# Lesson 22 MAX7219 LED Dot Matrix Module

## Introduction

In this lesson we will connect a MAX7219 and scroll the text across.

## Hardware Required

✓ 1 * RexQualis UNO R3

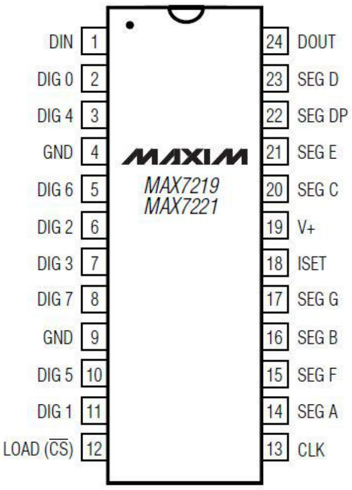
✓ 1 * Max7219 module

✓ 5 * F-M wires (Female to Male DuPont wires)

## Principle

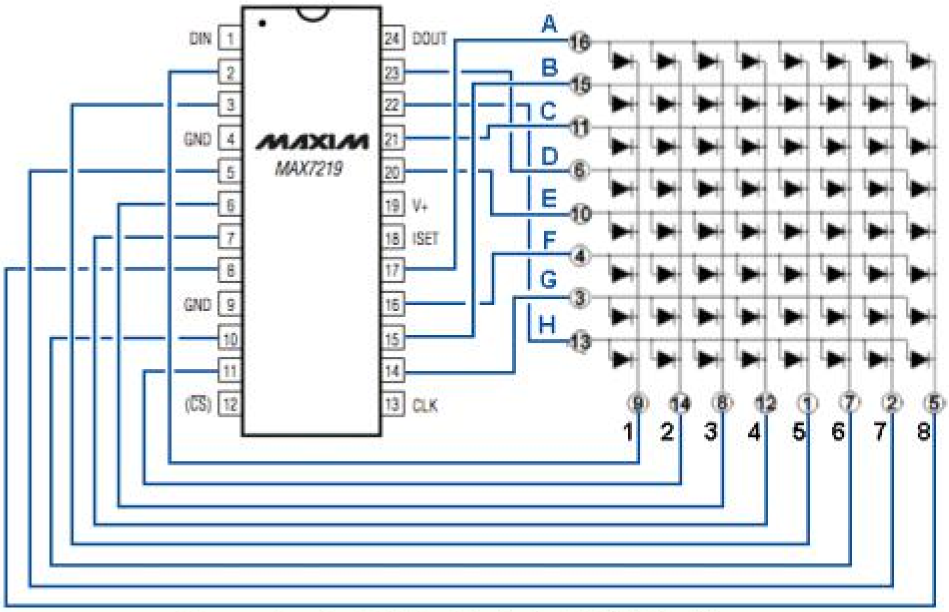
## MAX7219 LED Dot Matrix Module

A typical 8x8 Dot Matrix unit has 64 LEDS arranged in a plane. You can get your hands on two types of Dot Matrices. One which comes as a plain single matrix which has 16 pins to control the rows and columns of the array. This one would use a lot of wires and things can get a lot messier.



To simplify these things, it is also available integrated with MAX7219 Driver, which has 24 pins. At the end you have 5 pins to connect to your I/O which makes your job a lot more easier.

There are 16 output lines from the 7219 driving 64 individual LEDS. Persistence of vision is exploited to make the LEDS appear to be on all the time when in fact they are not. You can also control the brightness of the LEDS through the code.



Connecting the 8x8 Display to the MAX7219 chip

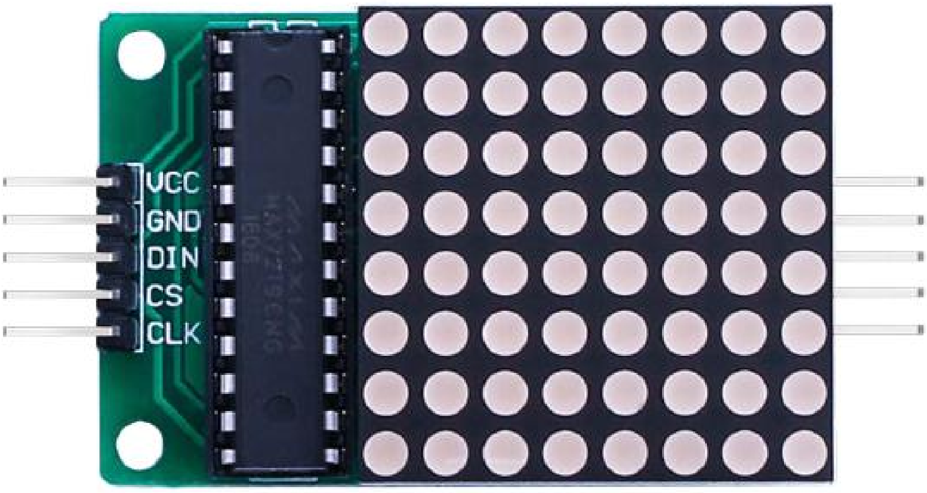
specification of this LED Matrix Module is shown below:

