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Arduino LCD Tutorial

 [Dejan Nedelkovski \(http://howtomechatronics.com/author/howtom12_wp/\)](http://howtomechatronics.com/author/howtom12_wp/) © July 9, 2015

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 9 (<http://howtomechatronics.com/tutorials/arduino/lcd-tutorial/#comments>)

In this Arduino LCD Tutorial we will learn how to connect an LCD (Liquid Crystal Display) to the Arduino board. LCDs like these are very popular and broadly used in electronics projects as they are good for displaying information like sensors data from your project, and also they are very cheap.

You can watch the following video or read the written tutorial below.

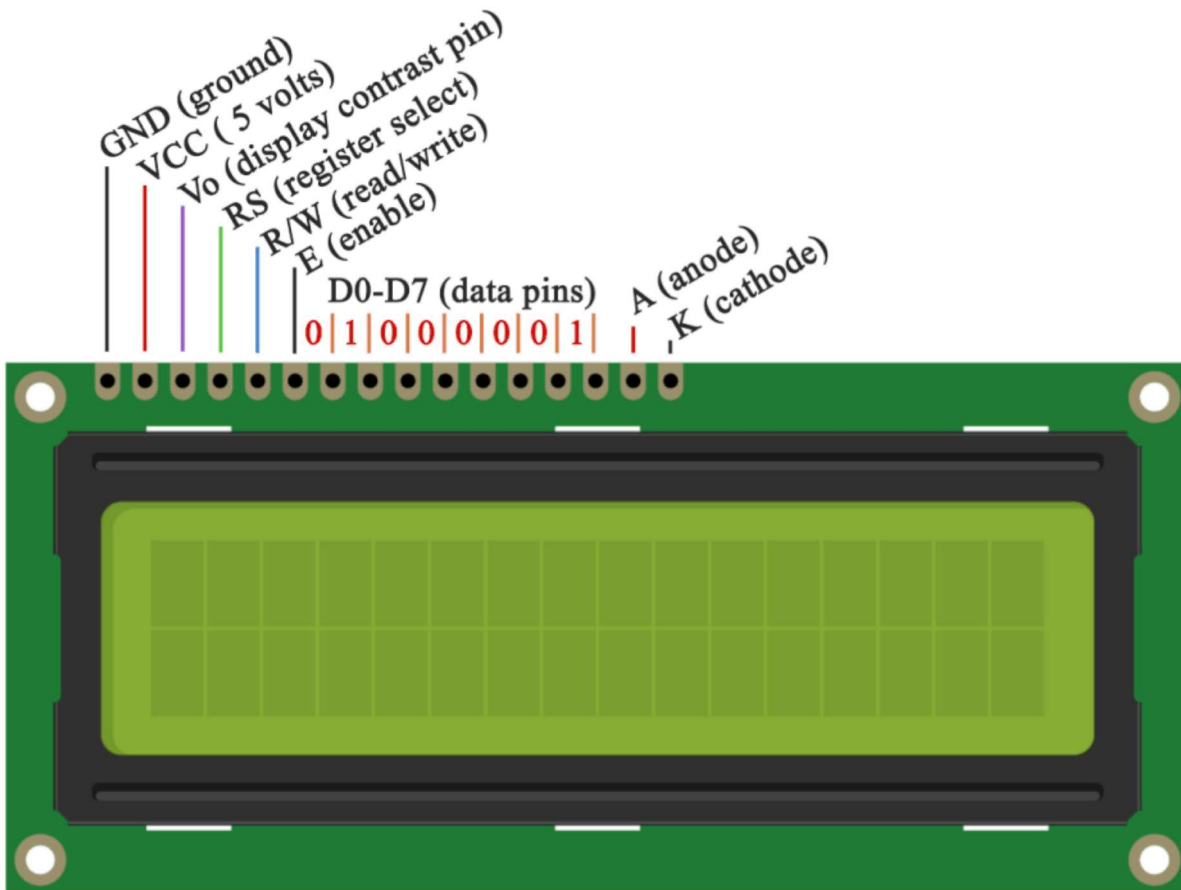
Arduino LCD Tutorial | How To Control An LCD



The LCD Pinout

It has 16 pins and the first one from left to right is the Ground pin. The second pin is the VCC which we connect the 5 volts pin on the Arduino Board. Next is the Vo pin on which we can attach a potentiometer for controlling the contrast of the display.

