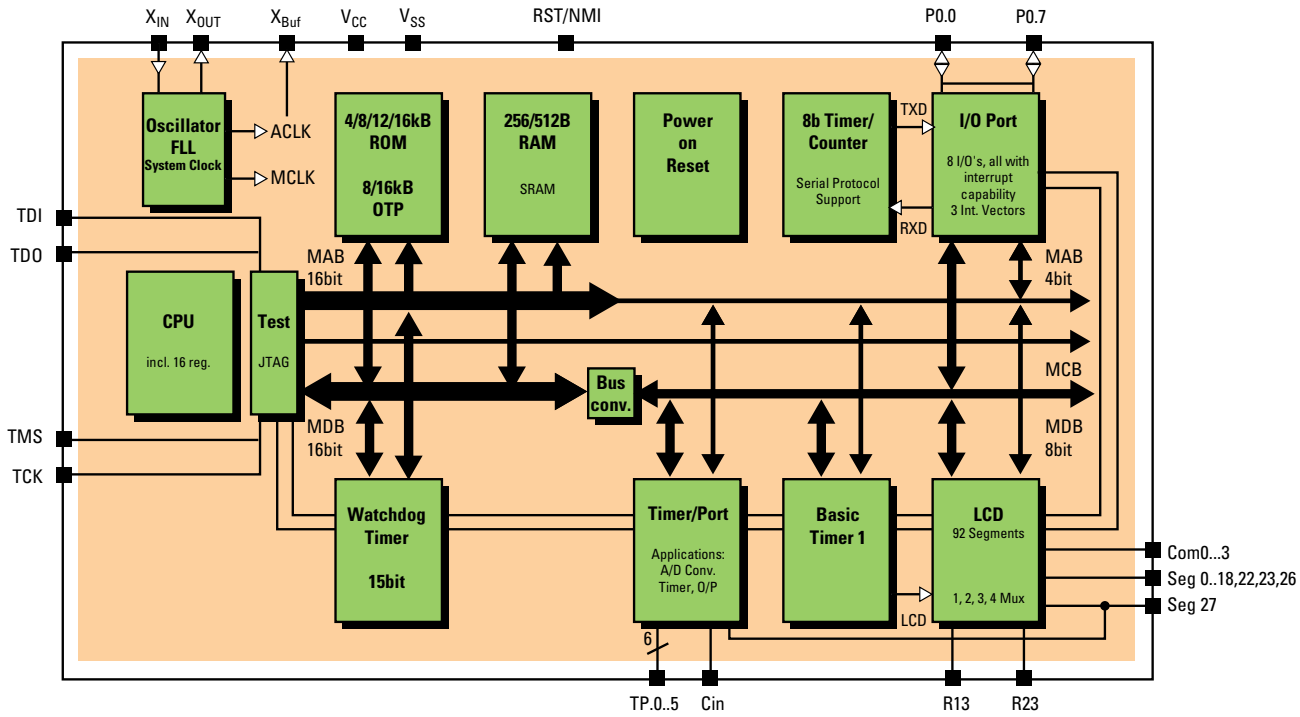
The MSP430x11x series, new members to the MSP430 family, expands the reach of low-cost system design to a higher level. A 10-year Real-Time Clock is one of many system applications that minimize the cost to manufacturers while simplify the design and development cycle drastically.

Working at Low Power Mode 3 (LPM3), the MSP430x11x receives the time input from a 32,768-Hz external crystal oscillator. With a connection to an outside host device through UART or SPI port, MSP430x11x internally generates a timer interrupt service routine to wake-up once per second. System integration engineers will be able to develop an application specific system by taking advantage of this 1.52-µA average current consumption solution.



Low-cost 10-year Real-Time Clock (RTC)

MSP430x31x Configuration



The MSP430x31x configuration is the most cost optimized version with the LCD driver in the MSP430 family. It offers all the family features like **16-bit RISC core** and **ultra-low power** consumption.

