



# TEXAS INSTRUMENTS

## MSP430 16-Bit Microcontroller

The Solution for Battery Powered Measurement

### SELECTION GUIDE



October 2001

## MSP430 Key Features

### 16bit RISC CPU

- high throughput ( down to 125-ns instruction cycle time)
- up to 8 MIPS possible
- only 27 basic instructions
- 16 CPU registers
- highly orthogonal structure
- seven different addressing modes

### LOW POWER MODES

- operating range down to: 1.8 V - 3.6 V; 2.5V – 5.5V
- five different low-power modes
- active current down to 250 uA at 2.2 V
- standby current down to 0.8 uA at 2.2 V in LPM3
- current consumption in RAM retention off mode down to 0.1 uA at 3 V

### HARDWARE MULTIPLIER

- multiplication in all 16-bit / 8-bit combinations
- signed and unsigned multiply
- signed and unsigned multiply and accumulate
- no extra cycle needed for the multiplication after loading the two registers

### MEMORY

- 1 / 4 / 8 / 16 / 32 / 48 / 60 Kbytes Flash versions
- 2 / 4 / 8 / 12 / 16 / 24 / 32 Kbytes ROM versions
- 8 / 16 / 32 Kbytes OTP/EEPROM versions

### OSCILLATOR MODULE

- 32-kHz crystal for peripherals, no external components necessary

### 12+2 BIT A/D CONVERTER 6 Channels

- 12-bit ADC with 4 different ranges                      sample time: 96 us
- 14-bit ADC with auto range                                sample time: 132 us
- integrated current source

### 12 BIT A/D CONVERTER 8 Channels

- 12-bit ADC with one range Vref+ or Vref-              sample time: 5 us

### LCD DRIVER

- up to 120 segments possible
- external voltage divider for lower power consumption
- segment line can be used as general-purpose outputs

### TIMER/PORT MODULE

- slope A/D conversion of resistive sensors possible (R/D converter)
- general purpose cascable 8-bit timer

### Timer\_A

- 16-bit timer with up to 5 capture / compare registers
- several operating modes for various applications

### Timer\_B

- 8-, 10-, 12 or 16-bit timer with up to 7 capture / compare registers
- 4 capture / compare / shadow registers
- several operating modes for various applications

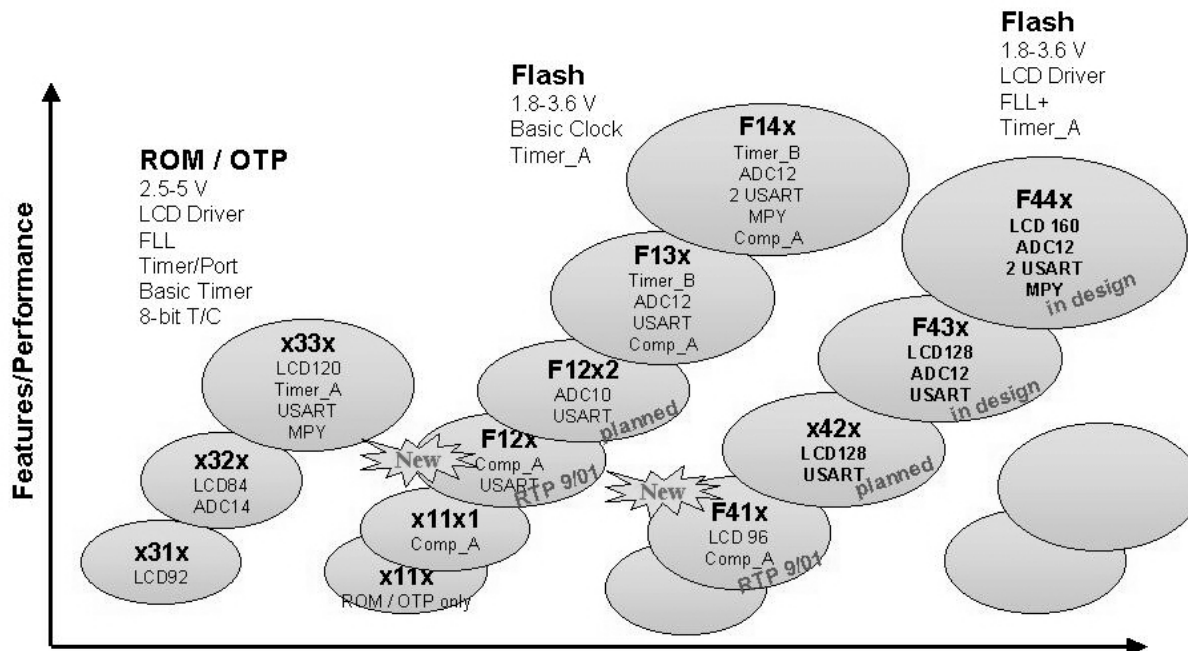
### USART

- UART or SPI function selectable by software

### COMPARATOR\_A

- analog signal compare function
- slope A/D conversion

## MSP430 Roadmap



## MSP430 Typical Applications

### Utility Metering

Gas Meter  
Water Meter  
Electricity Meter  
Heat Cost Allocators  
Heat Volume Counter  
Meter Reading Systems(RF)

### Portable Instrumentation

Blood Pressure Meter  
Blood Sugar Meter  
Breath Measurement  
Sports Computers  
Weight Scales  
EKG System  
Airflow Measurement  
Alcohol Meter  
Barometer  
Altimeter  
Emission/Gas Analyzer  
Humidity Measurement  
Temperature Measurement  
Heartbeat Logger  
Data Logger

### Intelligent Sensing

Air Conditioning  
Control Unit  
Thermostat  
Boiler control  
Smoke/Fire detector  
Irrigation System  
Door Control  
Glass Break Sensors  
White Goods  
Shutter Control  
Access Control Systems  
Personal Identification Systems

## MSP430 Family Quick Reference

MSP430 devices without LCD Driver

DEVICE	ROM	OTP	Flash	RAM	ADC	Comp	USART	PACKAGE
MSP430C111IDW	2KB			128B	No	No	No	20SOIC - DW
MSP430C112IDW	4KB			256B	No	No	No	20SOIC - DW
MSP430P112IDW		4KB		256B	No	No	No	20SOIC - DW
PMS430E112JL		4KB		256B	No	No	No	20DIL - JL
MSP430F1101IDW			1KB	128B	No	Yes	No	20SOIC - DW
MSP430F1111IDW			2KB	128B	No	Yes	No	20SOIC - DW
MSP430F1121IDW			4KB	256B	No	Yes	No	20SOIC - DW
MSP430C1111IDW	2KB			128B	No	Yes	No	20SOIC - DW
MSP430C1121IDW	4KB			256B	No	Yes	No	20SOIC - DW
MSP430F1121AIDGV			4KB	256B	No	Yes	No	20TVSOP - DGV
MSP430F122IDW			4KB	256B	No	Yes	Yes	28SOIC - DW
MSP430F123IDW			8KB	256B	No	Yes	Yes	28SOIC - DW
MSP430F1101IPW			1KB	128B	No	Yes	No	20TSSOP - PW
MSP430F1111IPW			2KB	128B	No	Yes	No	20TSSOP - PW
MSP430F1121IPW			4KB	256B	No	Yes	No	20TSSOP - PW
MSP430C1111IPW	2KB			128B	No	Yes	No	20TSSOP - PW
MSP430C1121IPW	4KB			256B	No	Yes	No	20TSSOP - PW
MSP430F122IPW			4KB	256B	No	Yes	Yes	28TSSOP - PW
MSP430F123IPW			8KB	256B	No	Yes	Yes	28TSSOP - PW
MSP430F133IPM			8KB	256B	Yes	Yes	1	64QFP - PM
MSP430C1331IPM	8KB			256B	No	Yes	1	64QFP - PM
MSP430F135IPM			16KB	512B	Yes	Yes	1	64QFP - PM
MSP430C1351IPM	16KB			512B	No	Yes	1	64QFP - PM
MSP430F147IPM			32KB	1024B	Yes	Yes	2	64QFP - PM
MSP430F148IPM			48KB	2048B	Yes	Yes	2	64QFP - PM
MSP430F149IPM			60KB	2048B	Yes	Yes	2	64QFP - PM