Operating Voltage: DC 4.7V – 5.3V

Typical Voltage: 5V

Operating Current: 320mA

Max Operating Current: 2A



## Code interpretation

#include <LedControl.h>

```
#include "LedControl.h"

/*

Now we need a LedControl to work with.

These pin numbers will probably not work with your
hardware.

 pin 12 is connected to the DataIn

 pin 11 is connected to LOAD(CS)

 pin 10 is connected to the CLK

 We have only a single MAX72XX.

 */

LedControl lc=LedControl(12,10,11,1);

/* we always wait a bit between updates of the display */

unsigned long delaytime1=2000;

unsigned long delaytime2=100;

void setup() {

   /*

    The MAX72XX is in power-saving mode on startup,

    we have to do a wakeup call

    */

  lc.shutdown(0,false);

   /* Set the brightness to a medium values */

  lc.setIntensity(0,8);

   /* and clear the display */
   lc.clearDisplay(0);
}

/*
 This method will display the characters for the
 word "Arduino" one after the other on the matrix.
 (you need at least 5x7 leds to see the whole chars)
 */
void writeArduinoOnMatrix() {
   /* here is the data for the characters */
   byte a[5]={B01111110,B10001000,B10001000,B10001000,B01111110};
   byte r[5]={B00010000,B00100000,B00100000,B00010000,B00111110};
   byte d[5]={B11111110,B00010010,B00100010,B00100010,B00011100};
   byte u[5]={B00111110,B00000100,B00000010,B00000010,B00111100};
   byte i[5]={B00000000,B00000010,B10111110,B00100010,B00000000};
   byte n[5]={B00011110,B00100000,B00100000,B00010000,B00111110};
   byte o[5]={B00011100,B00100010,B00100010,B00100010,B00011100};
   /* now display them one by one with a small delay */
   lc.setRow(0,0,a[0]);
   lc.setRow(0,1,a[1]);
   lc.setRow(0,2,a[2]);
   lc.setRow(0,3,a[3]);
   lc.setRow(0,4,a[4]);

   delay(delaytime1);

   lc.setRow(0,0,r[0]);

   lc.setRow(0,1,r[1]);

   lc.setRow(0,2,r[2]);

   lc.setRow(0,3,r[3]);

   lc.setRow(0,4,r[4]);

   delay(delaytime1);

   lc.setRow(0,0,d[0]);

   lc.setRow(0,1,d[1]);

   lc.setRow(0,2,d[2]);

   lc.setRow(0,3,d[3]);

   lc.setRow(0,4,d[4]);

   delay(delaytime1);

   lc.setRow(0,0,u[0]);

   lc.setRow(0,1,u[1]);

   lc.setRow(0,2,u[2]);

   lc.setRow(0,3,u[3]);

   lc.setRow(0,4,u[4]);

   delay(delaytime1);

   lc.setRow(0,0,i[0]);

   lc.setRow(0,1,i[1]);
   lc.setRow(0,2,i[2]);

   lc.setRow(0,3,i[3]);

   lc.setRow(0,4,i[4]);

   delay(delaytime1);

   lc.setRow(0,0,n[0]);

   lc.setRow(0,1,n[1]);

   lc.setRow(0,2,n[2]);

   lc.setRow(0,3,n[3]);

   lc.setRow(0,4,n[4]);

   delay(delaytime1);

   lc.setRow(0,0,o[0]);

   lc.setRow(0,1,o[1]);

   lc.setRow(0,2,o[2]);

   lc.setRow(0,3,o[3]);

   lc.setRow(0,4,o[4]);

   delay(delaytime1);

   lc.setRow(0,0,0);

   lc.setRow(0,1,0);

   lc.setRow(0,2,0);

   lc.setRow(0,3,0);

   lc.setRow(0,4,0);

   delay(delaytime1);
```