It can be used for sensor applications by measuring the resistor values. The **Timer/Port module** can perform this resistive to digital conversion by measuring the charge/discharge time of an external capacitor. If this function is not needed, this module can be used as a 16-bit Timer.

The **Watchdog Timer** can be used in 15-bit watchdog mode or in 16-bit general-purpose timer mode.

The **Basic Timer** includes two 8-bit timers for general use. It generates the basic LCD frequency and supports the real time clock function.

The **LCD driver** module can drive up to 92 segments in 1 - 4 MUX mode in this configuration.

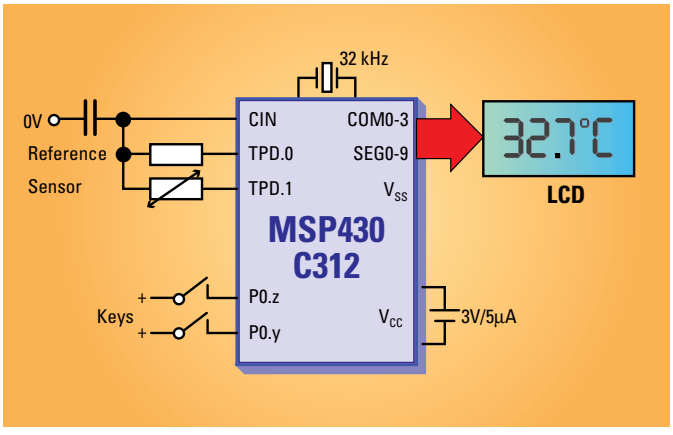
The **I/O port** can be individually configured and each pin has interrupt capability. The **8-bit Timer/Counter** supports serial communication protocols like UART or I²C bus on the I/O port, the software routines are included in the MSP430 application report.

MSP430x31x Application Example

The MSP430 requires only a minimum of external components to build up a complete system.

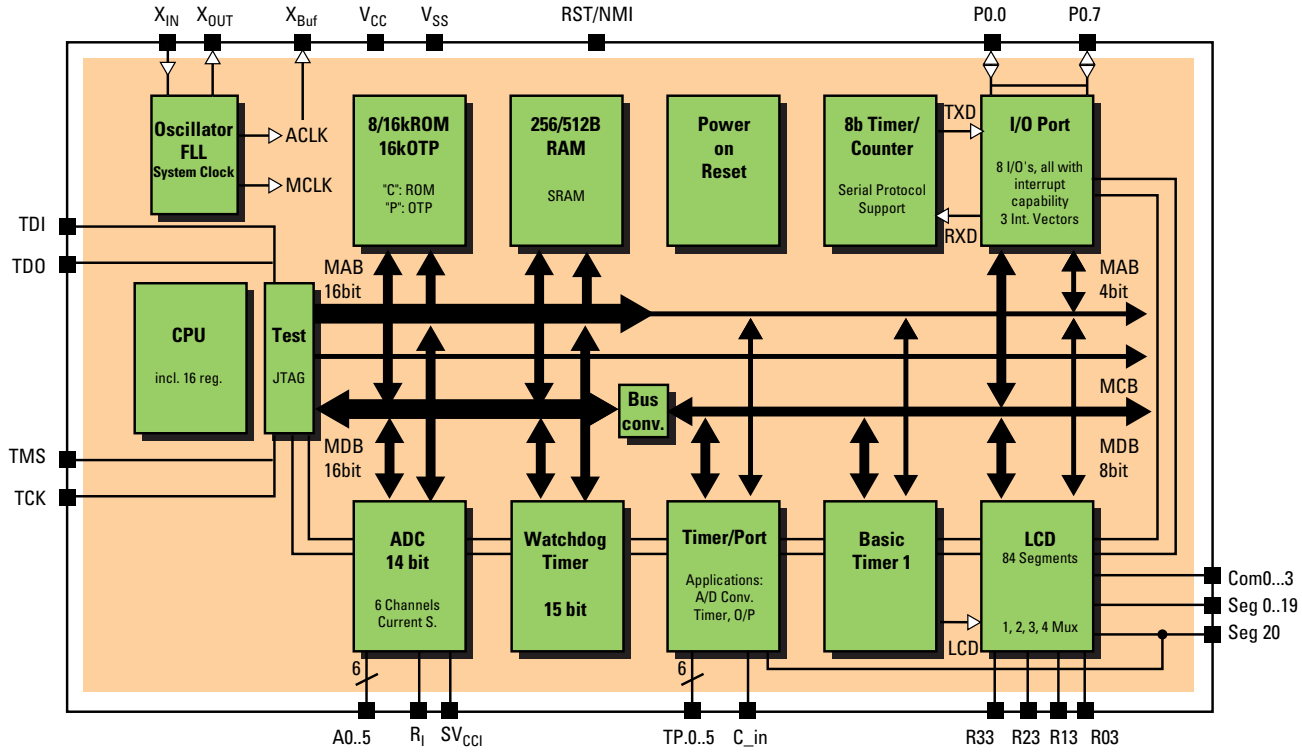
The low component count in the thermometer shown ensures a fast design cycle, maximum flexibility via software and a very competitive system cost.