MSP430 devices with LCD Driver

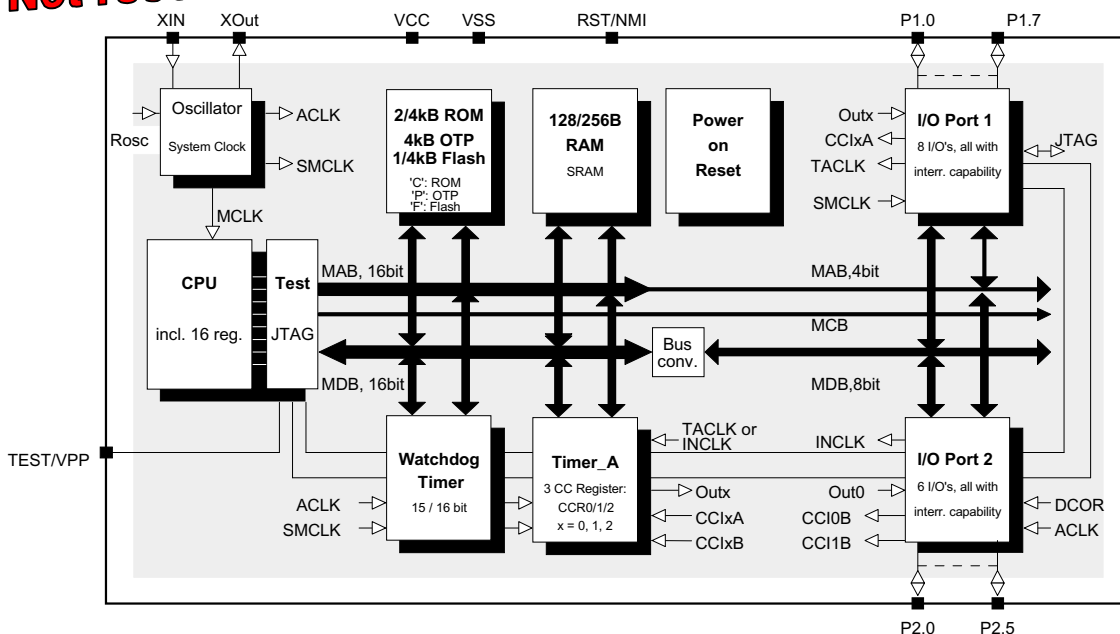
DEVICE	ROM	OTP	FLASH	RAM	PACKAGE
MSP430C311SIDL	2kB			128B	48SSOP - DL
MSP430C312IDL	4kB			256B	56SSOP - DL
MSP430C313IDL	8kB			256B	56SSOP - DL
MSP430C314IDL	12kB			512B	56SSOP - DL
MSP430C315IDL	16kB			512B	56SSOP - DL
MSP430P315IDL		16kB		512B	56SSOP - DL
MSP430P315SIDL		16kB		512B	48SSOP - DL
PMS430E315FZ		16kB		512B	68CLCC - FZ
MSP430C323IPG	8kB			256B	64QFP - PG
MSP430C323IPM	8kB			256B	64QFP - PM
MSP430C325IPG	16kB			512B	64QFP - PG
MSP430C325IPM	16kB			512B	64QFP - PM
MSP430P325(A)IPG		16kB		512B	64QFP - PG
MSP430P325(A)IPM		16kB		256B	64QFP - PM
MSP430P325(A)IFN		16kB		512B	68PLCC - FN
PMS430E325FZ		16kB		512B	68CLCC - FZ
MSP430C336IPJM	24kB			1kB	100QFP - PJM
MSP430C337IPJM	32kB			1kB	100QFP - PJM
MSP430P337IPJM		32kB		1kB	100QFP - PJM
MSP430P337AIPJM		32kB		1kB	100QFP - PJM
PMS430E337HFD		32kB		1kB	100CQFP - HFD
MSP430F412IPM			4kB	256B	64QFP - PM
MSP430F413IPM			8kB	256B	64QFP - PM

## MSP430x1xx Family without LCD Driver – Device Configuration

### Device Configuration

MSP430C111, MSP430C112, MSP430P112

**Not recommended for new design. Use x11x1 instead.**

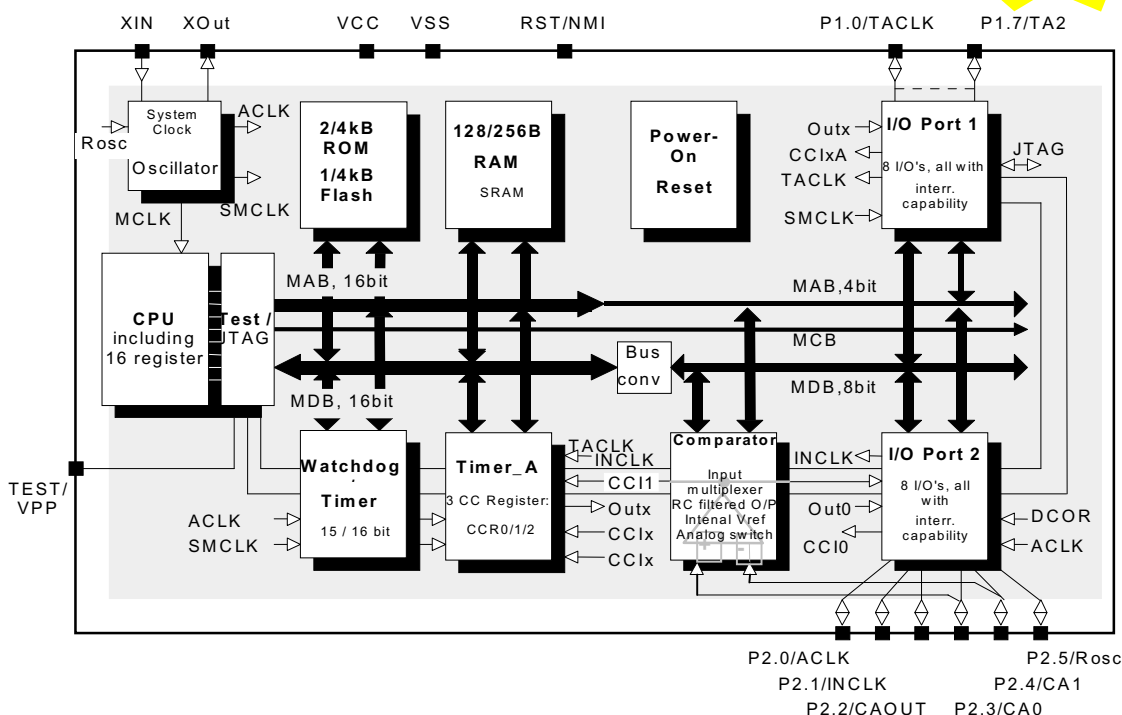


Package: 20 SOIC (DW)