Next, The RS pin or register select pin is used for selecting whether we will send commands or data to the LCD. For example if the RS pin is set on low state or zero volts, then we are sending commands to the LCD like: set the cursor to a specific location, clear the display, turn off the display and so on. And when RS pin is set on High state or 5 volts we are sending data or characters to the LCD.



Next comes the R / W pin which selects the mode whether we will read or write to the LCD. Here the write mode is obvious and it is used for writing or sending commands and data to the LCD. The read mode is used by the LCD itself when executing the program which we don't have a need to discuss about it in this tutorial.

Next is the E pin which enables the writing to the registers, or the next 8 data pins from D0 to D7. So through this pins we are sending the 8 bits data when we are writing to the registers or for example if we want to see the latter uppercase A on the display we will send 0100 0001 to the registers according to the ASCII table.

And the last two pins A and K, or anode and cathode are for the LED back light.

After all we don't have to worry much about how the LCD works, as the Liquid Crystal Library takes care for almost everything. From the Arduino's official website you can find and see the functions of the library which enable easy use of the LCD. We can use the Library in 4 or 8 bit mode. In this tutorial we will use it in 4 bit mode, or we will just use 4 of the 8 data pins.

Components needed for this Arduino LCD Tutorial

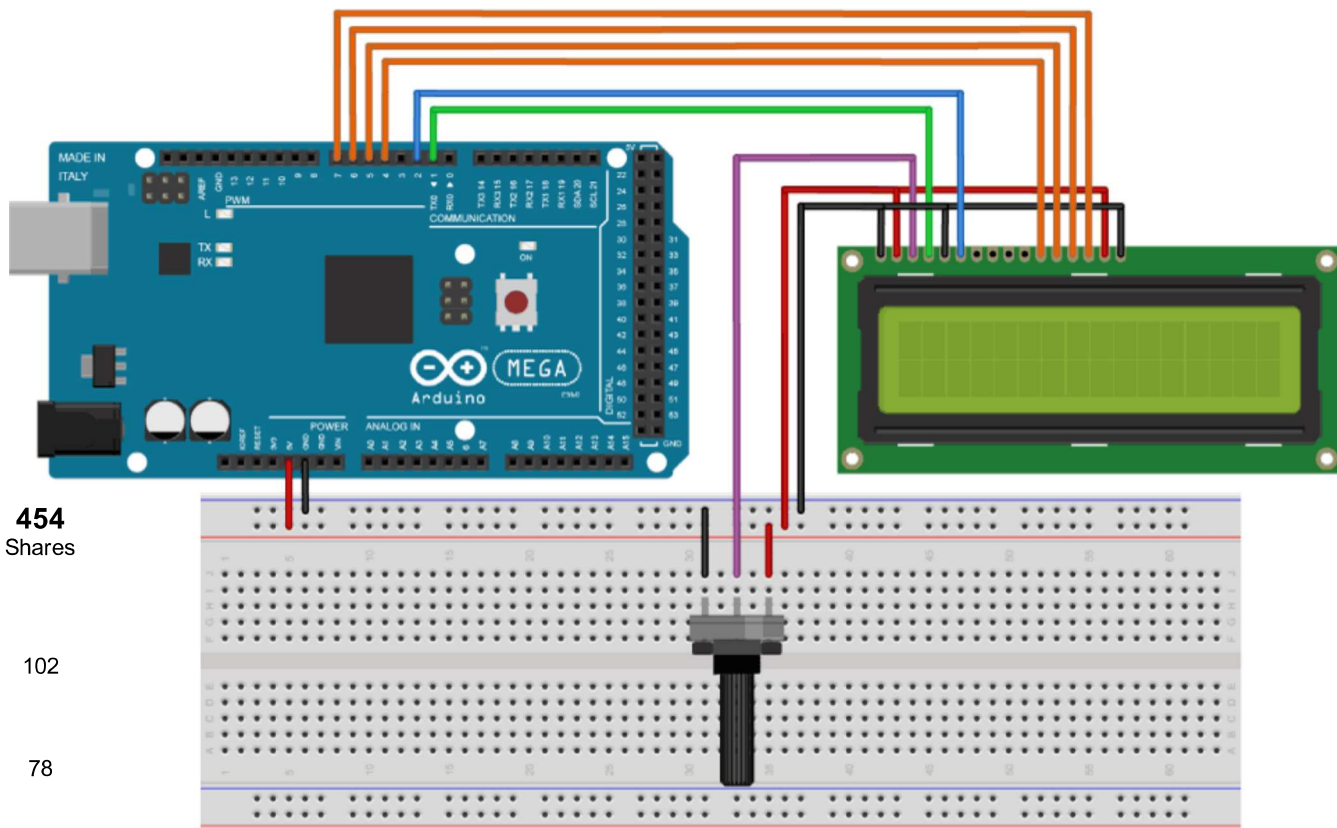
You can get these components from any of the sites below:

- 16×2 Character LCD..... [Amazon \(http://howtomechatronics.com/recommends/1602-lcd-display-amazon/\)](http://howtomechatronics.com/recommends/1602-lcd-display-amazon/) / [Banggood \(http://howtomechatronics.com/recommends/1602-character-lcd-display-module-bg/\)](http://howtomechatronics.com/recommends/1602-character-lcd-display-module-bg/) / [GearBest \(http://howtomechatronics.com/recommends/1602-lcd-display-gearbest/\)](http://howtomechatronics.com/recommends/1602-lcd-display-gearbest/) / [DealExtreme \(http://howtomechatronics.com/recommends/1602-lcd-display-dealextreme/\)](http://howtomechatronics.com/recommends/1602-lcd-display-dealextreme/) / [ICStation \(http://howtomechatronics.com/recommends/1602-lcd-display-icstation/\)](http://howtomechatronics.com/recommends/1602-lcd-display-icstation/)
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**Please note: These are affiliate links. I may make a commission if you buy the components through these links. I would appreciate your support in this way!*

Circuit Schematic

We will use just 6 digital input pins from the Arduino Board. The LCD's registers from D4 to D7 will be connected to Arduino's digital pins from 4 to 7. The Enable pin will be connected to pin number 2 and the RS pin will be connected to pin number 1. The R/W pin will be connected to Ground and the Vo pin will be connected to the potentiometer.



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Source Codes

First thing we need to do is it insert the Liquid Crystal Library. We can do that like this: Sketch > Include Library > Liquid Crystal. Then we have to create an LC object. The parameters of this object should be the numbers of the Digital Input pins of the Arduino Board respectively to the LCD's pins as follow: (RS, Enable, D4, D5, D6, D7). In the setup we have to initialize the interface to the LCD and specify the dimensions of the display using the ***begin()*** function.

In the loop we write our main program. Using the ***print()*** function we print on the LCD. The ***setCursor()*** function is used for setting the location at which subsequent text written to the LCD will be displayed. The ***blink()*** function is used for displaying a blinking cursor and the ***noBlink()*** function for turning off. The ***cursor()*** function is used for displaying underscore cursor and the ***noCursor()*** function for turning off. Using the ***clear()*** function we can clear the LCD screen.

Here's the source code of the first example from the video:

```

1.  /*
2.   * Arduino LCD Tutorial
3.   *
4.   * Crated by Dejan Nedelkovski,
5.   * www.HowToMechatronics.com
6.   *
7.   */
8.