For resistive sensors (such as thermistors) the 16-bit A/D converter integrated in the Timer/Port Module is ideal. Three (3) additional external components: a crystal (optional), a battery and the LCD display are all that you need for a complete system with the MSP430.



Thermometer application

MSP430x32x Configuration

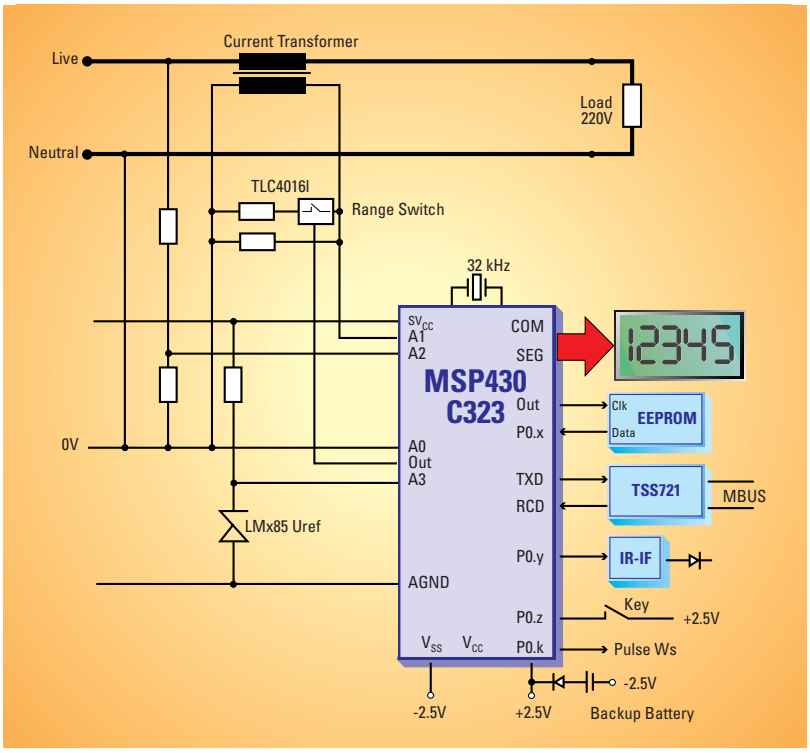


The second configuration in the MSP430 family, the MSP430x32x, offers a high resolution A/D converter in addition to the peripherals of the MSP430x31x.

This **14-bit A/D converter** has six inputs to convert analog signals into a 14-bit digital value over the full supply voltage range; or a 12-bit resolution in each of four separate ranges. The integrated current source can be programmed with an external resistor to connect current driven sensors.

