Software Requirements

For Windows

Atmel Studio
https://www.microchip.com/mplab/avr-support/atmel-studio-7

WinAVR
https://sourceforge.net/projects/winavr/files/WinAVR/20100110/WinAVR-20100110-install.exe/download

USBasp Drivers
https://protostack.com.au/download/USBasp-win-driver-x86-x64-v3.0.7.zip

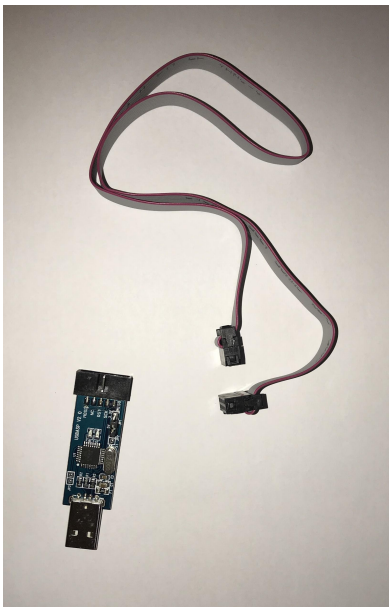
[https://netmaxtech.com/how-to-make/install-usbasp-driver-windows-8-and-windows/
https://ph.answers.acer.com/app/answers/detail/a_id/38288/~/windows-10%3A-disable-signed-driver-enforcement]

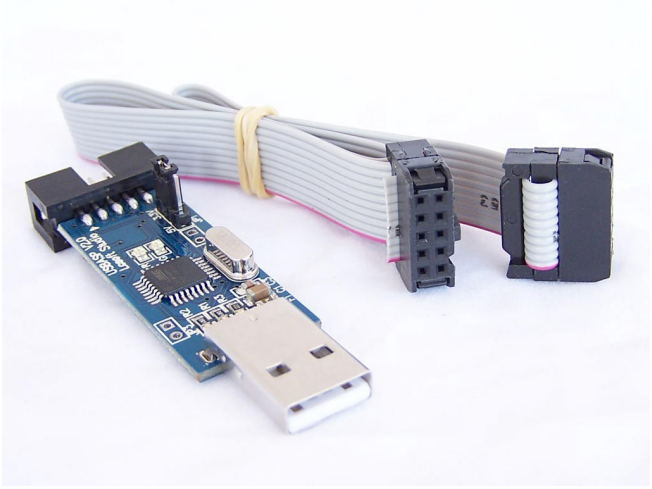
For Mac

https://www.obdev.at/products/crosspack/index.html
https://aaroneiche.com/2016/11/06/programming-avrs-using-a-usbasp-on-a-mac/
http://makerdude.com/blog/avr-programming-using-mac-os-x/

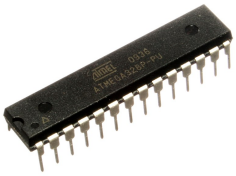
Hardware Requirements

- AVR USBasp





- Atmega328P-PU



- Breadboard & Jumpers
- 22pF Capacitors x2
- 16MHz Oscillator x1
- 10k Resistor (Brown, Black, Orange)

Programming the Atmel

Basic Setup

USBasp User Guide
https://docs.google.com/document/d/1jTvOJiXSGdCLGPI54R3d7KZ0U0BJ6b5GAGI5TbWvgtU/

Setting up Atmel Studio for USBasp and AVR Programming
https://blog.manash.me/setting-up-atmel-studio-for-usbasp-and-avr-programming-802bb4dcf1e9

AVR Programming Videos
https://www.youtube.com/playlist?list=PLtQdQmNK_0DRhBWYZ32BEILOykXLpJ8tP

http://www.ladyada.net/learn/avr/

MIT OpenCourseWare

1. https://ocw.mit.edu/courses/media-arts-and-sciences/mas-962-special-topics-new-textiles-spring-2010/readings-lectures-tutorials/tut06_avr1/
2. https://ocw.mit.edu/courses/media-arts-and-sciences/mas-962-special-topics-new-textiles-spring-2010/readings-lectures-tutorials/tut06_avr2/