### Device Configuration

MSP430F1101, MSP430F1111, MSP430F1121, MSP430C1111, MSP430C1121

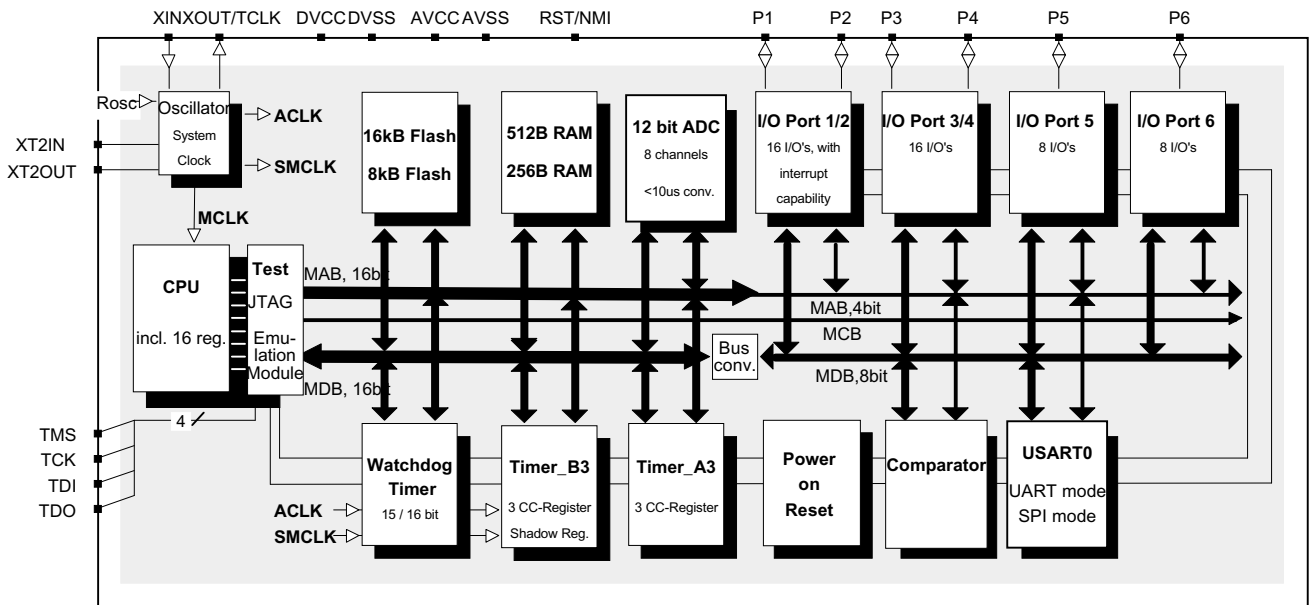
**100% compatible  
to x11x + free  
Comparator !!!**



Package: 20 SOIC (DW); 20 TSSOP (PW), 20 TVSOP (DGV)

### Device Configuration

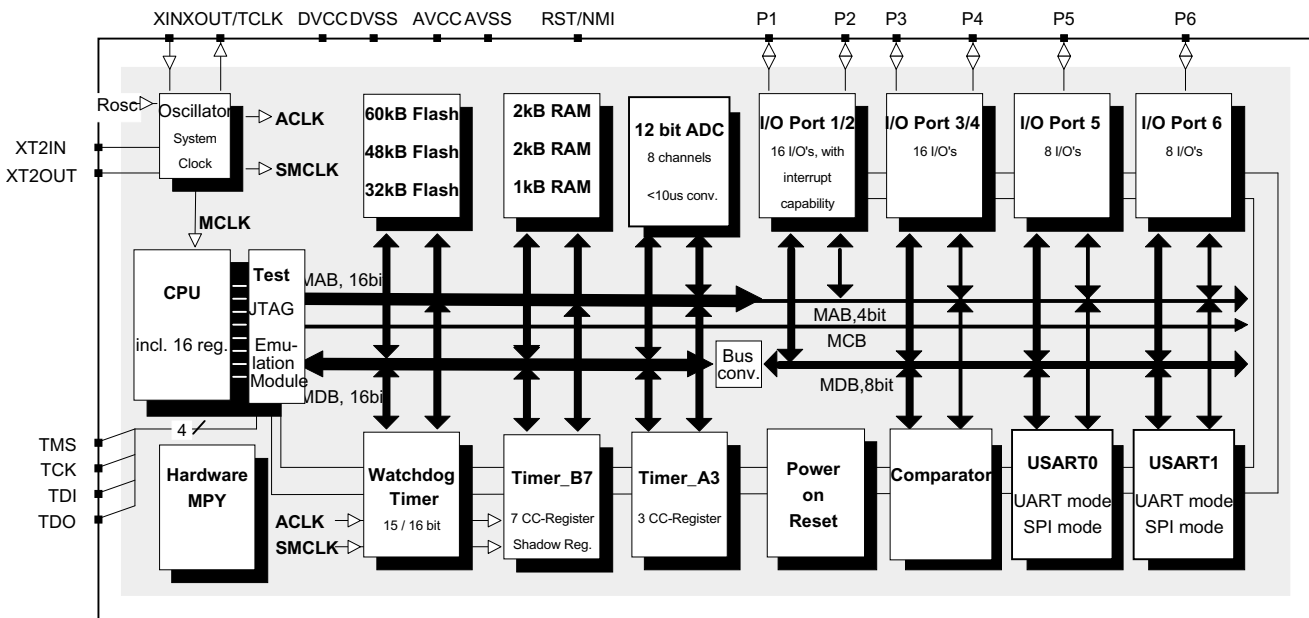
#### MSP430F133, MSP430F135 and MSP430C1331, MSP430C1351 without 12bit ADC



Package: 64 QFP (PM)

### Device Configuration

#### MSP430F147, MSP430F148, MSP430F149

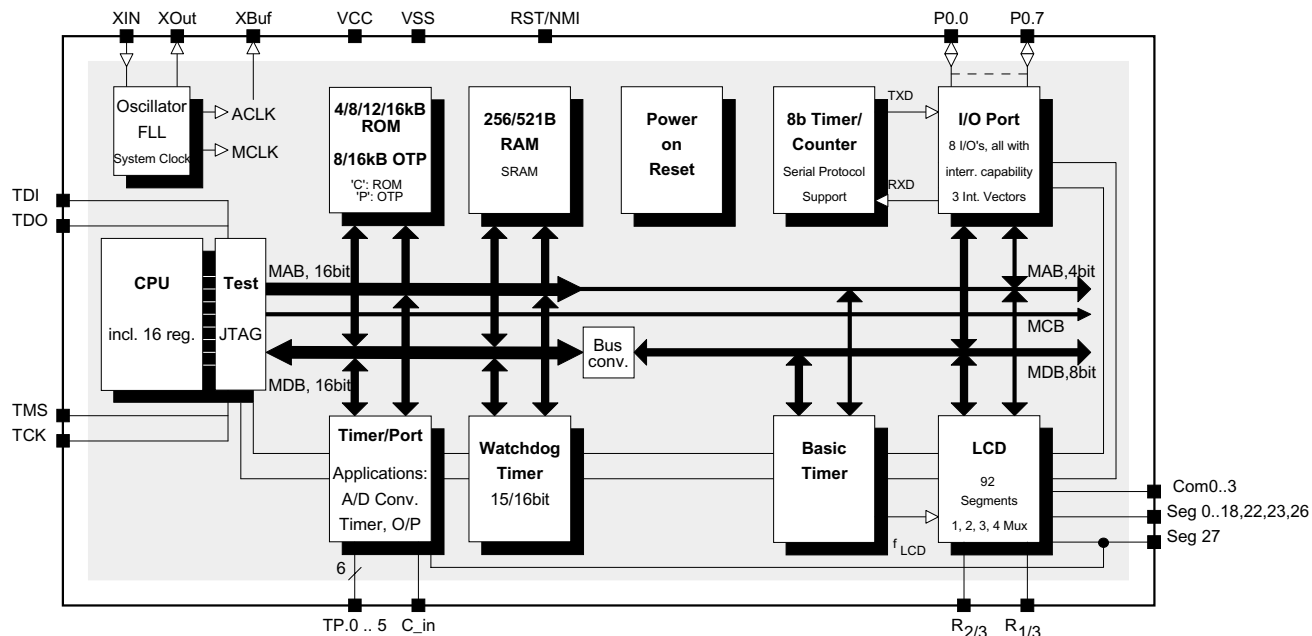


Package: 64 QFP (PM)