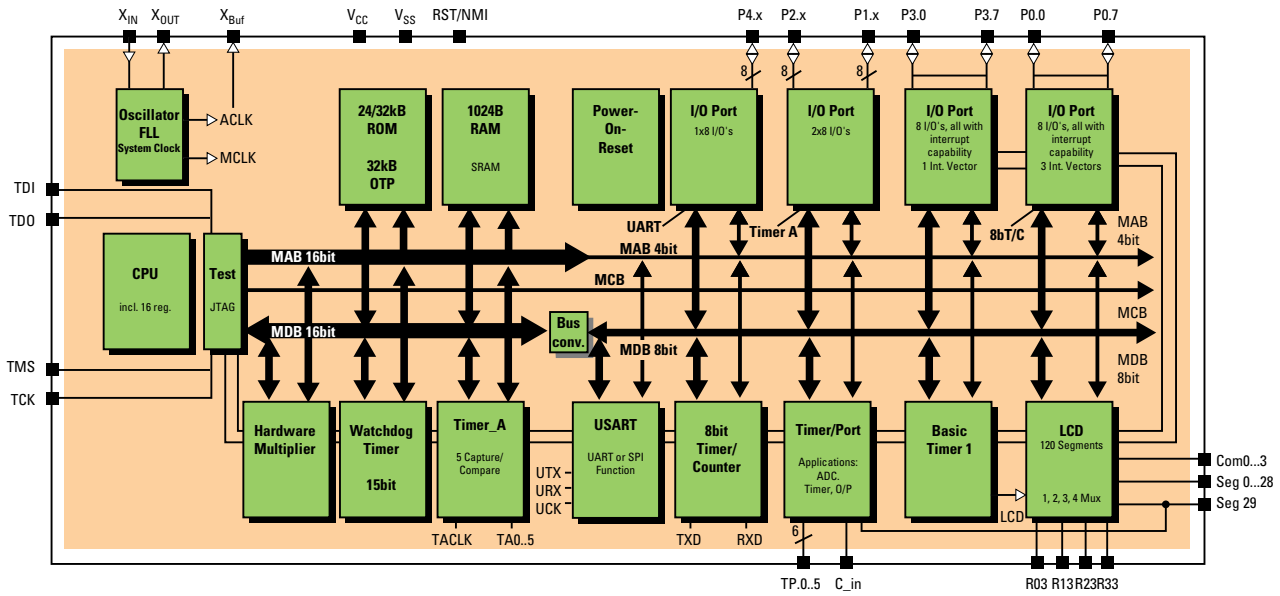
MSP430x32x Application Example

One of the many application examples in the MSP430 application report is the shown single-phase electricity meter with the MSP430. This cost competitive single-chip solution uses the 14-bit ADC to convert the analog signals of the voltage (via a voltage divider on A2) and the current (via a current transformer on A1) into a digital value. A split power supply enables signed measurement, while the LMx85 creates a reference voltage on A3. The value of the consumed energy is calculated by the CPU and directly displayed on the LCD or transmitted via the optional serial (MBUS) connection. Non-volatile data storage is possible with an optional external EEPROM.



Single phase electricity meter

MSP430x33x Configuration



The new MSP430x33x configuration is focused on the high-end area of applications. For this reason, this device generation was equipped with some additional features.

The **H/W multiplier** module performs 16x16, 16x8, 8x16 and 8x8 multiplications with signed, unsigned and unsigned accumulation. After loading both operands into the multiplier, the result is available in a separate register; no extra cycle is needed for the multiplication.

The Timer_A module includes a 16-bit timer/counter and five capture / compare registers, which can be configured by the application to capture or compare mode. The capture mode is primarily used to measure external or internal events from any combination of positive, negative or both edges; but, can also be stopped by software. The compare mode is primarily used to generate timing for the software or application hardware or to generate pulse-width modulated output signals for various purposes like D/A conversion functions, PWM, or motor control.

The **USART** module has two functions for serial communication included, a standard asynchronous communication protocol (UART up to 115.2 kBaud) and a serial peripheral interface function (SPI). One bit in a control register defines the mode (which can be switched back and forth in the application).