Sparkfun Tutorial
https://www.sparkfun.com/tutorials/93

Writing Codes

An Introduction to programming an Atmega microcontroller Benjamin Reh
https://joanna.iwr.uni-heidelberg.de/rlab/download/atmega-tutorial.pdf

http://www.avr-tutorials.com/

Datasheet

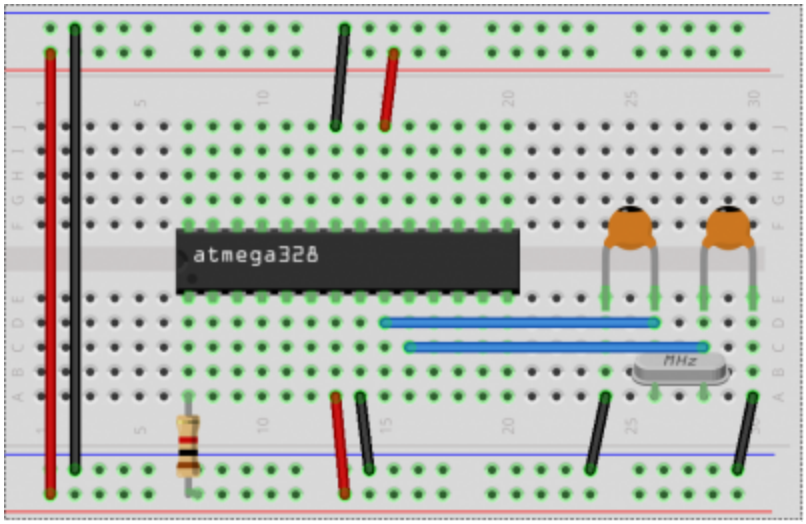
http://ww1.microchip.com/downloads/en/devicedoc/atmel-42735-8-bit-avr-microcontroller-atmega328-328p_datasheet.pdf

