Using Arduino Boards in Atmel Studio

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Introduction

There are varieties of hardware tools to program Atmel microcontrollers. But if the chips have bootloaders, they can be programmed using serial ports without needing to use any hardware tools. Bootloader is small software which gets the program through the serial port and programs the IC chip.

The microcontrollers of Arduino boards have boot loaders. As a result you can connect them to the PC and use them as an AVR trainer board. The document teaches you to use Arduino Trainer boards in Atmel Studio.

You can also burn the boot loader on a new chip and make your own trainer board. But to program the boot loader onto the new chip you need a programmer.

Installing Atmel Studio and Making the First Project

To install Atmel Studio and make the first project, read one of the following documents:

[Assembly Programming in Atmel Studio 6.2 (Step by step tutorial)](#)

[C Programming in Atmel Studio 6.2 (Step by step tutorial)](#)

Downloading Avrdude

1. To program Arduino boards you need *Avrdude*. Download Avrdude from the following website:

   http://mirror.rackdc.com/savannah//avrdude/avrdude-5.11-Patch7610-win32.zip

2. Unzip the downloaded file, rename the directory to **avrdude**, and copy it into your **C** drive.
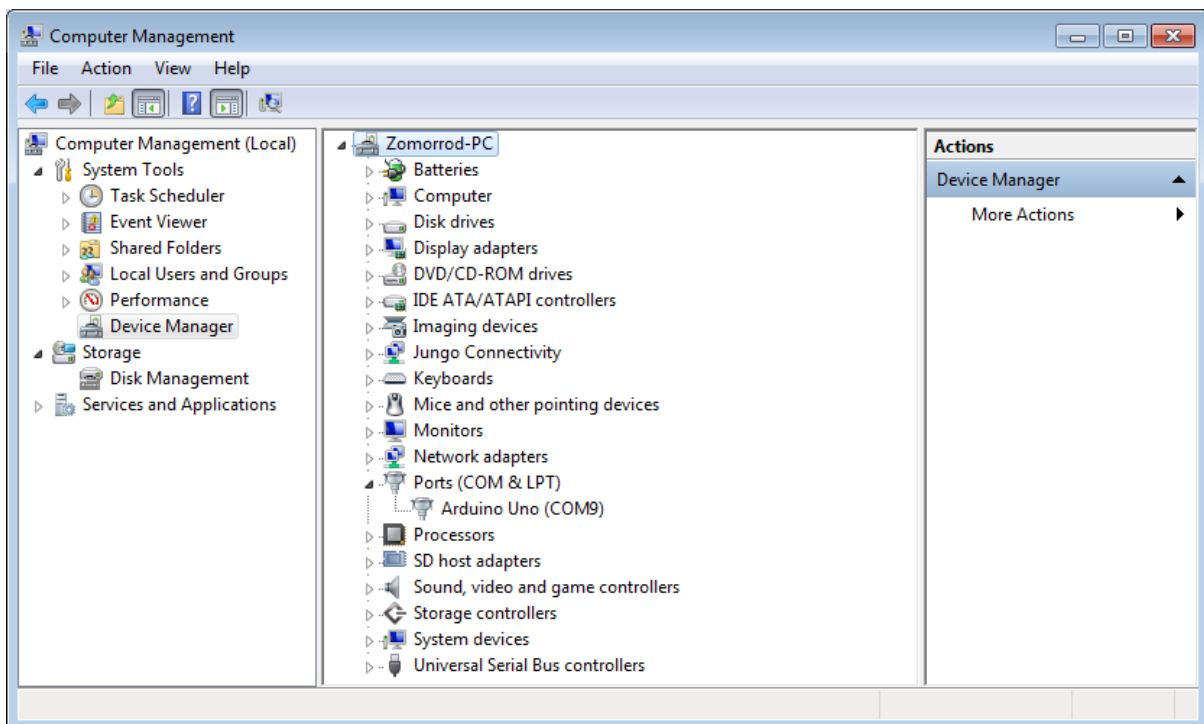
> **Note**
> If you already have the Arduino IDE on your PC, the avrdude.exe file is located in
> C:\Program Files (x86)\Arduino\hardware\tools\avr\bin\avrdude.exe
> and avrdude.conf is in
> C:\Program Files (x86)\Arduino\hardware\tools\avr\etc\avrdude.conf