The number of **I/O pins** is increased in this configuration to 40. The **LCD** offers 30 segment lines to drive up to 120 segments in 4MUX mode.

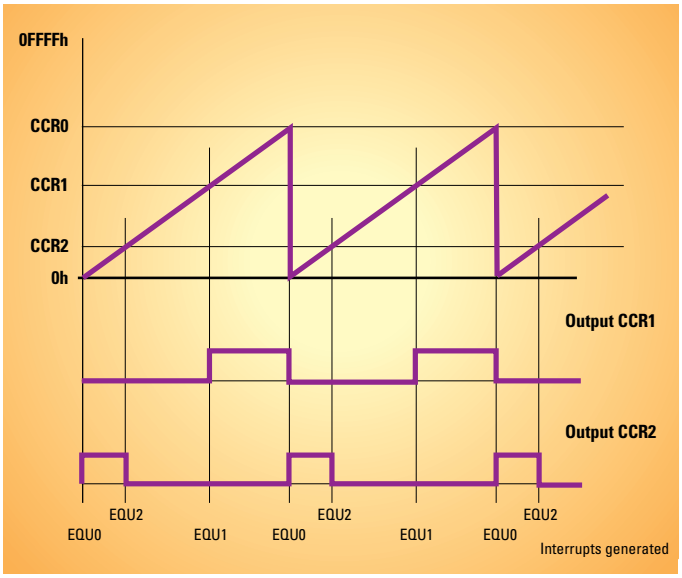
MSP430x33x Application Example

The Timer_A of the MSP430x33x configuration is ideally suited for the generation of PWM-signals in several modes.

Continuous Mode: the Timer Register runs continuously upwards and continues at zero after the value 0FFFFh. This mode allows up to five independent timing.

Up Mode: the Timer Register counts up to the content of Compare Register 0 (here the Period Register) and restarts at zero when it has reached this value. If the Timer Register equals one of the four Compare Latches the hardware task programmed to the Output Unit is performed.

Up-Down Mode: the Timer Register counts up to the content of Capture/Compare Register 0 (here the Period Register) and counts down to zero when it has reached this value.



PWM with the Timer_A (motor control application)

The MSP430 Starter Kit

MSP-STK430x320—a Low-cost Plug-and-Play Tool

The Starter Kit (STK) enables you to explore the MSP430 features in a very easy and cost efficient way.

Simply connect the Starter Kit board to your PC with the cable supplied, install the MS-Windows® based software and start the pre-programmed demo with a mouse click on one of the installed icons. Due to the extremely low power consumption, no external power supply is needed for this Starter Kit.

But the STK is not only a demo board. You can develop your own program, test it with the basic Simulation Environment and download it in the 512B on-chip RAM of the OTP version to test on board-level. Additionally, it is possible to program the 16KB on-chip OTP memory with your code.

For more information or a complete list of all starter kits available today, please visit http://www.ti.com/sc/msp430

The MSP430 Starter Kit Package Contains:

- MSP430 board with OTP, LCD display, PC connector and light sensor
- Cable to connect the STK to your PC
- MS-Windows based basic simulation environment and assembler software*
- Terminal software to communicate with the on-chip monitor
- Starter Kit/Evaluation kit manual
- MSP430 application report
- Architecture users guide and module library
- Software users guide

- Assembly language tools users guide
- MSP430 data sheets
- Simulation environment and LCD editor manual
- MSP430 Brochure

