

MSP430 Microcontroller: Its Features and Applications

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ABSTRACT

The present paper is devoted to the study of MSP430 microcontroller and its various features and application with reference to TEXAS INSTRUMENT (MSP430). A microprocessor with memory and I/O port supports directly on chip. It also includes controllers for interfaces such as JTAG, A-2-D conversion on board. Microcontrollers, with the support on chip are very important in design and implementation of embedded system. The MSP430 is the microcontroller family from TEXAS INSTRUMENTS. It has its own special significance which differentiates it from other chips. It is built around a 16-bit CPU. It is also made for low power consumption and designed for low cost.

Keywords: *MSP430, Embedded System, 16-bits CPU, JTAG, A-2-D, Low Power*

INTRODUCTION TO MICROCONTROLLER

Microcontroller is a single chip that contains the processor (CPU), Volatile memory for input (RAM) and output, non volatile memory for the program (ROM). It also contains a clock and an I/O control unit which is also called "Computer on a Chip". Microcontroller chips play a very important role in modern day-to-day life. Billions of microcontroller units (MCUs) are embedded each year in various products from toys to appliances to automobiles. For example, a single vehicle can use 70 or more microcontroller. A microcomputer, microprocessor or other equipment are used for precise process control in data handling, communication and manufacturing. A microprocessor on a single integrated circuit is designed to operate as an embedded system. In other words, a microcontroller is typically designed in such a way that includes a small amount of RAM and PROM and Timers and I/O ports such as Intel 8751.

Microcontrollers are used in automatically controlled products. It can be seen in automobile engine control system, implantable medical devices, remote control, office machines, power tools, other embedded systems, so on and so forth. Microcontrollers are very economical because it digitally controls even more devices and processes.

Some microcontrollers may use 4-bit words and operate at clock rate of frequencies as 4 KHz. Other microcontrollers may serve performance critical roles. They act more like a Digital Signal Processor (DSP) with higher clock speed and power consumption.

Manufacturers from all over the globe have often produced special versions of their microcontrollers in order to help the hardware and software development of the target system. The EPROM versions have a 'window' on the top of the device through which program memory can be erased by UV light.

Since 1998, EPROM versions are rare and now they have been replaced by EEPROM and FLASH because they are easier to be used and cheaper to be manufactured. They can also be erased electronically. It is interesting to note that other versions may be available where the ROM is accessed as an internal device rather than as internal memory. Today, they are becoming rare due to the widespread availability of cheap microcontroller programs. We know that using parts program at the time of manufacture can be more economical option than other identical devices.

MSP430 MICROCONTROLLER

The MSP430 is gaining ground in the field of microcontroller all over the world. The credit of its fast popularity goes to its low power consumption and easily access to use.

In MSP430, the most common interfaces in embedded system are SPI which requires more pins than UART. Its external clock often seen enabling very fast transfers that it's both ends are synchronized. The MSP430 supports SPI connection between a Master and a slave device as shown below:

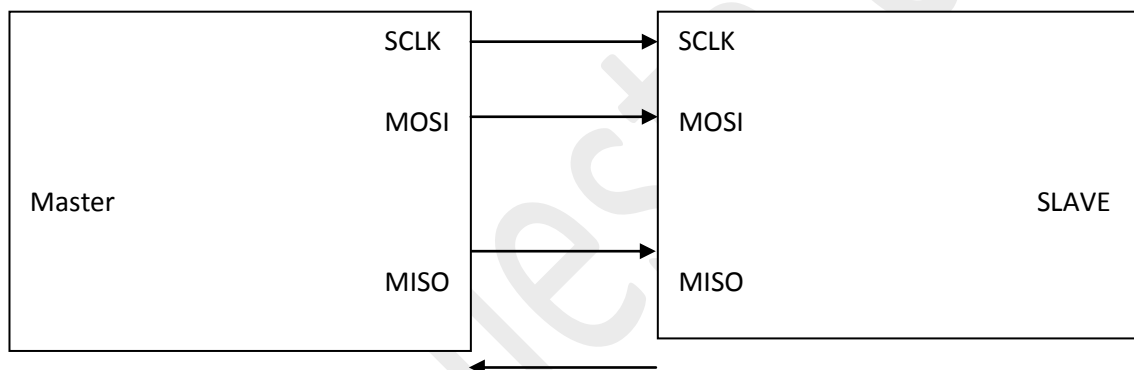


Fig 1:Outlook In MSP430 Function

LET US LOOK AT ITS SIGNALS:

- SCLK- It's a main clock synchronizing SPI on both devices. It is generated by Master to all the subordinates(slaves)
- MOSI- It stands for Master Output and Slave Input. By this process data is sent from the master to the slave on each clock edge.
- MISO- It stands for Master Input and Slave Output in which data is sent from the slave to the master on each clock edge.
- SS- It stands for Slave Select. It is often called CS (Chip Select). This line selects the current active slave.