Checking COM Port

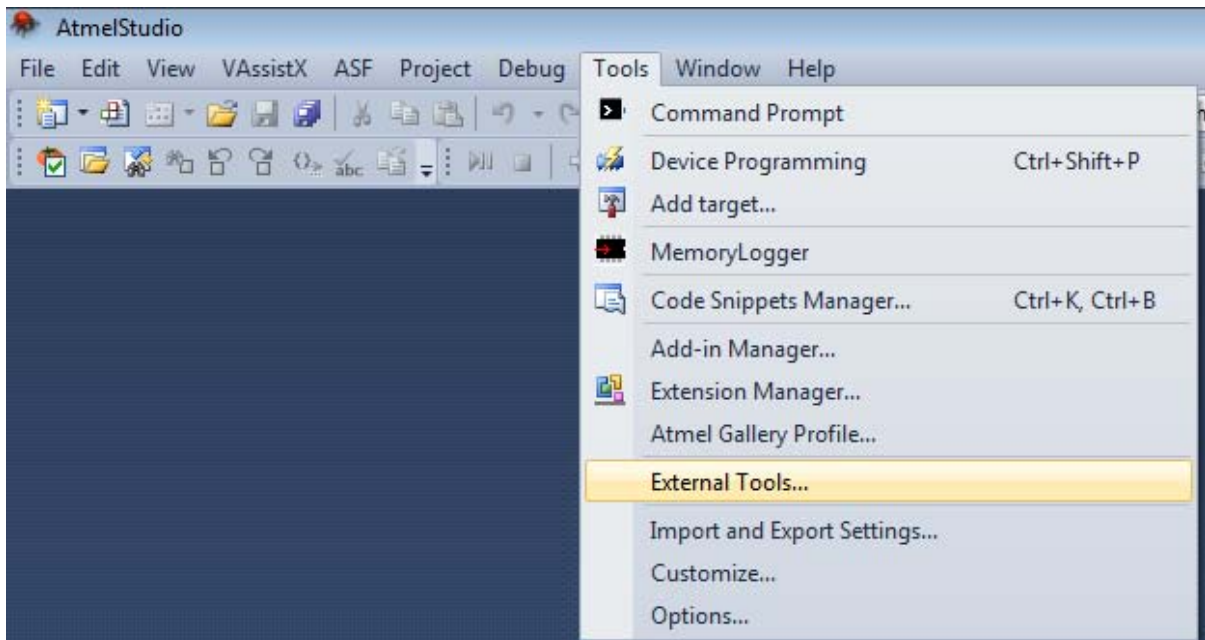1. Right click on the *Computer* icon and choose *Manage*.
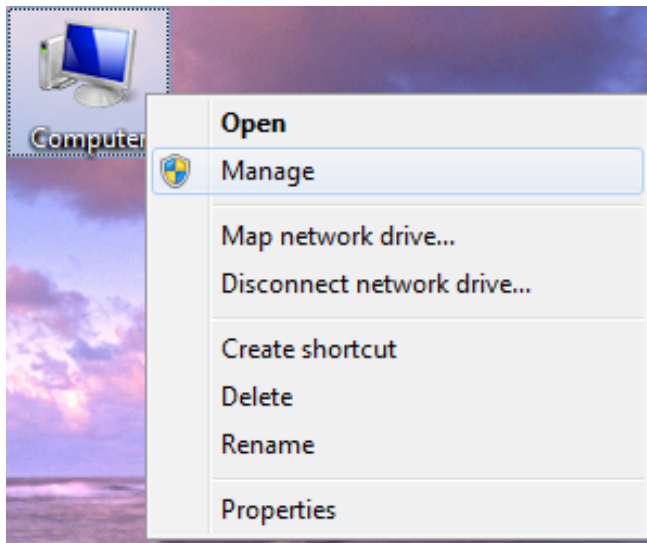
2. Click on *Device Manager* and then *Ports (COM & LPT)*. Check the *COM* port.