MSP430 Evaluation Kits

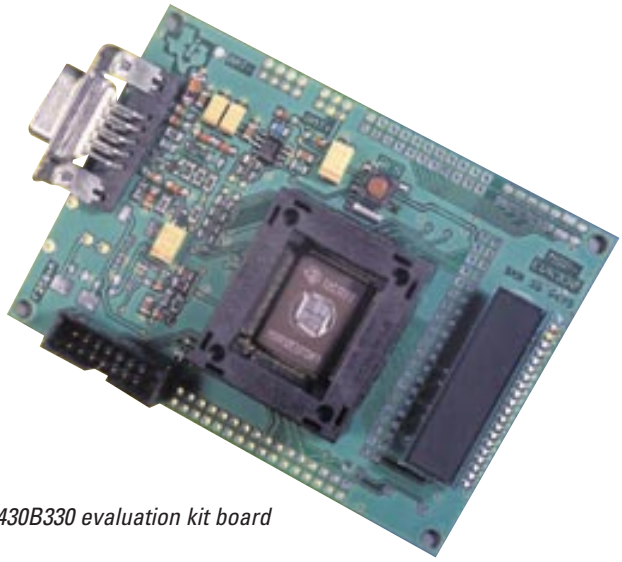
MSP-EVK430x110, MSP-EVK430x320 and MSP-EVK430x330

These three evaluation kits are powerful development tools and include much of the hardware and software required to complete your application development. Each EVK (11x, 32x and 33x) comes with its own evaluation board.

The MSP-EVK430x110 evaluation kit supports the MSP430x11x family of devices and comes with the PMS430E112JL (UV EPROM). The MSP-EVK430x320 evaluation kit supports the MSP430x32x family of devices and comes with the PMS430E325FZ (UV EPROM) assembled in a socket. The MSP-EVK430x330 evaluation kit supports the MSP430x33x family of devices and comes with the PMS430E337HFD (UV EPROM).

The MSP430 Evaluation Kits Contents

- MSP430 EVK board with UV erasable EPROM, LCD, PC connector



The MSP-EVK430B330 evaluation kit board

- Cable to connect the EVK to your PC
- MSP-PRG430 programming adapter*
- Programming adapter software
- MSP-SIM430 simulation environment and assembler language software*
- Terminal software (to communicate with the on-chip monitor)
- Starter-kit/Evaluation kit manual
- Architecture users guide and module library
- Software users guide
- Assembly language tools users guide
- MSP430 Application Report
- MSP430 Data sheets (MSP430x11x, MSP430x31x, MSP430x32x, and MSP430x33x)
- Simulation environment and LCD-editor manual
- MSP430 Brochure

*See the following page for additional information.

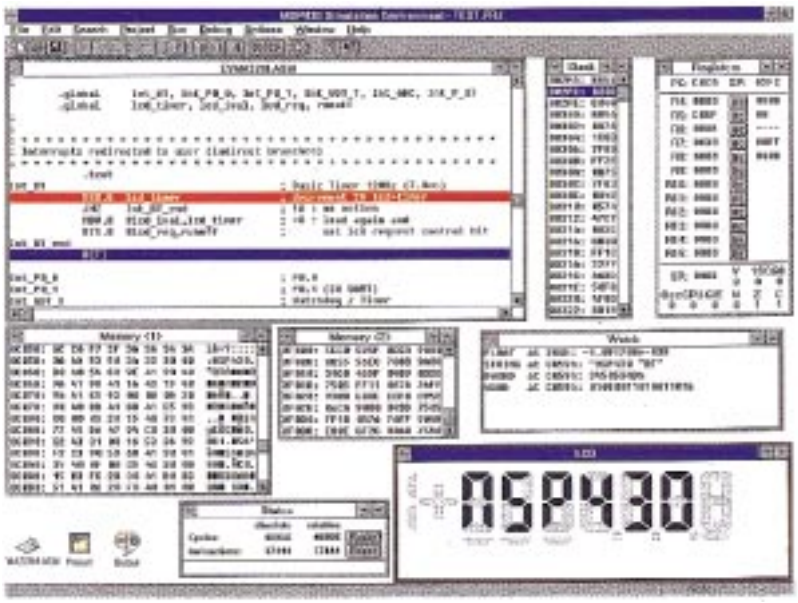
MSP430 Design Support Features

Simulation Environment MSP-SIM430

The MS-Windows based Simulation Environment allows you to get familiar with the MSP430 quickly and easily. The source window allows editing and debugging of your code, along with some breakpoint logic. Several locations in the memory area, e.g. the system stack can be displayed independently.