FEATURES OF MSP 430

In our day to day life, the use of battery-operated electronic devices is increasing very rapidly. We now expect versatile products by using low consumption and low cost. The MSP430 which is also known as ultra low power microcontroller has been designed to meet

the aforesaid requirements. These microcontrollers contain a number of précised components like comparators and analog to digital convertors with 16-bit CPU, flash memory and many digital modules.

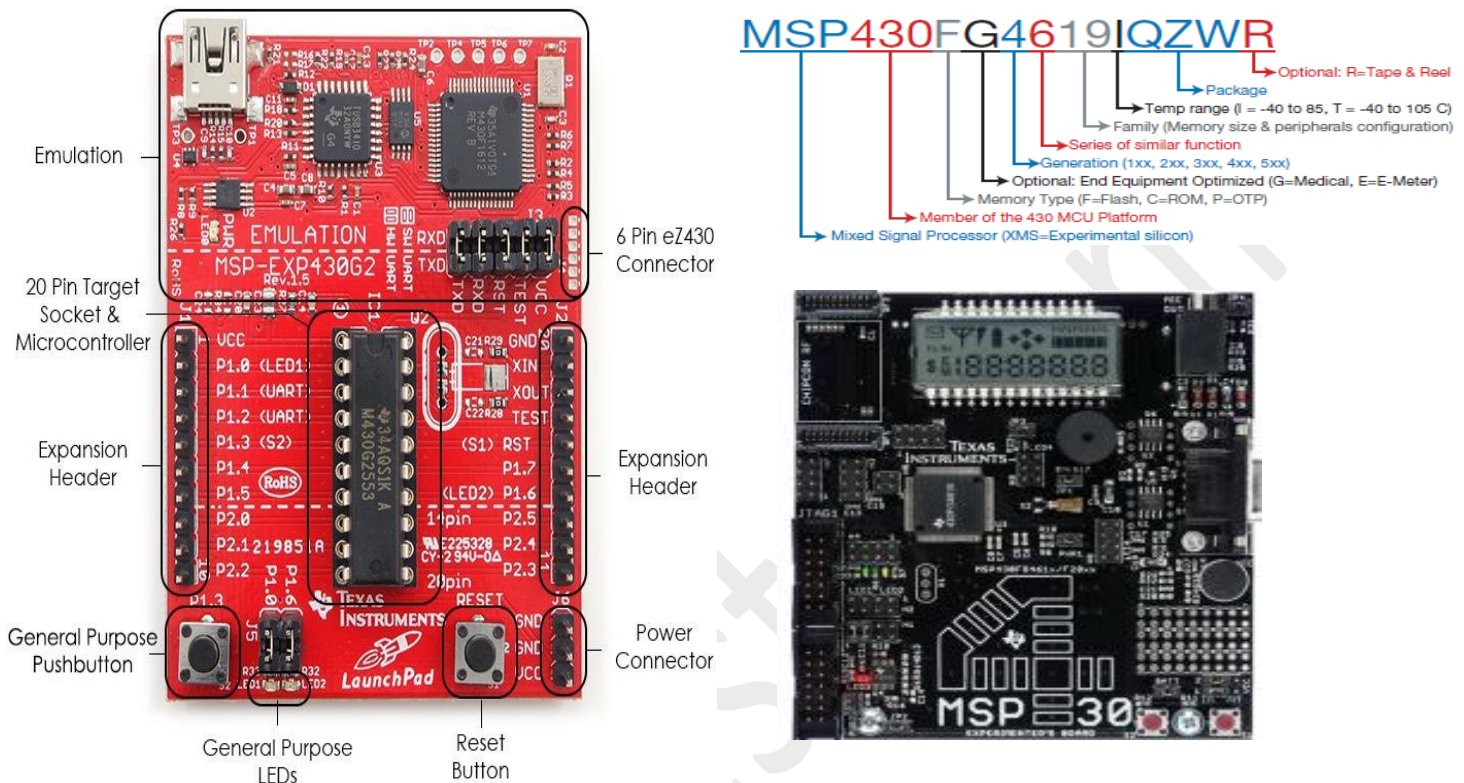


Fig 1: Overall Feature MSP430 Function Points

The whole architecture of MSP430 has been designed to operate the end product at the lowest power without compromising on accuracy and its correct functions. Perhaps this is why it is being rapidly used in products like blood glucose meters, energy meters, clinical thermometers, handheld weather monitors and other such precision instruments.

To sum up, a microcontroller or microprocessor is used for precise process control in data handling, communication and manufacturing. It is designed for embedded application in contrast to the microprocessor used in personal computers or other general purpose application.

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