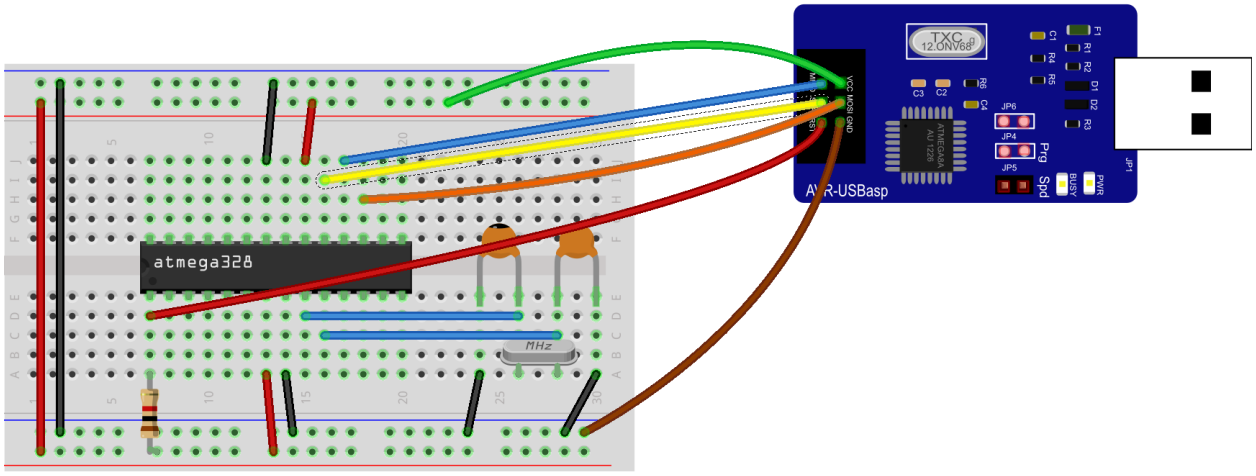
Examples

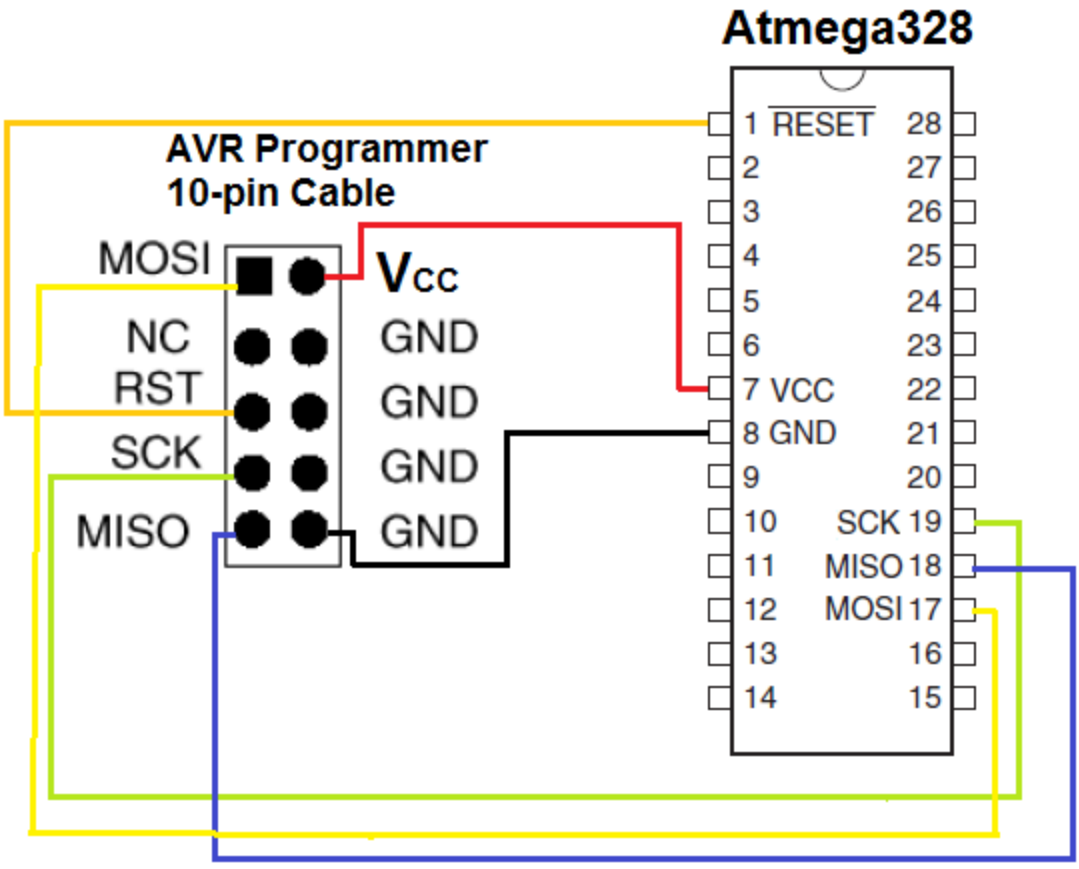
Seven Segment Display
[http://exploreembedded.com/wiki/Interfacing_Seven_Segment_Displays_with_AVR]

Bluetooth
[https://www.electronicwings.com/avr-atmega/hc-05-bluetooth-module-interfacing-with-atmega1632]