## MSP430x3xx Family with LCD Driver – Device Configuration

### Device Configuration

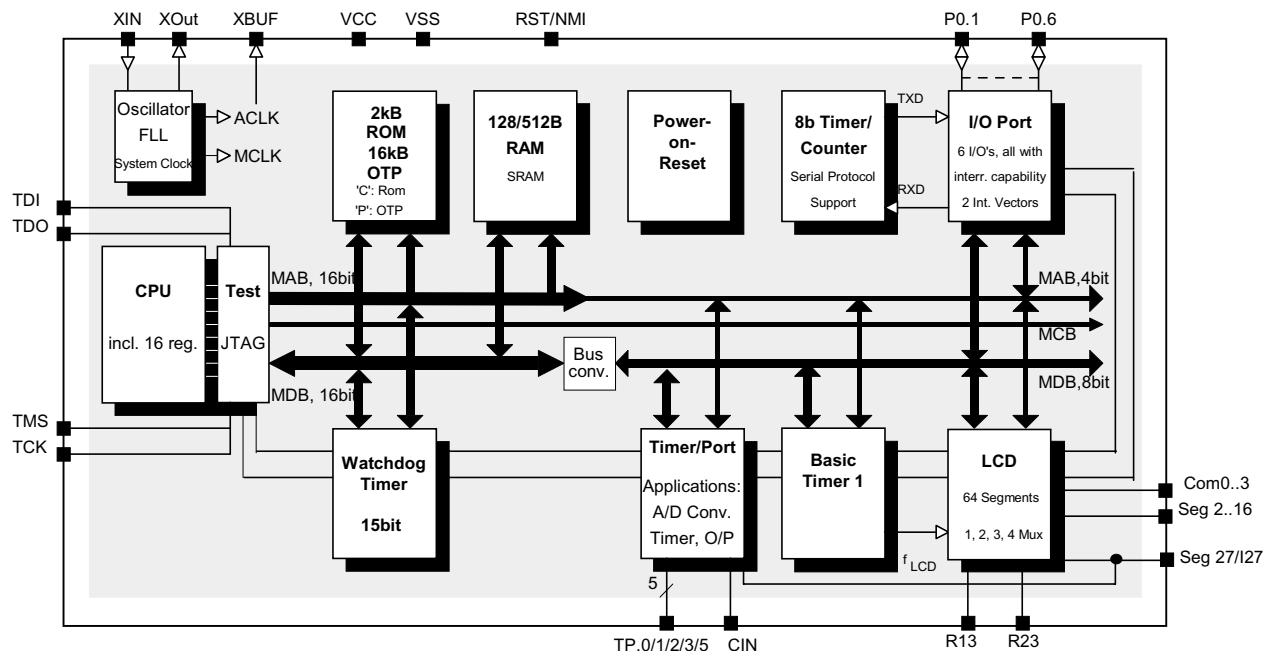
MSP430C312, MSP430C313, MSP430C314, MSP430C315, MSP430P315



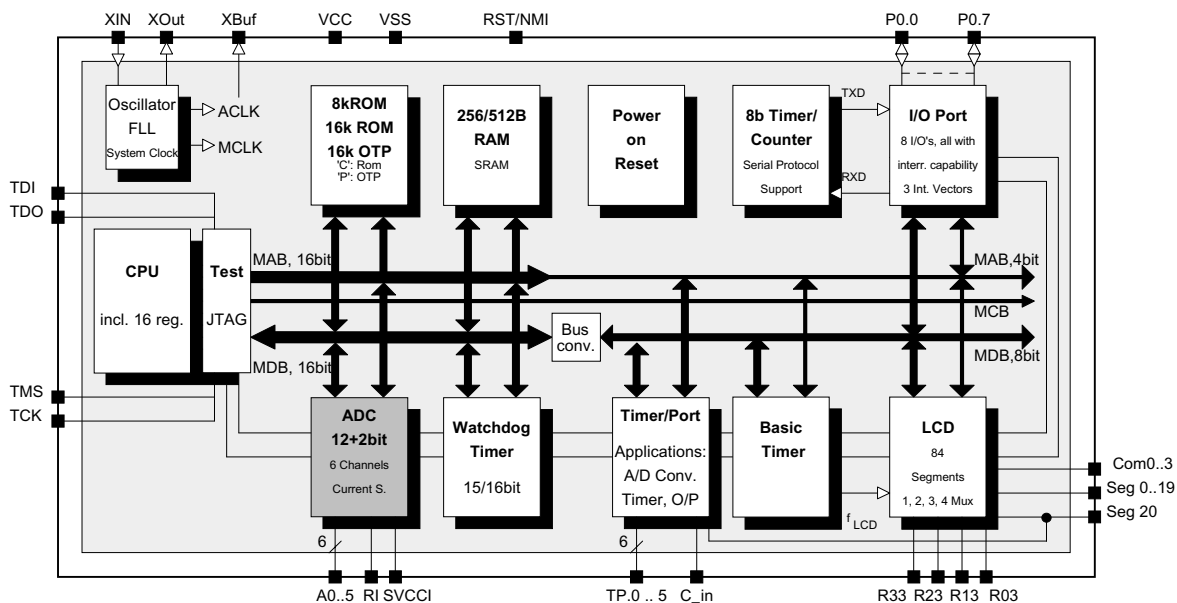
Package: 56 SSOP (DL)

### Device Configuration

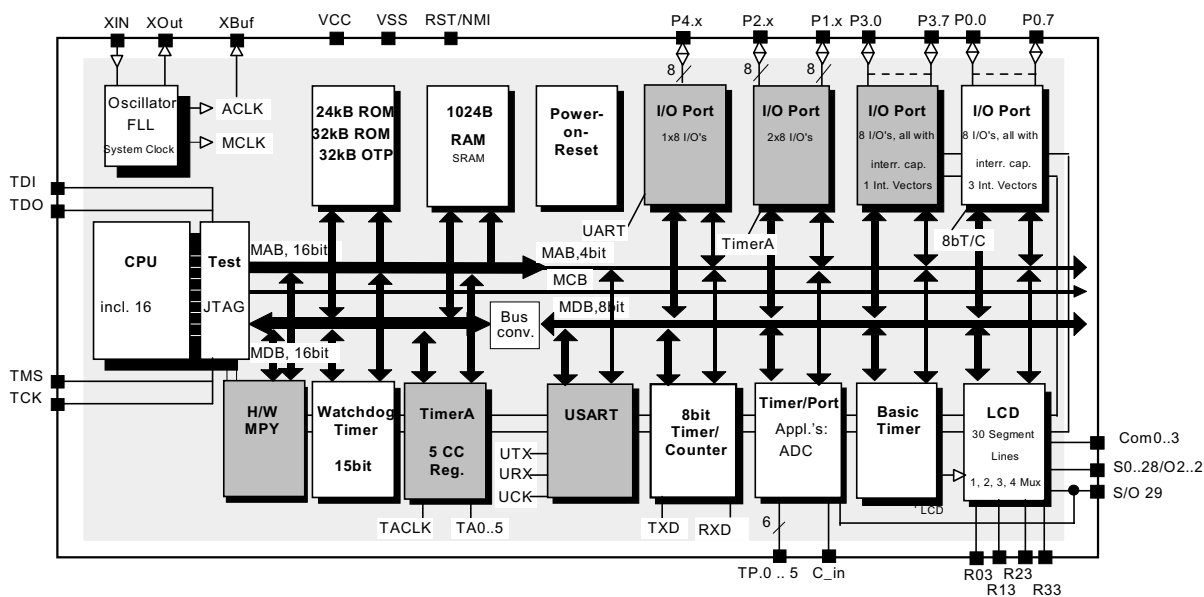
MSP430C311S, MSP430P315S



Package: 48 SSOP (DL)