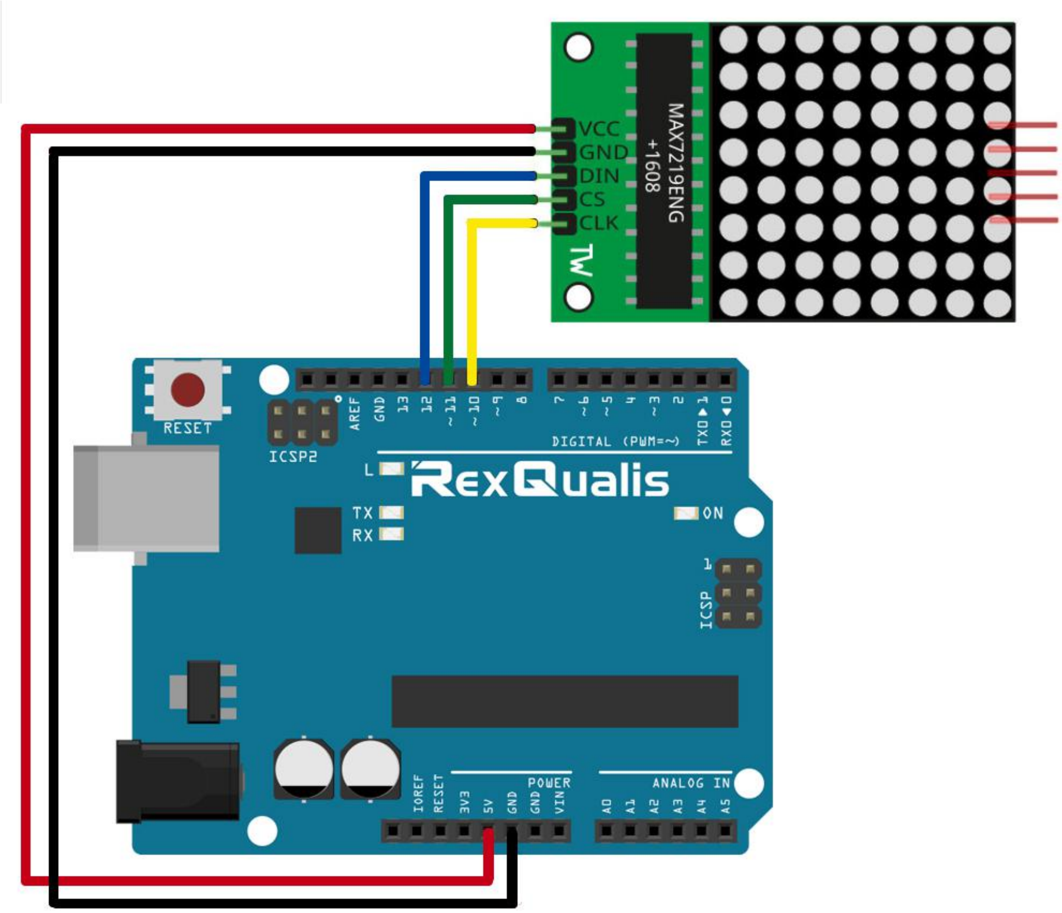
```
}

/*
   This function lights up a some Leds in a row.
  The pattern will be repeated on every row.
  The pattern will blink along with the row-number.
  row number 4 (index==3) will blink 4 times etc.
  */
void rows() {
  for(int row=0;row<8;row++) {
    delay(delaytime2);
    lc.setRow(0,row,B10100000);
    delay(delaytime2);
    lc.setRow(0,row,(byte)0);
    for(int i=0;i<row;i++) {
      delay(delaytime2);
      lc.setRow(0,row,B10100000);
      delay(delaytime2);
      lc.setRow(0,row,(byte)0);
    }
  }
}
```

```
/*
  This function lights up a some Leds in a column.
 The pattern will be repeated on every column.
 The pattern will blink along with the column-number.
 column number 4 (index==3) will blink 4 times etc.
 */
void columns() {
  for(int col=0;col<8;col++) {
    delay(delaytime2);
    lc.setColumn(0,col,B10100000);
    delay(delaytime2);
    lc.setColumn(0,col,(byte)0);
    for(int i=0;i<col;i++) {
      delay(delaytime2);
      lc.setColumn(0,col,B10100000);
      delay(delaytime2);
      lc.setColumn(0,col,(byte)0);
    }
  }
}
```