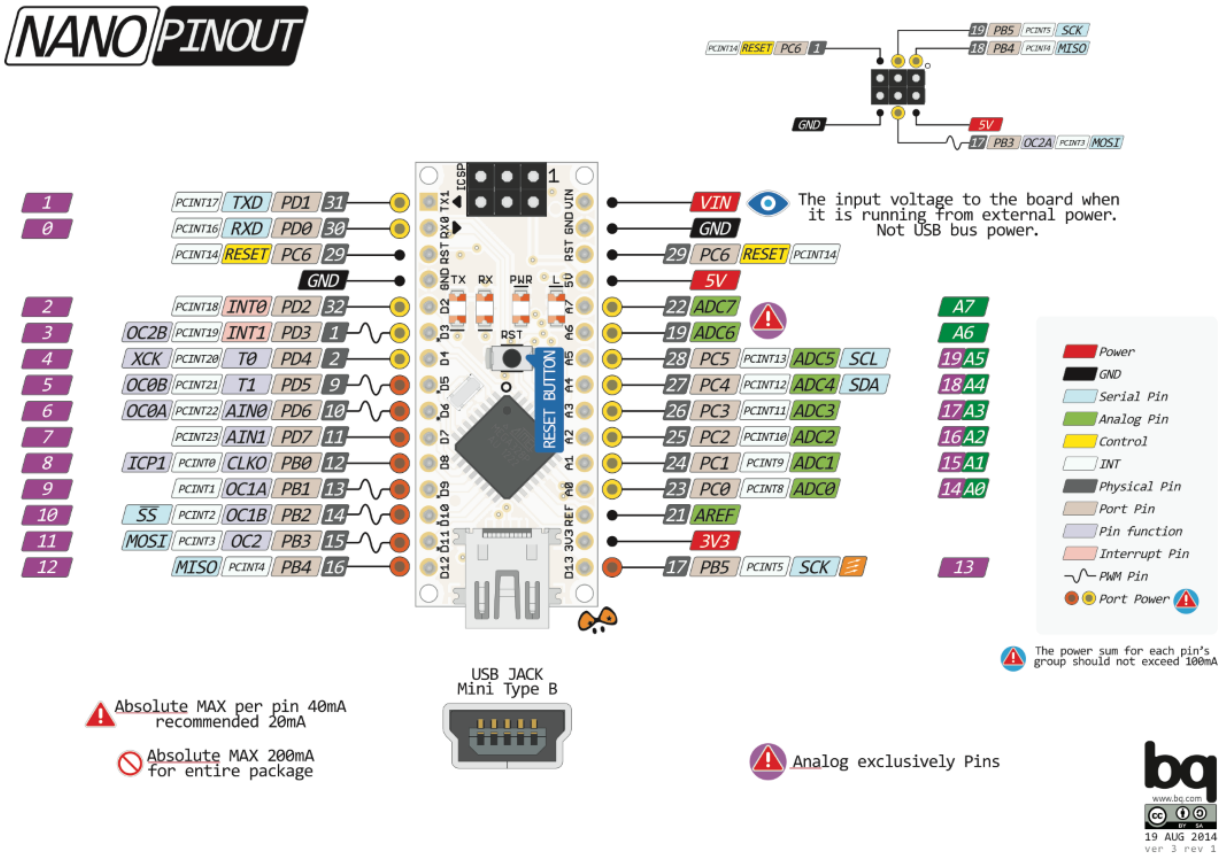
Circuit Diagrams



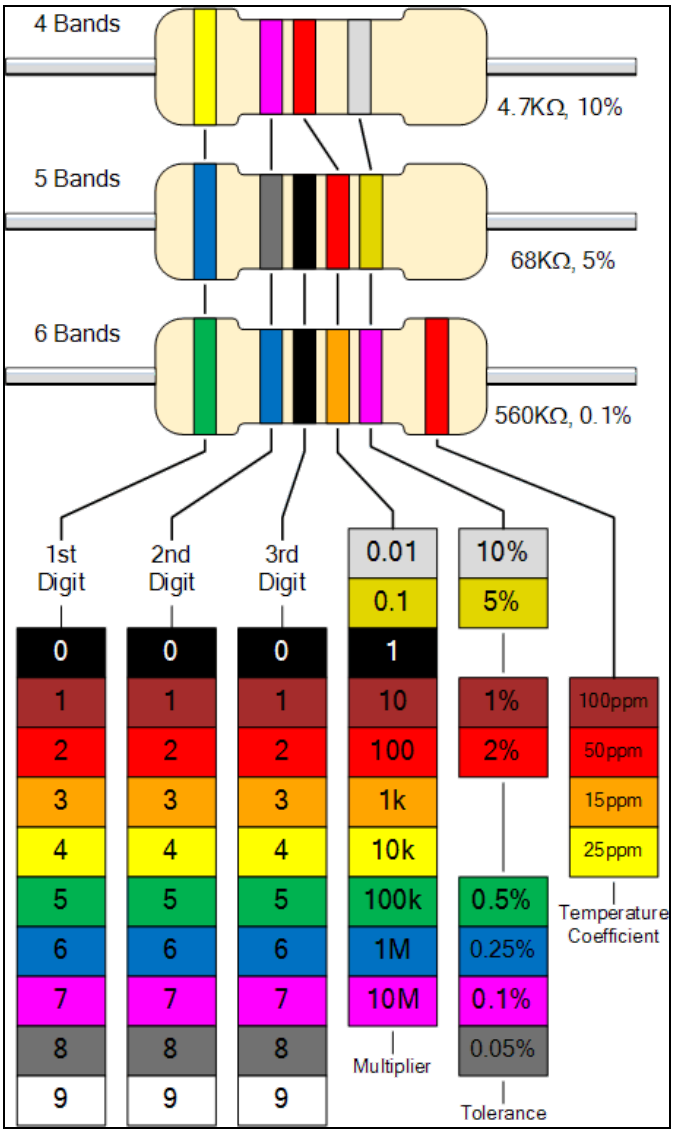




Using Arduino to for Testing (Register Mapping)