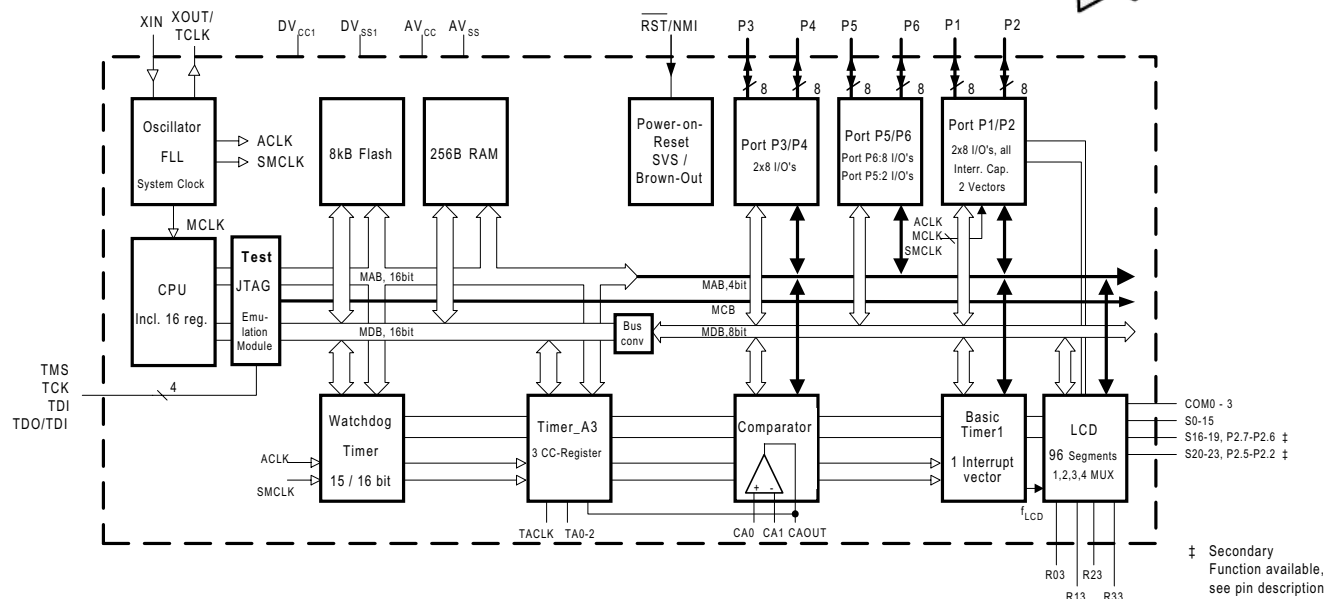
**Device Configuration****MSP430C323, MSP430C325, MSP430P325, MSP430P325A**

Package: 64 QFP (PG), 64 QFP (PM), 68 PLCC (FN)

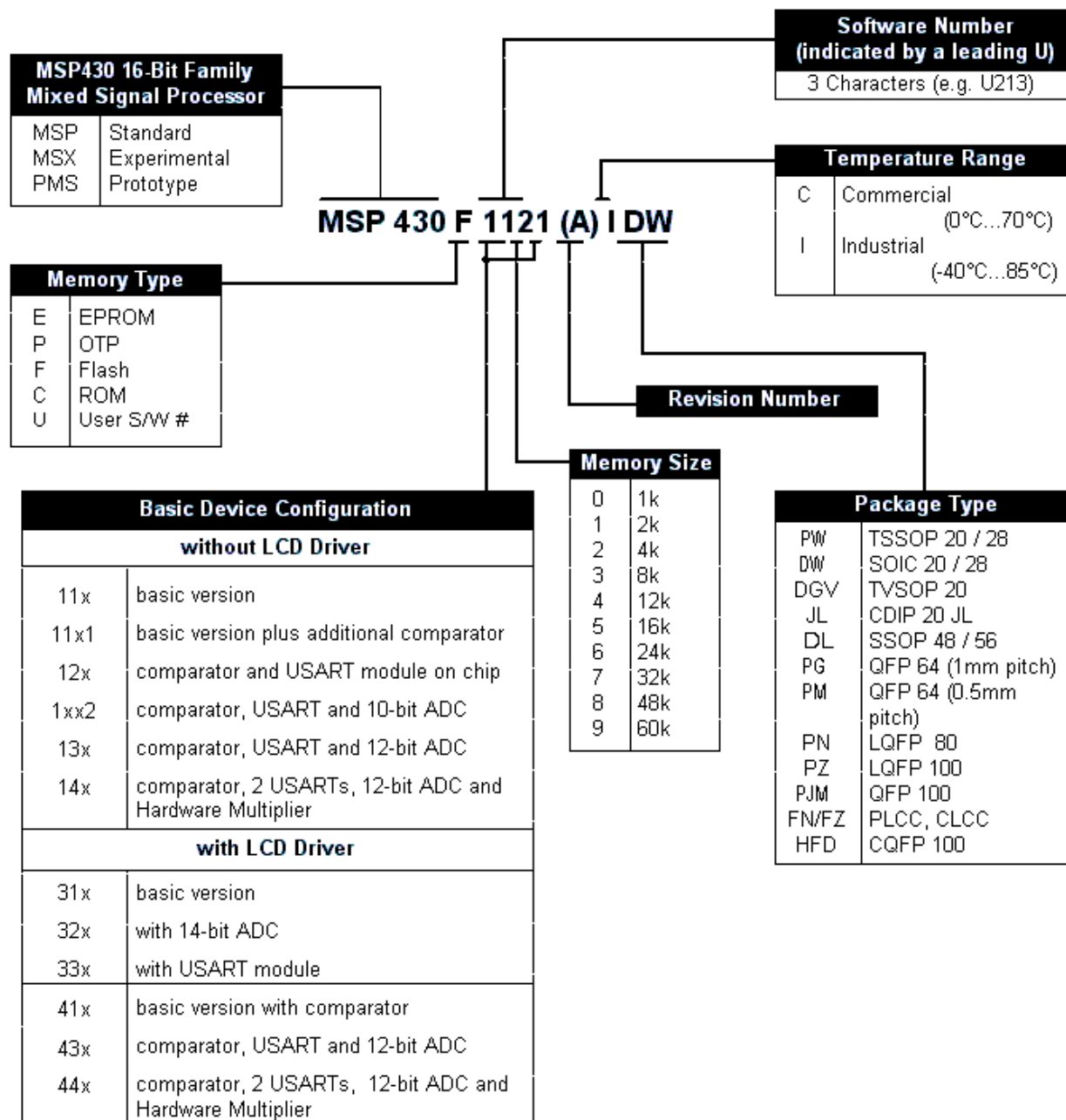
**Device Configuration****MSP430C336, MSP430C337, MSP430P337, MSP430P337A**

Package: 100 QFP (PJM)












**Device Configuration  
MSP430F412, MSP430F413**



## MSP430 Production Code



## MSP430 Device Packages

ID	Package	Pins	ID	Package	Pins
	TSSOP	20		QFP	64
	SOP	20		QFP	100
	CDIP	20		CFP	100
	SSOP	48		JLCC	68
	SSOP	56			
	QFP	64			
	PLCC	68			

### 20 TSSOP – PW

MSP430F1101PW  
MSP430F1111PW  
MSP430F1121PW  
MSP430C1111PW  
MSP430C1121PW

### 20 SOIC – DW

MSP430C111IDW  
MSP430C112IDW  
MSP430P112IDW  
MSP430F1101IDW  
MSP430F1111IDW  
MSP430F1121IDW  
MSP430C1111IDW  
MSP430C1121IDW

### 20 DIL – JL

PMS430E112JL

### 20 TVSOP – DGV

MSP430F1121AIDGV

### 28 TSSOP – PW

MSP430F122IPW  
MSP430F123IPW

### 28 SOWB – DW

MSP430F122IDW  
MSP430F123IDW

### 48 SSOP – DL

MSP430C311SIDL  
MSP430P315SIDL

### 56 SSOP – DL

MSP430C312IDL  
MSP430C313IDL  
MSP430C314IDL  
MSP430C315IDL  
MSP430P315IDL

### 64QFP – PM

MSP430F133IPM  
MSP430C1331IPM  
MSP430F135IPM  
MSP430C1351IPM  
MSP430F147IPM  
MSP430F148IPM  
MSP430F149IPM  
MSP430F412IPM  
MSP430F413IPM

MSP430C323IPM  
MSP430C325IPM

MSP430P325IPM  
MSP430P325AIPM

### 64QFP – PG

MSP430C323IPG  
MSP430C325IPG  
MSP430P325IPG  
MSP430P325AIPG

### 68 PLCC – FN

MSP430C323IFN  
MSP430C325IFN  
MSP430P325IFN  
MSP430P325AIFN

### 68JLCC FZ

PMS430E315FZ  
PMS430E325AFZ

### 100 QFP – PJM

MSP430C336IPJM  
MSP430C337IPJM  
MSP430P337IPJM  
MSP430P337AIPJM

### 100 CFP – HFD

PMS430E337AHFD

## MSP430 Design Support

### Texas Instruments Tools

<b>MSP430x11x FLASH EMULATION TOOL</b>	<b>MSP-FET430X110</b>
<b>MSP430x14x FLASH EMULATION TOOL</b>	<b>MSP-FET430P140</b>
<b>MSP430x41x FLASH EMULATION TOOL</b>	<b>MSP-FET430P410</b>
<b>MSP430x12x FLASH EMULATION TOOL</b>	<b>MSP-FET430P120</b>