```

```

9.  #include <LiquidCrystal.h> // includes the LiquidCrystal Library
10. LiquidCrystal lcd(1, 2, 4, 5, 6, 7); // Creates an LC object. Parameters: (rs, enable, d4, d5,
    d6, d7)
11.
12. void setup() {
13.     lcd.begin(16,2); // Initializes the interface to the LCD screen, and specifies the dimensions
    (width and height) of the display }
14. }
15.
16. void loop() {
17.     lcd.print("Arduino"); // Prints "Arduino" on the LCD
18.     delay(3000); // 3 seconds delay
19.     lcd.setCursor(2,1); // Sets the location at which subsequent text written to the LCD will be
    displayed
20.     lcd.print("LCD Tutorial");
21.     delay(3000);
22.     lcd.clear(); // Clears the display
23.     lcd.blink(); //Displays the blinking LCD cursor
24.     delay(4000);
25.     lcd.setCursor(7,1);
26.     delay(3000);
27.     lcd.noBlink(); // Turns off the blinking LCD cursor
28.     lcd.cursor(); // Displays an underscore (line) at the position to which the next character will
    be written
29.     delay(4000);
30.     lcd.noCursor(); // Hides the LCD cursor
31.     lcd.clear(); // Clears the LCD screen
32. }

```

It is also possible to write a custom characters to the LCD. It supports up to 8 characters of 5×8 pixels. We can specify the appearance of each character by an array of 8 bytes. In the source code below we can notice how we can specify the appearance of the character by changing the 0 into 1 which represents the 5×8 pixels. In the setup we have to create the custom character using the ***createChar()*** function. The first parameter in this function is a number between 0 and 7, or we have to reserve one of the 8 supported custom characters. The second parameter is the name of the array of bytes. We write the custom character to the display using the ***write()*** function and as a parameter we use the number of the character.

Here's the source code of the second example for custom characters:

```

1.  #include <LiquidCrystal.h>
2.
3.  byte slash[8]= { // Array of bytes
4.      B00001, // B stands for binary formatter and the 5 numbers are the pixels
5.      B00010,
6.      B00100,
7.      B01000,
8.      B10000,
9.      B00000,
10.     B00000,
11.     B00000,
12. };
13. LiquidCrystal lcd(1, 2, 4, 5, 6, 7); // Creates an LC object. Parameters: (rs, enable, d4, d5,
    d6, d7)

```

```

14.
15. void setup() {
16.     lcd.begin(16,2); // Initializes the interface to the LCD screen, and specifies the dimensions
    (width and height) of the display
17.     lcd.createChar(7, slash); // Create a custom character for use on the LCD. Up to eight
    characters of 5x8 pixels are supported
18. }
19.
20. void loop() {
21.     for(int i=0;i<=15;i++) {
22.         lcd.setCursor(i,0); // Sets the location at which subsequent text written to the LCD will be
        displayed
23.         lcd.write(7); // Writes a character to the LCD
24.         delay(1000); // 1 second delay
25.         lcd.clear(); // Write a character to the LCD
26.     }
27. }

```

We highly recommend **EasyEDA** for circuit design and **[low cost PCB order](https://easyeda.com/order)**
<https://easyeda.com/order>