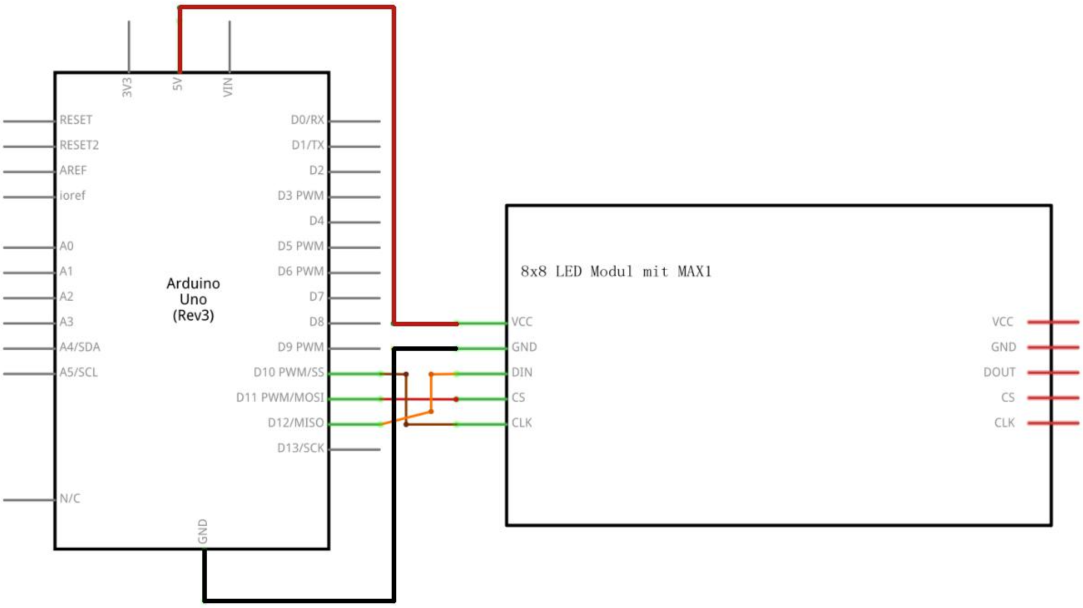
```
/*
 This function will light up every Led on the matrix.
 The led will blink along with the row-number.
 row number 4 (index==3) will blink 4 times etc.
 */
void single() {
  for(int row=0;row<8;row++) {
    for(int col=0;col<8;col++) {
      delay(delaytime2);
      lc.setLed(0,row,col,true);
      delay(delaytime2);
      for(int i=0;i<col;i++) {
        lc.setLed(0,row,col,false);
        delay(delaytime2);
        lc.setLed(0,row,col,true);
        delay(delaytime2);
      }
    }
  }
}


void loop() {
  writeArduinoOnMatrix();

  rows();

  columns();

  single();

}
```