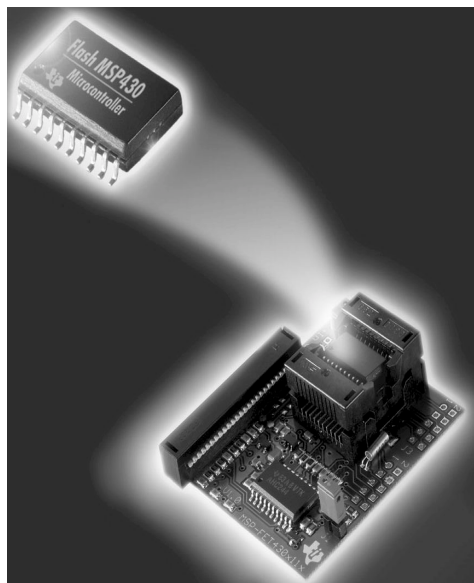
49\$ \*\*  
99\$ \*\*  
99\$ \*\*  
99\$ \*\*



The MSP430 Flash Emulation Tools, combined with the IAR Kickstart environment, enable system designers to quickly **update, download, run and debug their code** without ever disconnecting the MSP430 from the PC. This speeds up the development and debug portions of the application development cycle significantly. The FET Tools allow designers the flexibility of operating the device under JTAG control, running to internal breakpoints or free running the MSP430. Each FET comes with an **evaluation board, two Flash devices, PC parallel connection, development software and the MSP430 CD-ROM**.

The MSP-FET430X110 is a complete low-cost application development for MSP430F11x(1) products. The MSP-FET430P140 supports application development for both the MSP430F13x and MSP430F14x product families. It includes a parallel interface that also allows direct in-circuit programming of MSP430 Flash devices. The latest FET, the MSP-FET430P120, is available now as well as the new MSP-FET430P410 development tool for TI's first Flash device with integrated LCD driver, the F41x family.

**FET Driver Vers.: 3.01**



MSP-FET430X110

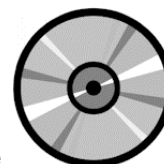


MSP-FET430P140

### IAR KICKSTART ENVIRONMENT

free

Kickstart is a fully integrated Windows-based development environment. It is derived from the popular IAR Workbench user interface. This one interface allows the user to **develop code, simulate operation, download software and debug applications** for all MSP430 derivatives. Kickstart allows the setting of breakpoints and the monitoring of special function registers, memory, the stack, as well as other useful information. Kickstart includes the **IAR assembler, a software simulator, a free 2KB version of the IAR C compiler and the C-SPY debugger**. Upgrading to the full version of IAR C is simple and does not require the user to learn a new interface. MSP430 devices with Flash, OTP or UV-EPROM memory can be programmed directly from Kickstart using either a Flash Emulation Tool (FET) or the new Serial Programming Adapter MSP-PRGS430. The Kickstart Environment is available on the free MSP430 CD-ROM, which is shipped with the TI Tools.



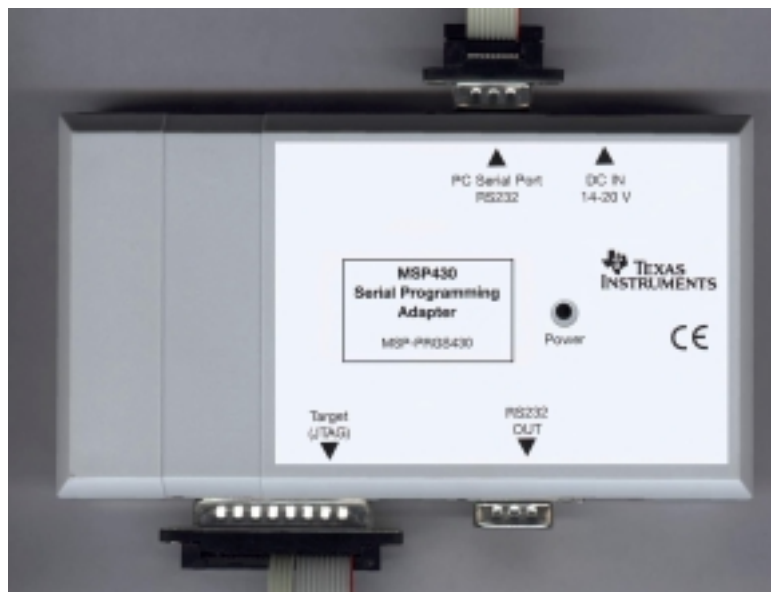
**MSP430 SERIAL PROGRAMMING ADAPTER**

**MSP-PRGS430**

**199\$ \*\***

The serial programming adapter is a second-generation programming Tool that can program any MSP430 Flash, OTP or UV-EPROM device. Devices can be programmed in stand-alone sockets or in-circuit. Software is included to facilitate device programming.

**Software Vers.: 1.0**



MSP-PRGS430

**MSP430x320 EVALUATION KIT  
MSP430x330 EVALUATION KIT**

**MSP-EVK430S320  
MSP-EVK430S330**

**399\$ \*\***

**399\$ \*\***

The MSP430 Evaluation Kits (EVK) are powerful development Tools that include much of the hardware and software required to complete your application development. Each EVK comes with an evaluation board, two UV-EPROM devices, serial programming adapter, development software and CD-ROM.

The MSP-EVK430S320 EVK supports the MSP430x32x family of devices. The MSP-EVK430S330 EVK supports the MSP430x33x and MSP430x31x families of devices. The EVKs are combined with the **new IAR Kickstart** environment. The **new Serial Programming Adapter** is a second-generation programming Tool that can program any MSP430 Flash, OTP or UV-EPROM device. Devices can be programmed in stand-alone sockets or in-circuit.

**MSP430 FLOATING POINT PACKAGE    MSP-FPP430V400**

**free**

The Floating Point Package for the MSP430 Family is supporting the basic arithmetic operations add, subtract, multiply, divide and compare with a 24bit or 40bit mantissa. A conversion from/to binary and BCD format is also supported. Support software 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. The Floating Point Package is also available for free from the MSP430 home page or the CD-ROM.



## MSP430 Third Party Support

### EMULATORS

#### Hitex

DProbe430-DP110 (+DBox16)	Supporting the x1x configurations
DProbe430-DP300 (+DBox16)	Supporting the 3xx configurations
MX430L	Supporting the 11x configuration

With the new DProbe430, Hitex offers a modular emulation system which is specifically designed to develop, test and optimize MSP430 applications. Starting with the entry-level system DProbe430, up to the high-end system DBox16, real-time debugging at the highest frequencies and with all the power saving modes is now possible without restrictions. Changing from one derivative to another can be done by an easy and low-cost exchange of the derivative specific part

With the convenient and easy to learn HiTOP user interface, all the processor internals and application structures are made transparent. Symbolic high-level language debugging, as well as examination down to assembler code, can be done to speed up the development and ensure quality in the application. The high-end features of the DBox16 allow the user to find and eliminate even the most complex bugs.

For more information please contact Hitex: [www.hitex.de](http://www.hitex.de).

### C-CROSS-COMPILER and C/ASM-DEBUGGER

#### IAR

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).

For more information please contact IAR on [www.iar.se](http://www.iar.se)

### UNIVERSAL PROGRAMMING SYSTEM

#### Data I/O

Data I/O 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(A), MSP430x337(A). 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 User ID, Watchdog Timer or Code Protection can be activated via a simple menu.

For more information please contact Data I/O [www.data-io.com](http://www.data-io.com)

#### 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 the universal engineering programmers (BP-1200 and BP-1400), the manual, multi-site Concurrent Programming Systems.