Opening the Atmel Studio and using avrdude

3. Open the **Atmel Studio** IDE.
4. Go to the **Tools** menu and choose **External Tools…** .

5. In the **External Tools** dialog:
   a. Press the **Add** button
   b. Name it **Arduino Programmer**.
   c. Type the following address next to the **Command**:

   C:\avrdude\avrdude.exe

   d. Avrdude needs the following arguments: **avrdude.conf** file, the COM port, the serial baud rate, the hex file to be programmed and the microcontroller part number. The following table gives the arguments for different Arduino board. They should be typed in the **Arguments** textbox:

Board	IC Chip	Arguments
Arduino Uno	Atmega328p	-C "C:\avrdude\avrdude.conf" -p atmega328p -c arduino -P COM9 -b 115200 -U flash:w:"$(ProjectDir)Debug\$(ItemFileName).hex":i
Arduino Pro Mini	Atmega328p	-C " C:\avrdude\avrdude.conf" -p atmega328p -c arduino -P COM9 -b 57600 -U flash:w:"$(ProjectDir)Debug\$(ItemFileName).hex":i
Arduino Mega2560	Atmega2560	-C " C:\avrdude\avrdude.conf" -p atmega2560 -c wiring -P COM9 -b 115200 -U flash:w:"$(ProjectDir)Debug\$(ItemFileName).hex":i
Note: Change the COM port and the location of avrdude.conf, according to your computer.		

