

Introduction to ISP Technique

USB AVR Programmer

Introduction to ISP

ISP or in circuit programming of a microcontroller (mcu) refers to programming the mcu while it is in the target circuit. That means we do not have to remove the micro from our product or project and place in some kind of programming device to program it. Rather the target has a ISP connector where the ISP programmer is connected. Therefore, the overhead is less and task becomes easy.

A basic target system

To design a basic target capable of ISP for AVR series of microcontrollers you need to have

- Power supply for MCU.
- Crystal Oscillator (for CPU clock)
- Proper signal at Reset.
- ISP connector

Power Supply

Most of the MCUs available works off a 5v power supply except their low voltage versions. They need a clean and stable 5V power supply. This is achieved using the 7805 voltage regulator IC. Also the MCUs have a separate power supply for its analog parts to increase their accuracy and reduce noise. This must not be connected directly with the digital supply but connected via an LC network with the Vcc. You need not care this if you are not going to use the ADC(analog to digital converter) . You can connect AGND to GND and AVcc to Vcc.

Crystal Oscillator

This is like a heart for MCU. It provides a beat that makes the MCU take steps. In AVR series of MCU each clock pulse executes one instruction(some instruction needs more than one clock cycle to execute) For accurate timing in you application you need a crystal oscillator. It provides a clean and voltage and temperature independent clock source. Generally you can use crystals from 1 MHz to 16 MHz on most AVRs as required for your project.

Reset Signal.

This signal must be high(5V) for normal operation and can be pulled low to reset the device. You can connect a switch to reset the device from it.

ISP Connector

For flexibility you should have a nice connector for is so that you can connected/disconnect a programmer easily for programming. The MCU has 3 PINs for the downloading a program in its flash namely

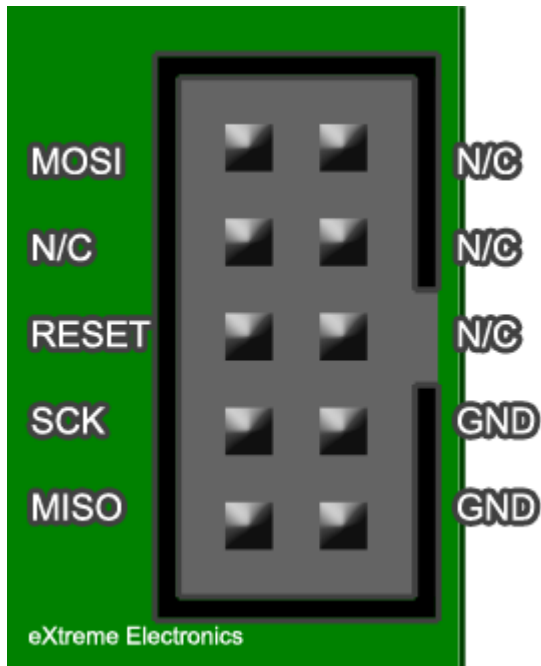
- MOSI – Master Out Slave In
- MISO – Master In Slave Out
- SCK – Serial Clock

That is for data transfer and you also need to connect RESET PIN of MCU to the ISP Connector so that programmer can put it in programming mode. One more pin should be their, that is the common or ground of the two systems. So all you need is a five PIN connector for programming.

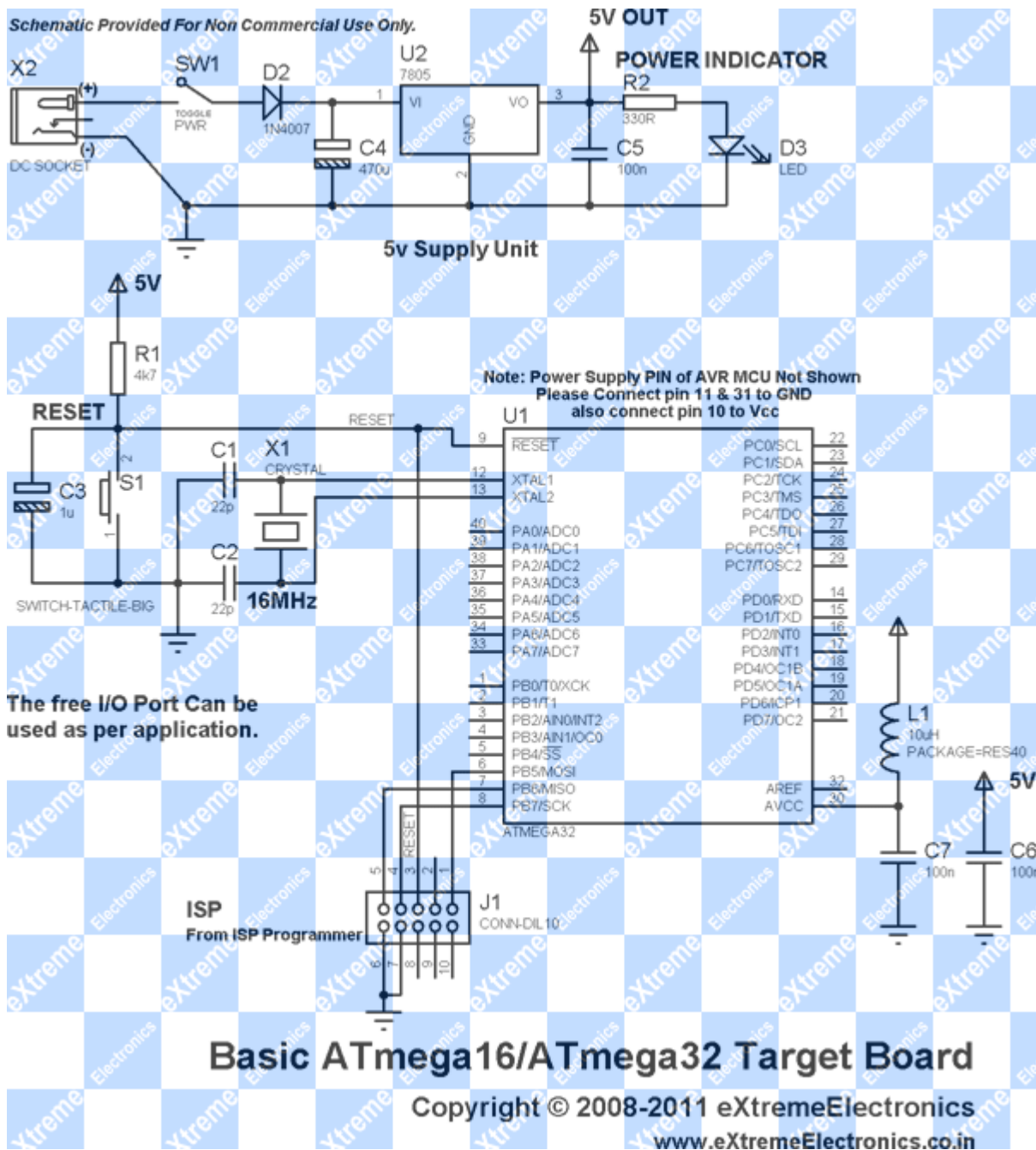
However, our AVR programmer has one additional PIN that is not connected to anything so you need a six PIN connector in your target system.

ISP PINOUT

Please refer to the diagram below for the pinout of ISP Port of our "USB AVR Programmer v2.0"



A basic target schematic



A Simple ATmega16 target.

The above shows the schematic of basic ATmega16 based target system. However, you can make a target system using any AVR microcontroller by providing basic connections mentioned above and make rest connection as per you projects requirement. You just need to know the PIN configuration of the AVR you planned to use which can be easily found out by the datasheet.