For more information, please visit the BP web site: [www.bpmicro.com](http://www.bpmicro.com)

## ON-CHIP EMULATION SOFTWARE for the MSP430

### Goepel electronic

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 testbus 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 breakpoint 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 EEPROMS and blowing fuses.

For more information please contact Goepel on [www.goepel.com](http://www.goepel.com)



## Universal Bootstrap Loader (BSL) Interface package for the MSP430

### Geßler Electronic GmbH

The new Flash derivatives from TI's MSP430 Microcontroller have an integrated bootstrap loader (BSL) that provides access to the embedded memory. The BSL is located in the ROM without using any Flash resources. The BSL supports download of code and parameters into the Flash memory during prototyping phase, production and in the field.

The Universal Bootstrap Loader Interface allows easy access to the MSP430 with any PC through the serial port. It supports the data signal transfer and provides the power supply for the target device.

Firmware updates of MSP430 devices can be done as easily as programming the device the first time. Note also that this is the only way to re-program the MSP430 once the security fuse has been blown.

A communications library that is part of the software package provides access to the target device's BSL. It can also be used by other programs since the documentation of the API of this library is included in the package.

For more information please check [www.gessler-electronic.com/msp430](http://www.gessler-electronic.com/msp430)

## MSP430 Literature, Application Notes & Examples

Description		Part Number
MSP430 Product Brochure		SLAB034B
MSP430 CD-ROM		SLAC001D
MSP430F11x	Data Sheet	SLAS256B
MSP430C11x/P112	Data Sheet	SLAS196B
MSP430x11x1	Data Sheet	SLAS241C
MSP430F13x/F14x	Data Sheet	SLAS272C
MSP430x31x	Data Sheet	SLAS165D
MSP430P325	Data Sheet	SLAS164A
MSP430C32x/P325A	Data Sheet	SLAS219B
MSP430P337	Data Sheet	SLAS163
MSP430C33x/P337A	Data Sheet	SLAS227A
MSP430F41x	Data Sheet	SLAS340A
MSP430F12x	Data Sheet	SLAS312
Getting Started with MSP430		SLAU028
MSP430x1xx Family User's Guide		SLAU049A
MSP430x3xx Family User's Guide		SLAU012
MSP430x4xx Family User's Guide		SLAU056A
MSP430x1xx Clock System		SLAA081
MSP430x3xx Clock System		SLAA080
MSP430 Family Software User's Guide		SLAUE11
MSP430 Family Assembler User's Guide		SLAUE12
MSP430 Family Application Report		SLAA024



### Application Notes

[http://www.ti.com/sc/docs/apps/process/msp430\\_ultra\\_low\\_power\\_microcontrollers.html](http://www.ti.com/sc/docs/apps/process/msp430_ultra_low_power_microcontrollers.html)

## MSP430 ROM Mask Versions

- Mask Version C3xx for volumes >25ku/y, C1xx1 and C41x for volumes >100ku/y.
- Mask Cost: 7 k\$ per mask
- Lead time for the first prototypes / production units: 12-14 weeks after code delivery and order entry
- Risk order of at least 3ku (non cancelable) is needed for any new project

TI will assist in setting up new ROM codes for the MSP430. This section describes the detailed flow to be used to ensure a smooth and quick setup.

### U-Code Name Generation

The customer's finished program code is sent to the TI Sales Representative responsible for the ROM code project. It is important that the program code file format is using the Intel Hex code standard. The TI Sales contact then obtains a unique three digit U-code number from the TI ROM code coordinator identifying the customer specific device programming and the package option, e.g. MSP430U999IPM for a MSP430 in a QFP package. This 3-digit U-code is being used to track the new ROM code device through its implementation cycle as well as to generate new entries for the ordering system when the device goes into production.

### ROM Code Release Sheet Submission

For each new ROM code, a ROM code release sheet will be submitted to the customer. It contains all device characteristics like symbolization, pull-up, pull-down resistors, operating voltage ranges, package options etc. The customer can compare the file as received by TI with his original program file and he can also verify all device setups.

### ROM Code Release Sheet Return

After the customer verified the program code and device settings and finds everything ok, he confirms this by sending back the release form with the program code and a written release confirmation for the risk run. To speed up the process, only the first two pages and the last page can be faxed to TI and the whole document is then sent by mail.

### Risk Order Entry

To initiate mask pattern generation and the production of the risk lot, the risk order of 3ku or more has to be entered. After order has been entered and ROM code release sheet has been approved and returned by the customer, lead time for the delivery of the risk lot is around 12 weeks.

### NRE Order Entry

For each new ROM code, a fixed amount of 7k\$ NRE will be entered in addition to the risk order.

### First Sample Delivery

The first sample shipment (i.e. the risk order, usually 3ku) is shipped to the customer directly from the TI PDC, as if it was a standard TI device. If the customer needs samples separated from this standard shipment (might be the case for material that comes in tape&reel), he needs to write down this request in the ROM Code Release Sheet.

### ROM Code Approval

The customer needs to provide formal ROM code approval based on the first samples, prior to placement of high volume production orders. This final approval is sent to TI by fax or mail and the Mask ROM device will become available for volume production orders.

## MSP430 Wafer Business

**only possible for designated device configurations – always check with TI Representative**

Possible with following rules:

- OTP versions on wafer are only available in a min. quantity to verify the ROM code in special cases
- Unsawed, inked wafers only, no die-business – production code: YS
- Currently available configurations: MSP430C112YS, MSP430C311YS and MSP430C315YS
- Tested only at room temperature or above
- NDA is needed as yield data is visible on the wafer
- Wafer Business is a special service for customers needing it for space reasons only, it is **not** a cost reduction program
- Minimum quantity goal for Wafer Business is 100ku (order has to be entered in the system!)
- Customer must have the expertise to handle a Wafer Business

## MSP430 Die Business

**only possible for designated device configurations – always check with TI Representative**

Possible with following rules:

- Production code: CY
- Currently available configurations: MSP430P315CY, MSP430P325ACY, MSP430F1121CY and MSP430F149CY
- NDA must be in place since TI proprietary information will be shared with the customer
- Die Business is a special service for customers needing it for space reasons only; it is **not** a cost reduction program
- Minimum quantity goal for Die Business is 100ku (order has to be entered in the system!)
- Customer must have the expertise to handle a Die Business

## MSP430 Tools by Texas Instruments - Overview

Tool	Product Code	Suggested Resale Price
MSP 430 FLASH EMULATION TOOL for x11x1	MSP-FET430X110	\$ 49
MSP 430 FLASH EMULATION TOOL for x13x/14x	MSP-FET430P140	\$ 99
MSP 430 FLASH EMULATION TOOL for x41x	MSP-FET430P410	\$ 99
MSP 430 FLASH EMULATION TOOL for x12x	MSP-FET430P120	\$99
MSP430 EVALUATION KIT x320	MSP-EVK430S320	\$ 399
MSP430 EVALUATION KIT x330	MSP-EVK430S330	\$ 399
MSP430 SERIAL PROGRAMMING ADAPTOR	MSP-PRGS430	\$ 199
TRF6900/MSP430 EVALUATION KIT	MSP-EVKTRF6900	\$399