   e. Tick "Use Output window".
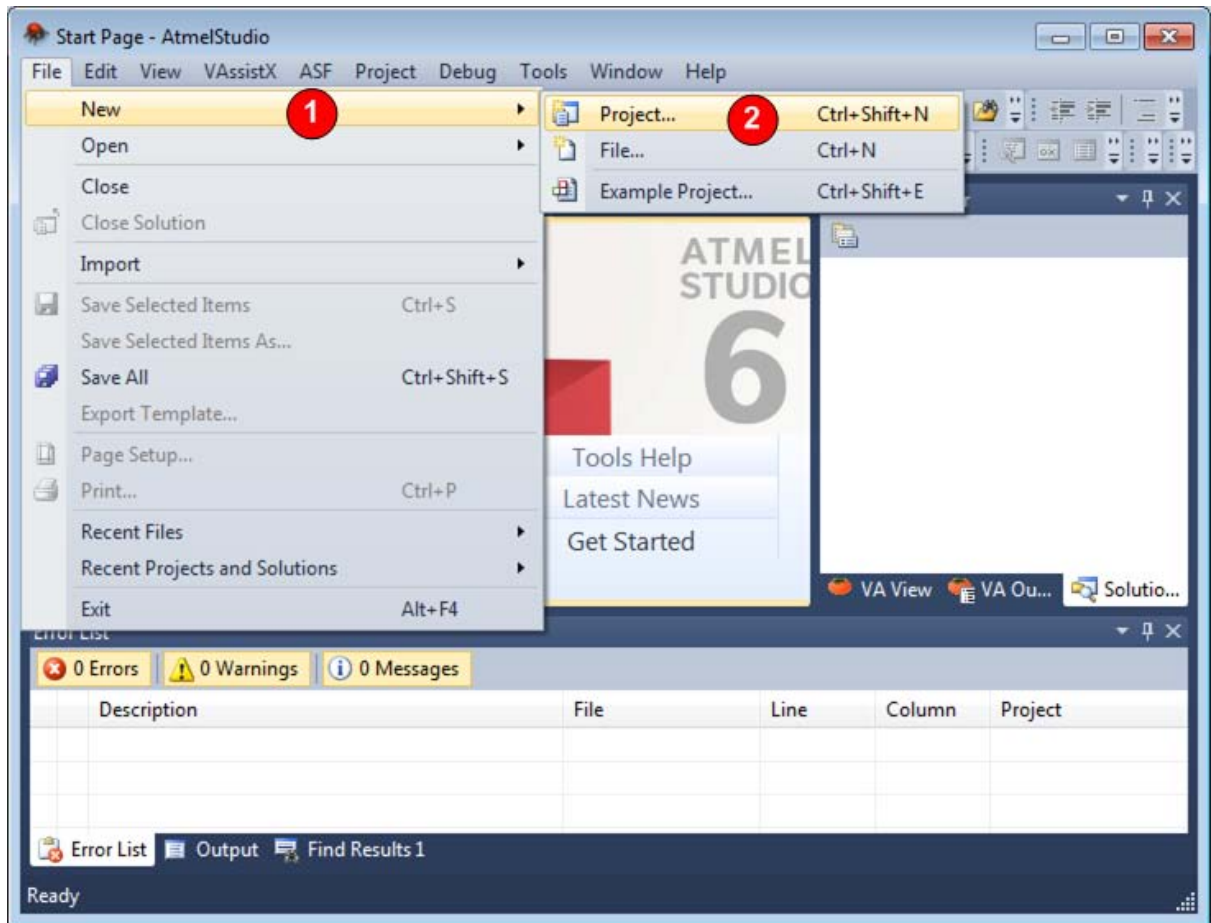   f. Press OK.
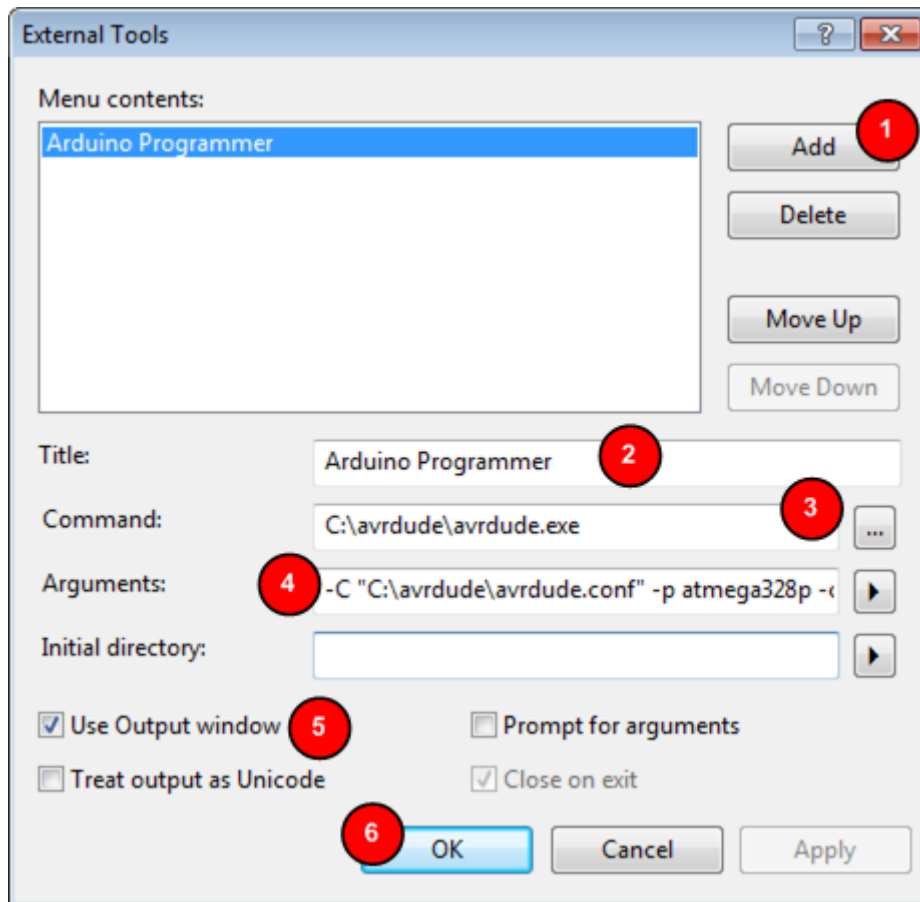
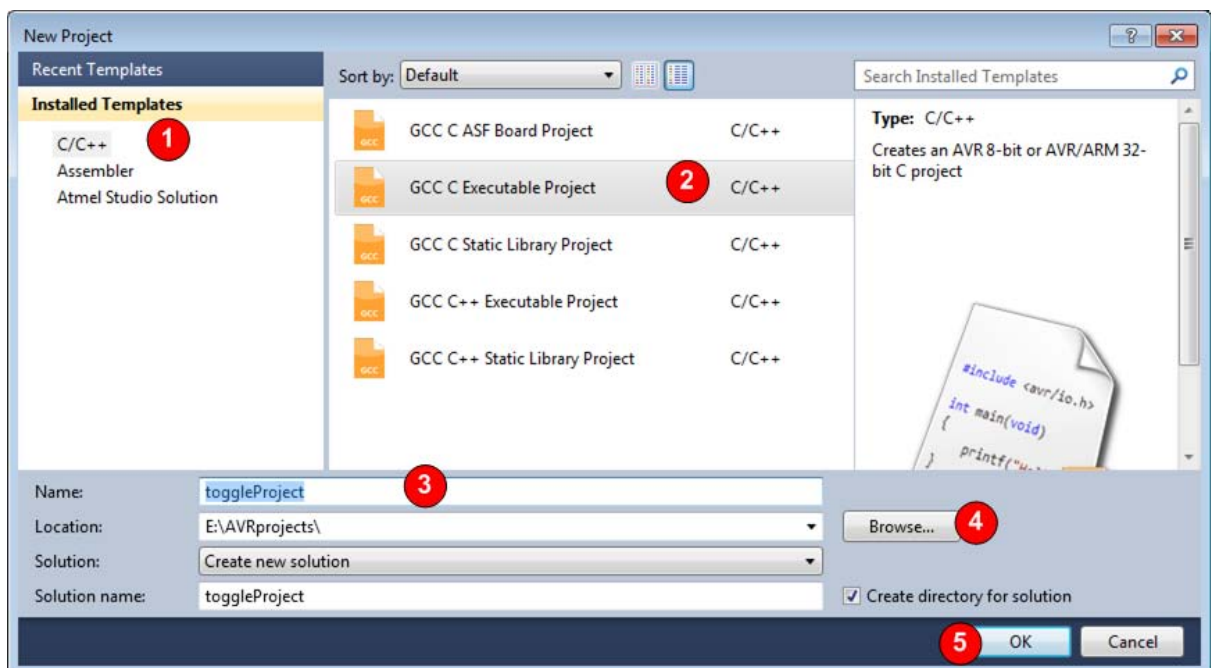6. Go to the **Tools** menu again. **Arduino Programmer** should be added to the **Tools** menu.
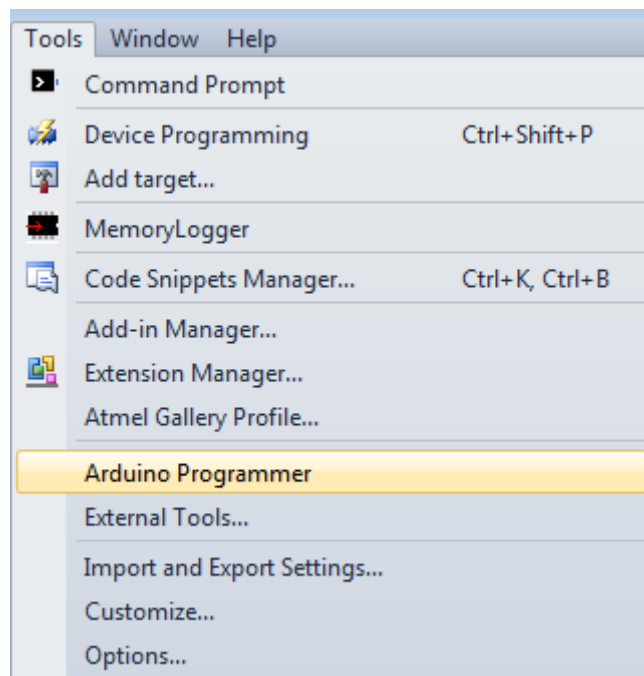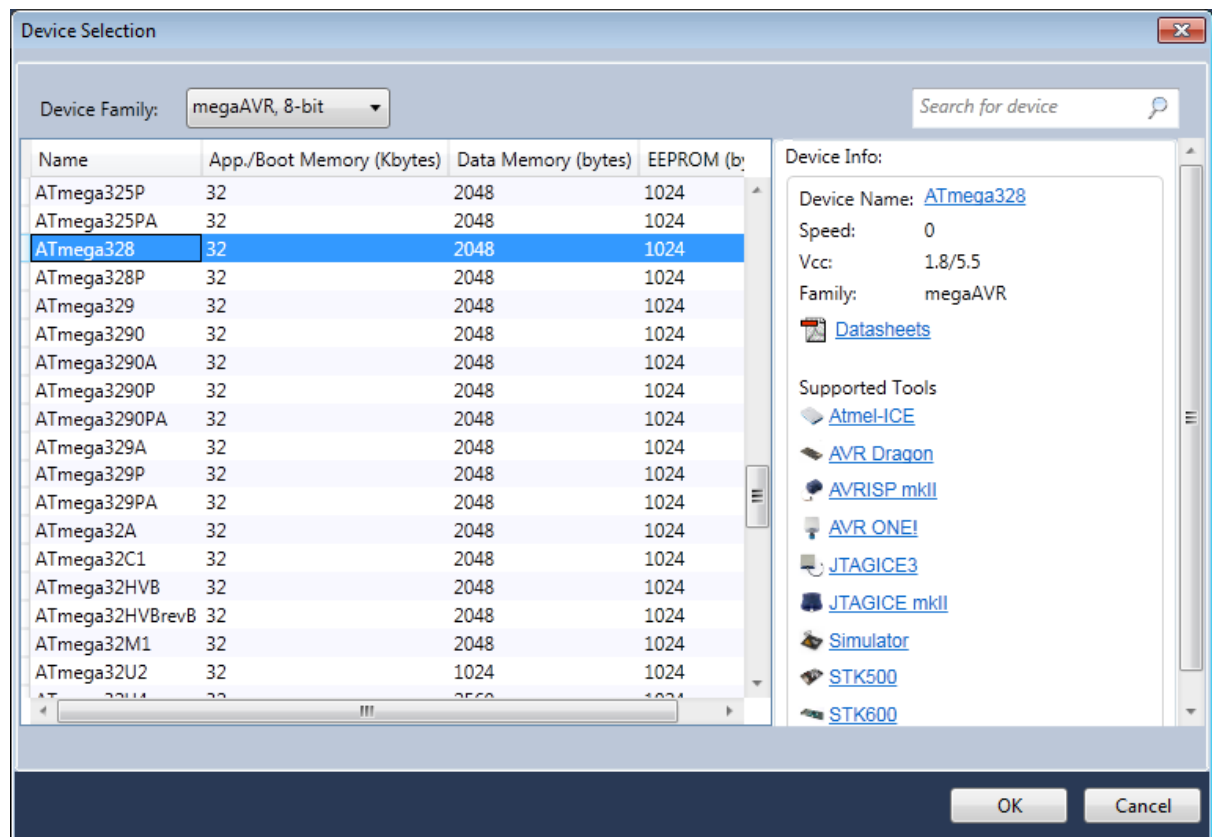
Making a Project