The Simulation Environment package contains also the MSP430 assembler, which can be used directly from the Simulation Environment.

A custom specific LC display can be simulated with the LCD Designer, which comes in the S/W package.



MSP-PRG430 Programming Adapter

To help you program your OTP versions of the MSP430, Texas Instruments offers a Programming Adapter, which can be used for all family members.

It comes together with the programming software including documentation, and allows the in-circuit programming of the devices. The chip is assembled on the final PCB board and can easily be programmed afterwards by connecting the Programming Adapter to the MSP430 JTAG pins; no additional power supply on the board is needed.

MSP-FPP430 Floating Point Package

The Floating Point Package for the MSP430 family is supporting the basic arithmetic operations add, subtract, multiply, divide and compare with a 24-bit or 40-bit mantissa. A conversion from/to binary and BCD format is also supported. Support s/w like square roots and trigonometric functions is included as well. The package makes use of the internal registers of the MSP430 RISC CPU; the hardware multiplier can be used in addition.

MSP430 Third-Party Support

Texas Instruments runs a dedicated MSP430 third-party program for hardware and software tooling as well as for programming support.

These third-party developers have the engineering expertise to provide application-specific software tools to help customers achieve design goals. A hyperlink in the Texas Instruments MSP430 web site will direct you to each company home page. Visit:

www.ti.com/sc/docs/msp/msp430/430tool.htm

BP MICROSYSTEMS

BP Microsystems Inc. designs and manufactures device programmers for both engineering and production applications. Leading the industry in device support, performance, and cost of ownership, BP provides complete device programming solutions to customers worldwide. The company offers a full line of single-site device programmers and Universal Programmers, and multi-site Concurrent Programming Systems.

The MSP430 can be programmed using any of our universal engineering programmers (BP-1200 and BP-1400), our manual, multi-site Concurrent Programming Systems.

For more information, please visit the BP web site:

www.bpmicro.com

DR. KROHN & STILLER

Dr. Krohn & Stiller Emulators for Every Budget

Dr. Krohn & Stiller supports the MSP430 family by a set of three different emulators—one for every budget. All three In-Circuit Emulators (Economy, Standard and Universal) are fully equipped with at least 128K emulation RAM, 32K trace memory and complex trigger capabilities.

A windows debugger interface is available for Windows 3.1, Windows 95 and Windows NT. C code generated by the IAR compiler is directly loaded into emulation memory—no pre-processor is needed. To step through the program the user may choose between C, mixed or assembler display in the HLL debugger. The emulator can even be used as a server for the IAR C-Spy debugger interface. Drag and Drop, coloring of changes in memory or registers, automatically updated local windows, and code coverage, are only a few features of these highly sophisticated emulators.

For more information, please visit the web site of Dr. Krohn & Stiller:

www.iceworld.de

GÖPEL electronic

Göpel electronic
On-chip Emulation Software for the MSP430

This solution is based on a complete software and hardware kit that turns any PC into a powerful device emulator. A standardized IEEE1149.1 / JTAG 4-wire test bus is plugged onto the parallel port via scan controller, while a powerful 32-bit software enables access to the different resources for programming, verification and debug. High efficiency is achieved through interactive control and direct download of the operation software into the on-chip EPROM. With the CPU emulator, debugging of TI assembler code is possible.

A low-cost and true high-level emulator is the result of features such as break-point setting, step function, re-assembler and extended register watching that makes the source code traceable and easy-to-debug. For recording user actions a script language is used. This ASCII language contains commands for memory and register handling, for programming the EPROMS and blowing fuses.

For more information please visit the Göpel web site:

www.goepel.com

hitex DEVELOPMENT TOOLS

Hitex
Emulator in an Affordable Quality Concept

The MX430 emulator is Hitex's debug tool offered for the MSP430x310 and MSP430x320 configuration. It provides hardware breakpoints in RAM/ROM, simulation memory for internal RAM/ROM with zero wait-states, easy change to other derivates, fast debugging due to transmission rates up to 115200 Baud and more.