# Experimental Procedures

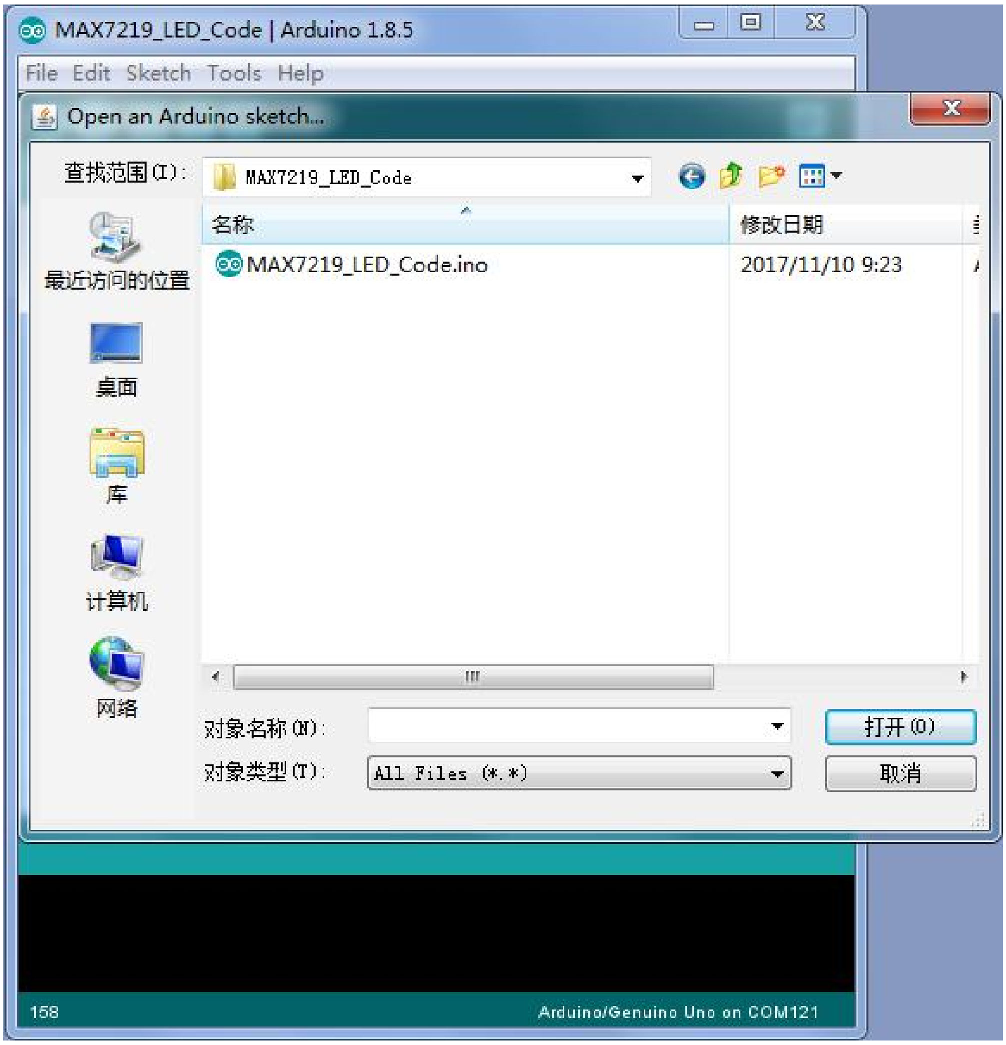
## Step 1:Build the circuit



## Schematic Diagram



## Step 2: Open the code:MAX7219_LED_Code



MAX7219_LED_Code | Arduino 1.8.5

Open an Arduino sketch...

查找范围(I): MAX7219_LED_Code

| 名称 | 修改日期 |
|---|---|
| MAX7219_LED_Code.ino | 2017/11/10 9:23 |

对象名称(N):

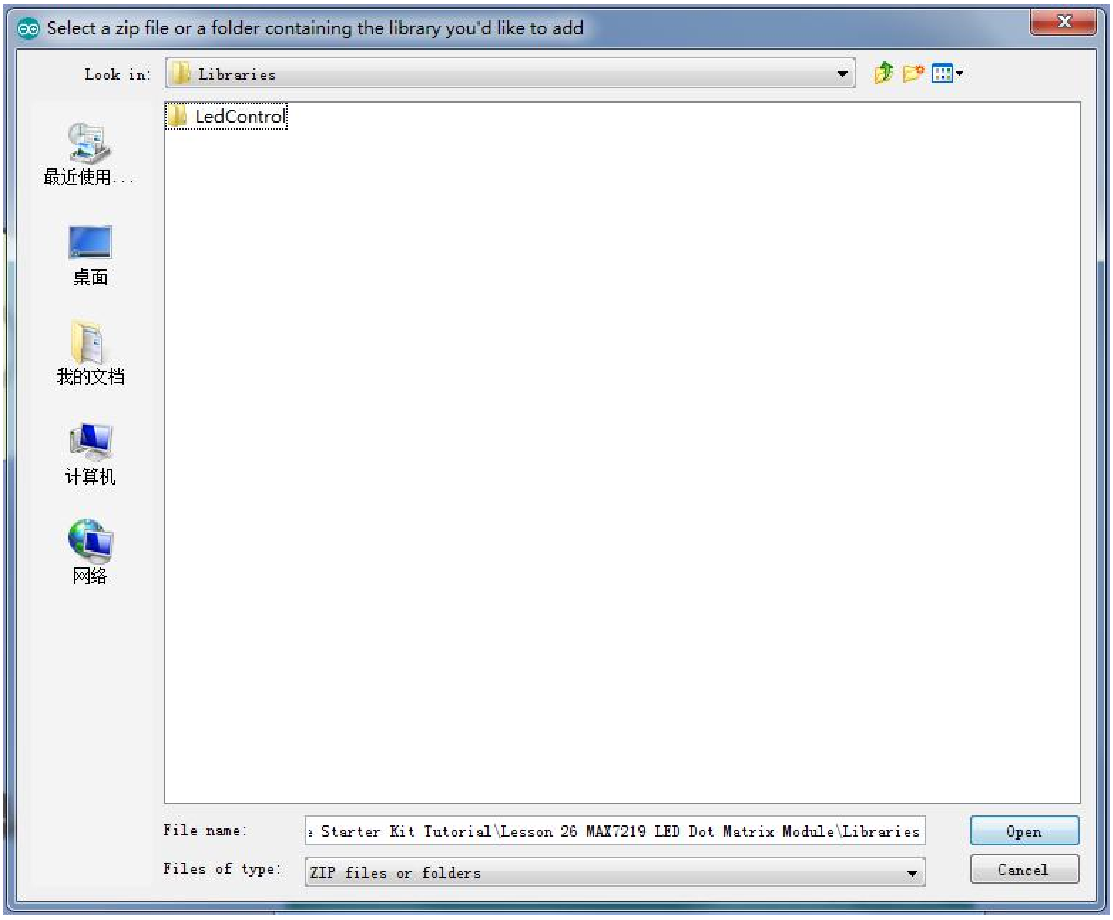
对象类型(T): All Files (*.*)