7. Go to the *File* menu. Click on *New* and then *Project*.

8. Choose *GCC C Executable Project* and name the project as *toggleProject*. Then press *OK*.

9. Choose **ATmega328** from the list and press **OK**.

10. Type the following program.

```c
/*
 * toggleProgram.c
 *
 * This program toggles ports B, C, and D.
 *
 * Created: 4/3/2015 4:43:51 PM
 *  Author: Naimi
*/

#include <avr/io.h>

#define F_CPU 16000000UL
#include "util/delay.h"

int main(void)
{
        DDRB = 0xFF;
        DDRC = 0xFF;

        while(1) //loop forever
        {
                PORTB ^= 0xFF;   //toggle port B
                PORTC ^= 0xFF;   //toggle port C

                _delay_ms(1000); //wait 1 second
        }
}
```
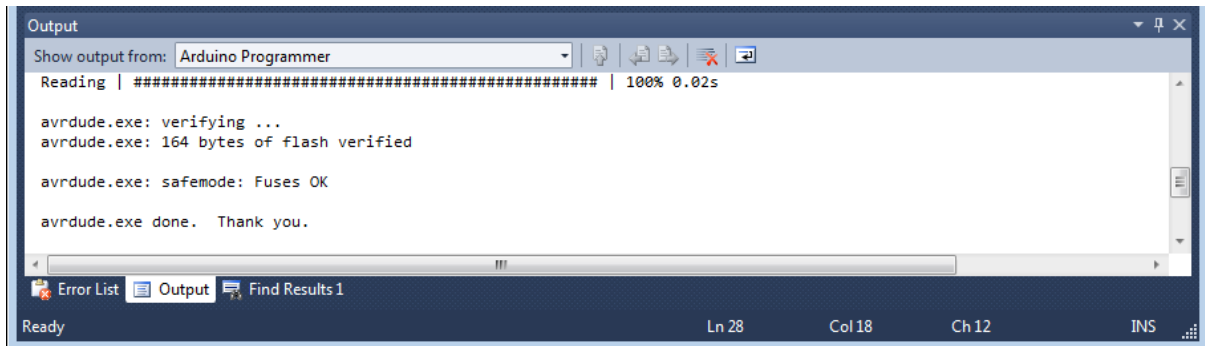
Programming the Arduino Board