The MX430P emulates all derivates of the MSP430x3xx family. The MX430L emulates the MSP430x11x configuration. The new AX430 high-end emulator provides comprehensive debugging and test tools for the whole MSP430x3xx family.

The HiTOP debugger provides comfortable usage guaranteeing high stability. It offers complete symbolic HLL debugging and rapid access to all emulator resources. All commands, such as Line and Single Stepping, GoTo Cursor, GoTo Label and many others can be executed by using the mouse, keyboard or the extensive command language HiSCRIPT.

For more information, please visit the Hitex web site:

www.hitex.de

IAR SYSTEMS

IAR
C-Cross-Compiler and C/ASM-Debugger

The EW430 integrates C compiler, linker, librarian and assembler in a seamless environment with easy-to-use project and option handling. The CW430 is a HLL debugger incorporating a complete C expression analyzer and full C-type knowledge. It combines a detailed control of code execution, needed for embedded development debugging, with the flexibility and power of the C language. The source window can display C source code and mix it with assembler.

CW430 simulator allows an unlimited number of breakpoints on C statements, assembler instructions and on any address with an access type of read, write and opcode fetch. Interrupt simulation implements commands to launch specific interrupts at a specific cycle-count or periodically. For interrupt simulation with intermittent interrupts, the same algorithm as the hardware, for choosing the highest priority interrupt to be executed, will be selected. The same interface is available to work on the EVK-Board (CW430R) and on the emulator from Dr. Krohn & Stiller (CW430K), so there is a common interface available for all these tools.

For more information, please visit the IAR web site:

www.iar.se

SMS

SMS
Universal Programming System Sprint

SMS has invested heavily into the steadily growing market of microcontroller devices by considerably expanding its device library. The universal programming systems of the Sprint family do not only stand out from most other programming systems by the variety of supported devices but also by guaranteeing its customers the use of vendor approved algorithms with maximal programming yields and minimal programming times.

SMS supports the TI devices with the universal programmers Sprint Multisystem as well as with the automatic programming systems PP100/22. With the latest version of the Sprint software the following devices are supported: MSP430x313, MSP430x325, MSP430x337 and MSP430x11x. All controllers are supported with flexible TOPs or adapters for different packages like PLCC, SSOP or QFP. Special software functions of the devices, such as UserID, Watchdog Timer or Code Protection can be activated via a simple menu.

For more information, please visit the SMS web site:

www.sms-sprint.com

Documentation

Texas Instruments provides extensive documentation support for the MSP430 in the form of users guides, applications book, data sheets and brochures.

- Architecture and module library users guide (SLAUE10B)
- Software users guide (SLAUE11)
- Assembly language tools users guide (SLAUE12)
- MSP430 application report (SLAAE10C)
- MSP430x11x data sheet (SLAS196)
- MSP430x31x data sheet (SLAS165B)
- MSP430x32x data sheet (SLAS164 to be replaced by SLAS219 for *new* lower-power versions)
- MSP430x33x data sheet (SLAS163)

The MSP430 application report (SLAAE10C), for example includes many hardware and software examples using the MSP430 for low power, metering, and high precision applications. This report contains examples of developing code and circuitry for most of the hardware found on the MSP430. It will assist you in developing code for ADC, UART, I²C bus, battery check, digital motor control, as well as arithmetic routines, table processing, and much more.

For More Information

For more information about TI's ultra-low-power signal processors, contact us at:

www.ti.com/sc/msp430

For a more personal look at the MSP430, or for pricing and availability, contact your local TI sales field office or authorized distributor.

TI Worldwide Technical Support

Internet

TI Semiconductor Home Page
http://www.ti.com/sc

TI Distributors
http://www.ti.com/sc/docs/distmenu.htm

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