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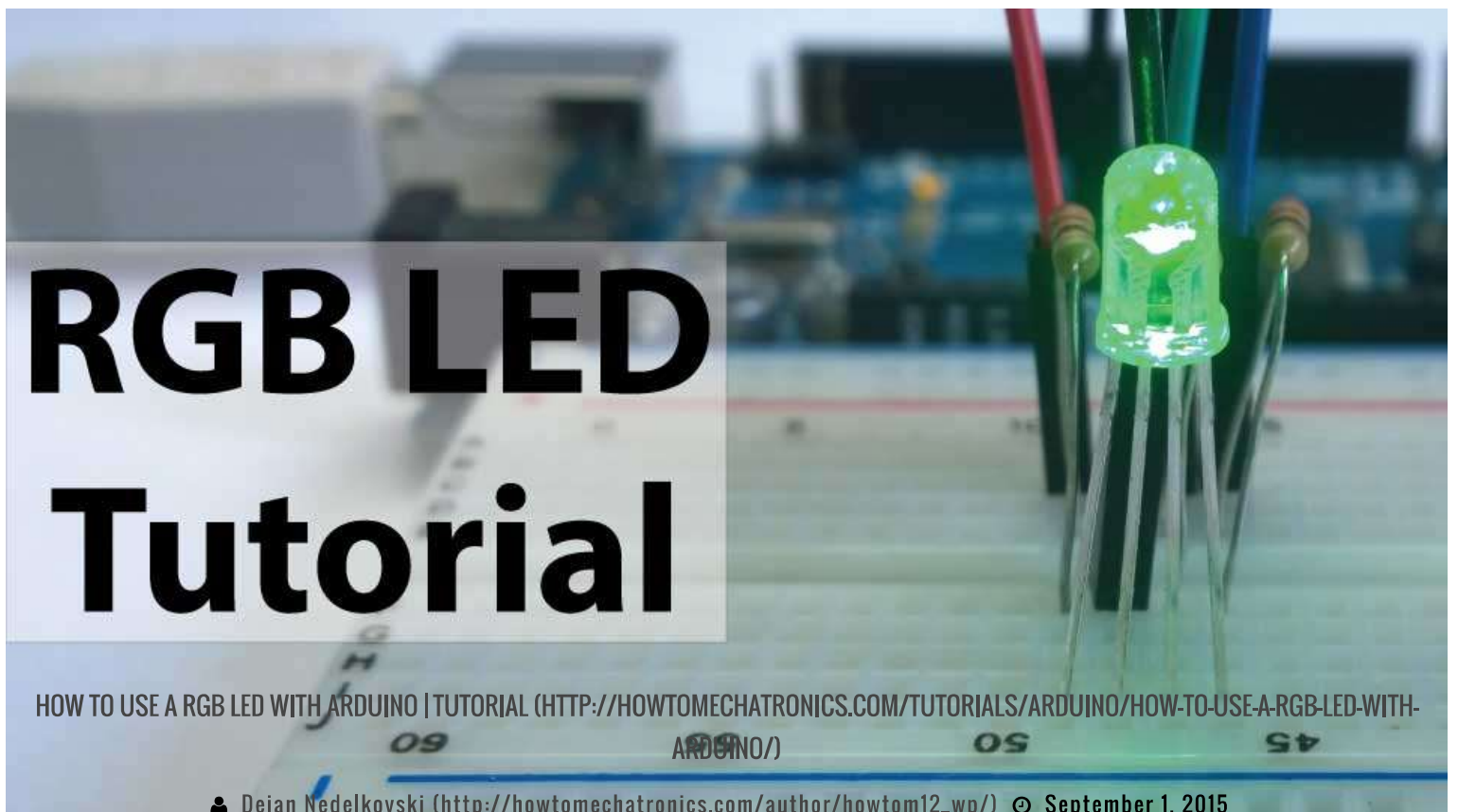