11. Connect your Arduino board to the PC.
12. Go to the **Tools** menu, and click on **Arduino Programmer**. The following texts appear in the **Output** window and the **L** LED starts blinking on the board.
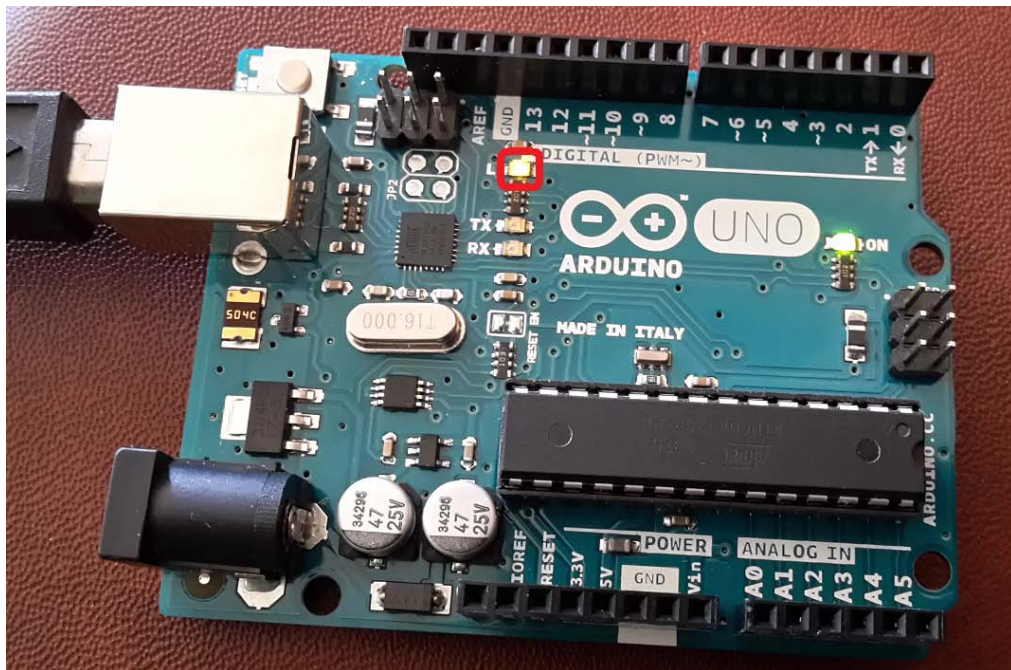
The IC pins

The following picture shows the Arduino UNO board together with the Atmega328 pins.

Label	Port
SCL	PC5(ADC5/SCL)
SDA	PC4(ADC4/SDA)
AREF	AREF
GND	GND
13	PB5(SCK)
12	PB4(MISO)
11	PB3(MOSI)
10	PB2(OC1B)
9	PB1(OC1A)
8	PB0
7	PD7
6	PD6
5	PD5
4	PD4
3	PD3(INT1)
2	PD2(INT0)
1	PD1(TXD)
0	PD0(RXD)

Label	Port
A0	PC0(ADC0)
A1	PC1(ADC1)
A2	PC2(ADC2)
A3	PC3(ADC3)
A4	PC4(ADC4)
A5	PC5(ADC5)

References

http://www.atmel.com/

http://www.nongnu.org/avrdude/

http://www.jayconsystems.com/tutorial/atmerpt1/