158 Arduino/Genuino Uno on COM121

## Step 3: Attach Arduino UNO R3 board to your computer via

**USB cable and check that the 'Board Type' and 'Serial Port' are set correctly.**

### Step 4: Load the Library:LedControl



Select a zip file or a folder containing the library you'd like to add

Look in: Libraries

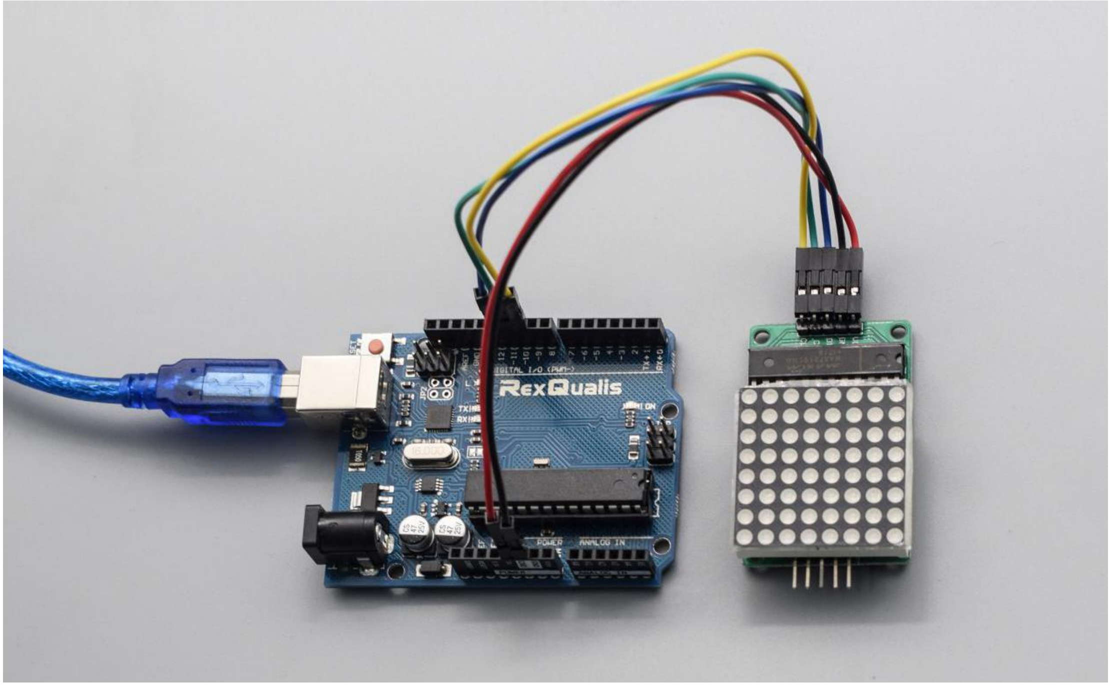
LedControl

File name: : Starter Kit Tutorial\Lesson 26 MAX7219 LED Dot Matrix Module\Libraries

Files of type: ZIP files or folders

### Step 5:Upload the code to the RexQualis UNO R3 board.

**Then, you can see that the MAX7219 LED starts flashing according to the programmed settings.**



**If it isn’t working, make sure you have assembled the circuit correctly, verified and uploaded the code to your board. For how to upload the code and install the library, check Lesson 0 Preface.**