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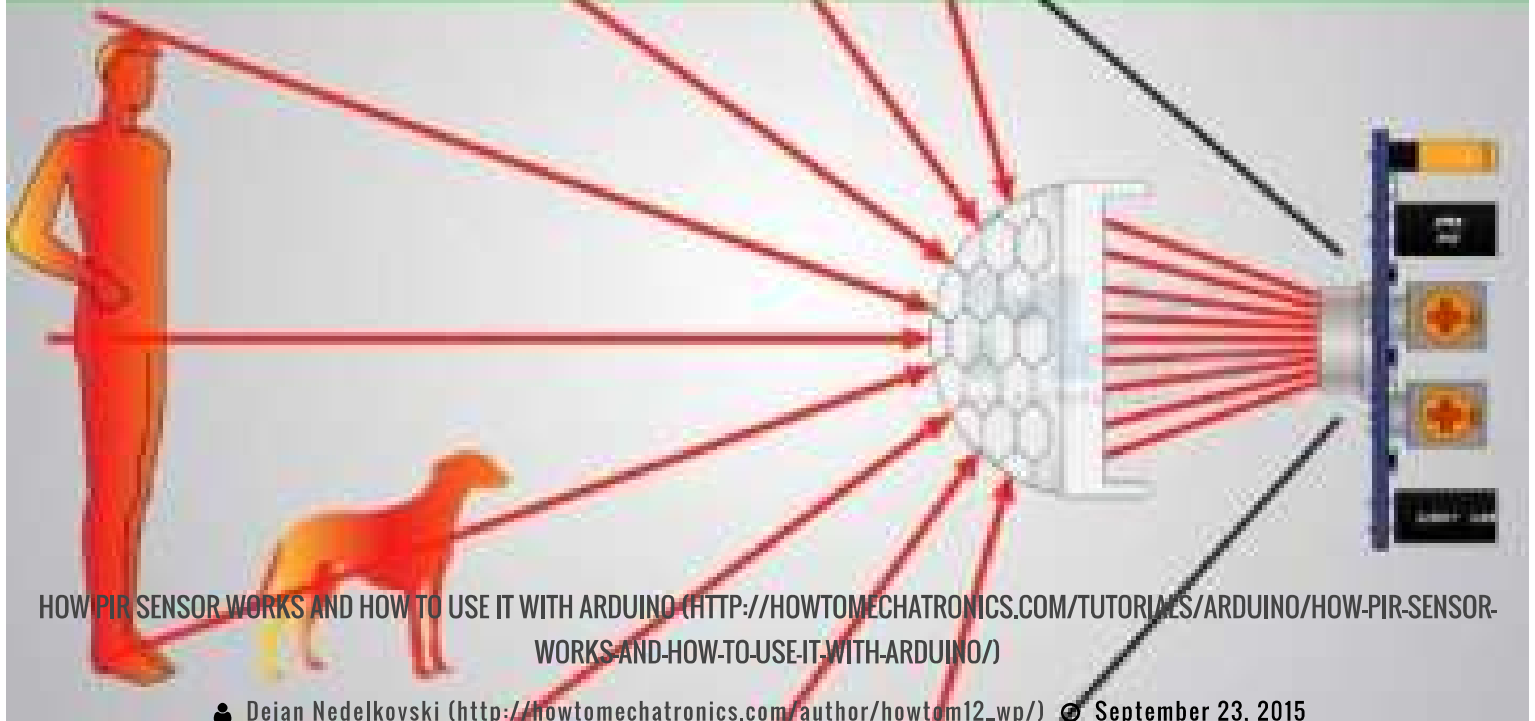