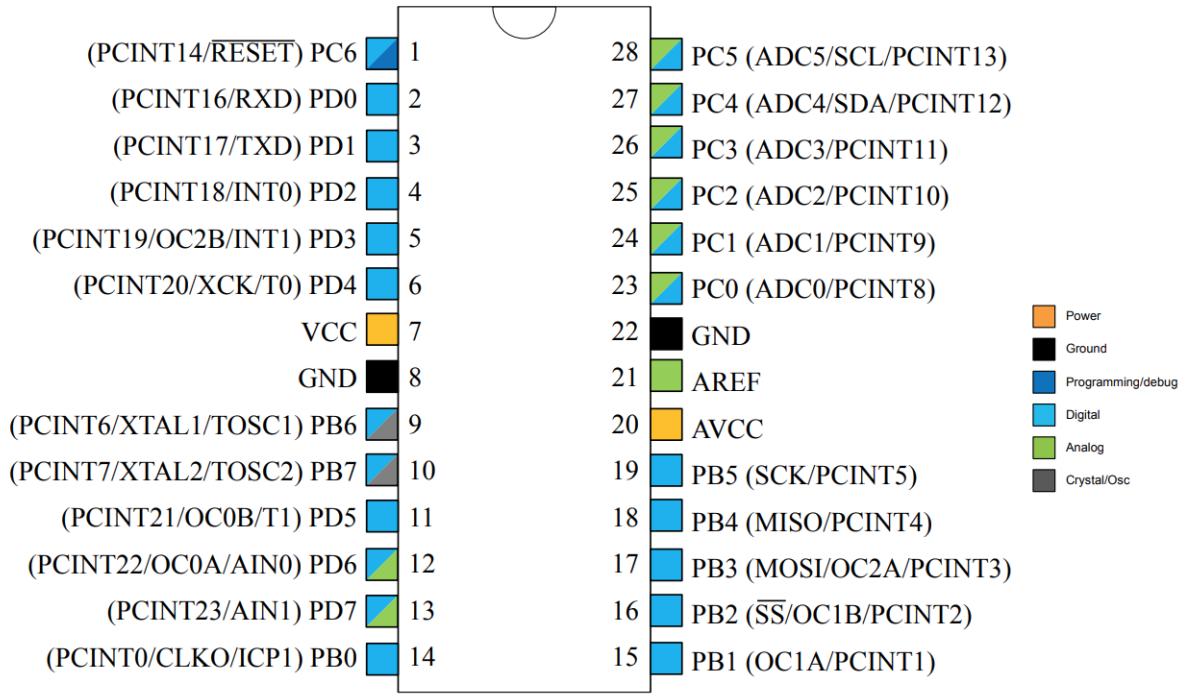
Annexe



Pinout

Pin-out

Figure 5-1. 28-pin PDIP



Pin Descriptions

5.2.1. VCC

Digital supply voltage.

5.2.2. GND

Ground.

5.2.3. Port B (PB[7:0]) XTAL1/XTAL2/TOSC1/TOSC2

Port B is an 8-bit bi-directional I/O port with internal pull-up resistors (selected for each bit). The Port B
output buffers have symmetrical drive characteristics with both high sink and source capability. As inputs,
Port B pins that are externally pulled low will source current if the pull-up resistors are activated. The Port
B pins are tri-stated when a reset condition becomes active, even if the clock is not running.
Depending on the clock selection fuse settings, PB6 can be used as input to the inverting Oscillator

amplifier and input to the internal clock operating circuit.
Depending on the clock selection fuse settings, PB7 can be used as output from the inverting Oscillator
amplifier.
If the Internal Calibrated RC Oscillator is used as chip clock source, PB[7:6] is used as TOSC[2:1] input
for the Asynchronous Timer/Counter2 if the AS2 bit in ASSR is set.

5.2.4. Port C (PC[5:0])

Port C is a 7-bit bi-directional I/O port with internal pull-up resistors (selected for each bit). The PC[5:0]
output buffers have symmetrical drive characteristics with both high sink and source capability. As inputs,
Port C pins that are externally pulled low will source current if the pull-up resistors are activated. The Port
C pins are tri-stated when a reset condition becomes active, even if the clock is not running.

5.2.5. PC6/RESET

If the RSTDISBL Fuse is programmed, PC6 is used as an I/O pin. Note that the electrical characteristics
of PC6 differ from those of the other pins of Port C.
If the RSTDISBL Fuse is unprogrammed, PC6 is used as a Reset input. A low level on this pin for longer
than the minimum pulse length will generate a Reset, even if the clock is not running. Shorter pulses are
not guaranteed to generate a Reset.
The various special features of Port C are elaborated in the Alternate Functions of Port C section.

5.2.6. Port D (PD[7:0])

Port D is an 8-bit bi-directional I/O port with internal pull-up resistors (selected for each bit). The Port D
output buffers have symmetrical drive characteristics with both high sink and source capability. As inputs,
Port D pins that are externally pulled low will source current if the pull-up resistors are activated. The Port
D pins are tri-stated when a reset condition becomes active, even if the clock is not running.

5.2.7. AVCC

AVCC is the supply voltage pin for the A/D Converter, PC[3:0], and PE[3:2]. It should be externally
connected to VCC, even if the ADC is not used. If the ADC is used, it should be connected to VCC through
a low-pass filter. Note that PC[6:4] use digital supply voltage, VCC.

5.2.8. AREF

AREF is the analog reference pin for the A/D Converter.

5.2.9. ADC[7:6] (TQFP and VFQFN Package Only)

In the TQFP and VFQFN package, ADC[7:6] serve as analog inputs to the A/D converter. These pins are
powered from the analog supply and serve as 10-bit ADC channels.