## MSP430 Product Selection Overview

MSP430 Product Selection Guide																		
(C)ROM (E)UV	(F) Flash (P)OTP	Pins/ Pkg	Program	SRAM	I/O	Vcc	LCD Seg	Basic Timer (2) 8-Bit	Watchdog 16-Bit	Interval Timer 8-Bit	Timer/ Port (2) 8-Bit	Timer_A 16-Bit	Timer_B 8-16 bit	USART	MPY	Comp_A	ADC	Price <sup>2</sup>
Flash Based F1xx Family																		
MSP430F1101	20 DW,PW	1 kB	128	14	1.8 - 3.6	–	–	–	X	–	–	X	–	–	–	X	slope	\$0.99
MSP430F1111	20 DW,PW	2 kB	128	14	1.8 - 3.6	–	–	–	X	–	–	X	–	–	–	X	slope	\$1.34
MSP430C1111	20 DW,PW	2 kB	128	14	1.8 - 3.6	–	–	–	X	–	–	X	–	–	–	X	slope	\$1.23
MSP430F1121	20 DW,PW, DGV	4 kB	256	14	1.8 - 3.6	–	–	–	X	–	–	X	–	–	–	X	slope	\$1.74
MSP430C1121	20 DW,PW, DGV	4 kB	256	14	1.8 - 3.6	–	–	–	X	–	–	X	–	–	–	X	slope	\$1.47
MSP430P112	20 DW,PW	4 kB	256	14	2.7 - 5.5	–	–	–	X	–	–	X	–	–	–	–	slope	\$2.33
PMS430E112	20 CDIP	4 kB	256	14	2.7 - 5.5	–	–	–	X	–	–	X	–	–	–	–	slope	\$49.00
MSP430F1122 <sup>4</sup>	20 DW,PW	4 kB	256	14	1.8 - 3.6	–	–	–	X	–	–	X	–	–	–	–	ADC10	\$2.24
MSP430F1132 <sup>4</sup>	20 DW,PW	8 kB	256	14	1.8 - 3.6	–	–	–	X	–	–	X	–	–	–	–	ADC10	\$2.48
MSP430F122	28 DW,PW	4 kB	256	22	1.8 - 3.6	–	–	–	X	–	–	X	–	1	–	X	slope	\$2.39
MSP430F123	28 DW,PW	8 kB	256	22	1.8 - 3.6	–	–	–	X	–	–	X	–	1	–	X	slope	\$2.51
MSP430F1222 <sup>4</sup>	28 DW,PW	4 kB	256	22	1.8 - 3.6	–	–	–	X	–	–	X	–	1	–	–	ADC10	\$2.62
MSP430F1232 <sup>4</sup>	28 DW,PW	8 kB	256	22	1.8 - 3.6	–	–	–	X	–	–	X	–	1	–	–	ADC10	\$2.79
MSP430F133	64 PM	8 kB	256	48	1.8 - 3.6	–	–	–	X	–	–	X	X	1	–	X	ADC12	\$2.96
MSP430C1331	64 PM	8 kB	256	48	1.8 - 3.6	–	–	–	X	–	–	X	X	1	–	X	slope	\$1.95
MSP430F135	64 PM	16 kB	512	48	1.8 - 3.6	–	–	–	X	–	–	X	X	1	–	X	ADC12	\$3.55
MSP430C1351	64 PM	16 kB	512	48	1.8 - 3.6	–	–	–	X	–	–	X	X	1	–	X	slope	\$2.25
MSP430F147	64 PM	32 kB	1024	48	1.8 - 3.6	–	–	–	X	–	–	X	X	2	X	X	ADC12	\$4.95
MSP430F148	64 PM	48 kB	2048	48	1.8 - 3.6	–	–	–	X	–	–	X	X	2	X	X	ADC12	\$5.65
MSP430F149	64 PM	60 kB	2048	48	1.8 - 3.6	–	–	–	X	–	–	X	X	2	X	X	ADC12	\$5.95
Flash Based F4xx Family with LCD Driver																		
MSP430F412	64 PM	4 kB	256	48	1.8 - 3.6	96	X	X	X	–	–	X	–	–	–	X	slope	\$2.55
MSP430C412 <sup>4</sup>	64 PM	4 kB	256	48	1.8 - 3.6	96	X	X	X	–	–	X	–	–	–	X	slope	\$1.90
MSP430F413	64 PM	8 kB	256	48	1.8 - 3.6	96	X	X	X	–	–	X	–	–	–	X	slope	\$2.90
MSP430C413 <sup>4</sup>	64 PM	8 kB	256	48	1.8 - 3.6	96	X	X	X	–	–	X	–	–	–	X	slope	\$2.10
MSP430F435 <sup>3</sup>	80 PN, 100 PZ	16 kB	512	48	1.8 - 3.6	160	X	X	X	–	–	X	X	1	–	X	ADC12	\$4.40
MSP430F436 <sup>3</sup>	80 PN, 100 PZ	24 kB	1024	48	1.8 - 3.6	160	X	X	X	–	–	X	X	1	–	X	ADC12	\$4.65
MSP430F437 <sup>3</sup>	80 PN, 100 PZ	32 kB	1024	48	1.8 - 3.6	160	X	X	X	–	–	X	X	1	–	X	ADC12	\$4.85
MSP430F447 <sup>3</sup>	100 PZ	32 kB	1024	48	1.8 - 3.6	160	X	X	X	–	–	X	X	2	X	X	ADC12	\$5.65
MSP430F448 <sup>3</sup>	100 PZ	48 kB	2048	48	1.8 - 3.6	160	X	X	X	–	–	X	X	2	X	X	ADC12	\$6.40
MSP430F449 <sup>3</sup>	100 PZ	60 kB	2048	48	1.8 - 3.6	160	X	X	X	–	–	X	X	2	X	X	ADC12	\$6.95
ROM/OTP Based X3xx Family with LCD Driver																		
MSP430C311S	48DL	2 kB	128	11	2.5 - 5.5	64	X	X	X	X	X	–	–	–	–	–	slope	\$1.99
MSP430P315S	48DL	16 kB	512	11	2.7 - 5.5	64	X	X	X	X	X	–	–	–	–	–	slope	\$5.16
MSP430C312	56 DL	4 kB	256	14	2.5 - 5.5	92	X	X	X	X	X	–	–	–	–	–	slope	\$2.40
MSP430C313	56 DL	8 kB	256	14	2.5 - 5.5	92	X	X	X	X	X	–	–	–	–	–	slope	\$2.61
MSP430C314	56 DL	12 kB	512	14	2.5 - 5.5	92	X	X	X	X	X	–	–	–	–	–	slope	\$2.82
MSP430C315	56 DL	16 kB	512	14	2.5 - 5.5	92	X	X	X	X	X	–	–	–	–	–	slope	\$3.04
MSP430P315	56 DL	16 kB	512	14	2.7 - 5.5	92	X	X	X	X	X	–	–	–	–	–	slope	\$5.16
PMS430E315	68 FZ	16 kB	512	14	2.7 - 5.5	92	X	X	X	X	X	–	–	–	–	–	slope	\$99.00
MSP430C323	64 PM, FN, PG	8 kB	256	14	2.5 - 5.5	84	X	X	X	X	X	–	–	–	–	–	ADC14	\$5.23
MSP430C325	64 PM, FN, PG	16 kB	512	14	2.5 - 5.5	84	X	X	X	X	X	–	–	–	–	–	ADC14	\$5.53
MSP430P325A	64 PM, FN, PG	16 kB	512	14	2.5 - 5.5	84	X	X	X	X	X	–	–	–	–	–	ADC14	\$6.87
PMS430E325A	68 FZ	16 kB	512	14	2.5 - 5.5	84	X	X	X	X	X	–	–	–	–	–	ADC14	\$99.00
MSP430C336	100 PJM	24 kB	1024	40	2.5 - 5.5	120	X	X	X	X	X	X	–	1	X	–	slope	\$6.10
MSP430C337	100 PJM	32 kB	1024	40	2.5 - 5.5	120	X	X	X	X	X	X	–	1	X	–	slope	\$6.38
MSP430P337A	100 PJM	32 kB	1024	40	2.5 - 5.5	120	X	X	X	X	X	X	–	1	X	–	slope	\$7.53
PMS430E337A	100 PZ	32 kB	1024	40	2.5 - 5.5	120	X	X	X	X	X	X	–	1	X	–	slope	\$99.00

<sup>1</sup> Temp. Range for all MSP430 is Industrial, except all Exxx parts (25 °C). <sup>2</sup> Suggested 10,000 unit resale price in U.S. dollars (budgetary only); C-Versions require minimum quantity of 25,000 units per year  
<sup>3</sup> Planned release Q1 2002. <sup>4</sup> Planned release Q2 2002.

## Notes

## TI Worldwide Technical Support

### MSP430 Home Page

[www.ti.com/sc/msp430](http://www.ti.com/sc/msp430)

### TI Distributors

[www.ti.com/sc/docs/general/distrib.htm](http://www.ti.com/sc/docs/general/distrib.htm)

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Indonesia	001-801-10	-800-800-1450
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