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9 RESPONSES

Brian

December 17, 2015 (<http://howtomechatronics.com/tutorials/arduino/lcd-tutorial/#comment-316>)

thank you so much! i have learn't so much better with hands on and you made it perfect for me ! thanks again!!!

REPLY

[Dejan Nedelkovski \(http://howtomechatronics.com\)](http://howtomechatronics.com)

December 17, 2015 (<http://howtomechatronics.com/tutorials/arduino/lcd-tutorial/#comment-317>)

I'm glad to hear that. You are welcome!

REPLY

PP

February 3, 2016 (<http://howtomechatronics.com/tutorials/arduino/lcd-tutorial/#comment-528>)

Why put code that doe's not compile...???

REPLY

Dejan Nedelkovski (<http://howtomechatronics.com>)

February 5, 2016 (<http://howtomechatronics.com/tutorials/arduino/lcd-tutorial/#comment-533>)

The code is working properly. You might be doing something wrong. What error do you get?

REPLY

magic

February 15, 2016 (<http://howtomechatronics.com/tutorials/arduino/lcd-tutorial/#comment-591>)

Strange to use the D1 pin,
is that wanted or specific to RS LCD functionalism ?

REPLY

Maria

March 23, 2016 (<http://howtomechatronics.com/tutorials/arduino/lcd-tutorial/#comment-715>)

avrdude: ser_open(): can't open device "\\.\COM13": The system cannot find the file specified.

There's an error. How to fix this.

REPLY

Dejan Nedelkovski (<http://howtomechatronics.com>)

March 24, 2016 (<http://howtomechatronics.com/tutorials/arduino/lcd-tutorial/#comment-725>)

Check what's your COM Port number.

REPLY

Anggi

April 30, 2016 (<http://howtomechatronics.com/tutorials/arduino/lcd-tutorial/#comment-876>)

sir, if use I2c, what the codes ?

REPLY

Dejan Nedelkovski (<http://howtomechatronics.com>)

May 2, 2016 (<http://howtomechatronics.com/tutorials/arduino/lcd-tutorial/#comment-880>)

It would be different. I don't have that code.

REPLY

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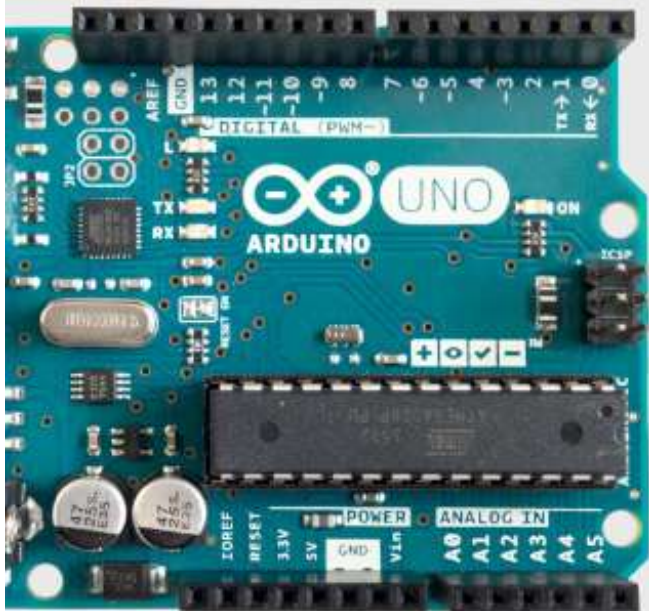
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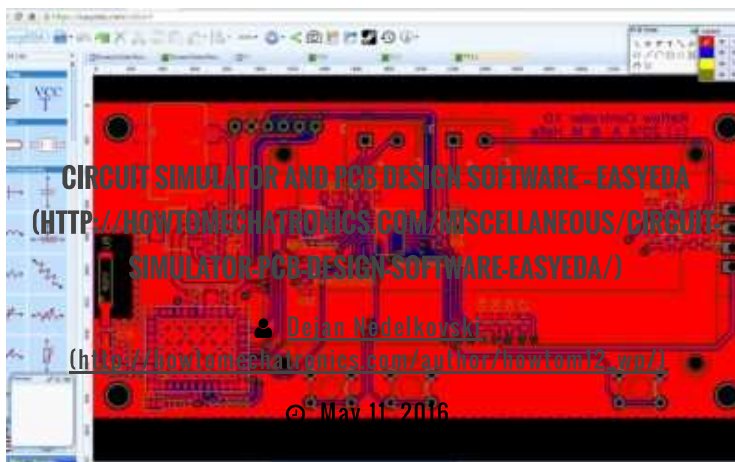
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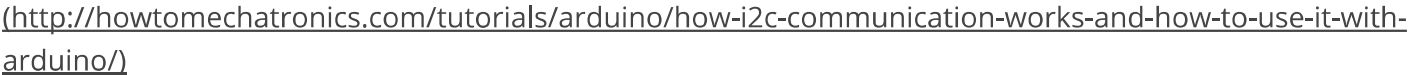
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