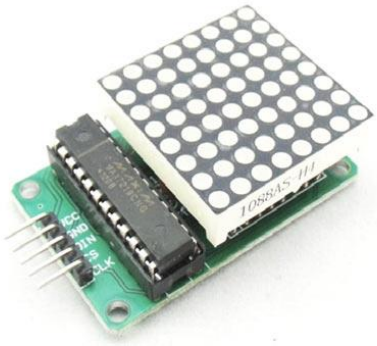
LED Matrix

(Technical Note)

What is LED Matrix?



LED matrix is a combination of LEDs in rows and columns. LEDs are put in specific number that defines the size of the matrix in rows and columns and their cathode and anode are connected. These connections forms a virtual diode at each intersection which can control each connected LED. Providing an advantage of using several leds together in one single module and without clumsy connections, LED matrix are used in many industrial and commercial applications.

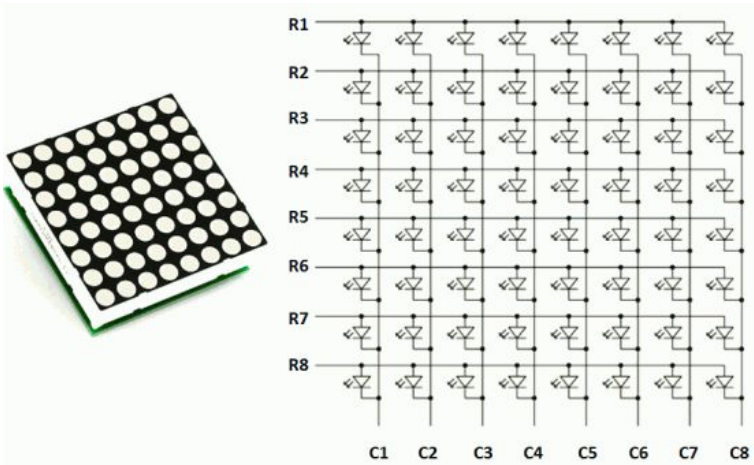
Scientific Fact and Applications

Depending on the size of the matrix (let's say **m** x **n**), **n** leds are connected with their cathode joining each other and such **m** rows are made. Similarly, the anode of **m** leds are connected forming **n** column. Applying suitable voltage (positive and ground) to the specific row and column, individual diode can be biased forward or reverse and thus individual led can be controlled.

Row/Col	C1	C2	C3	C4	C5	C6	C7	C8
R1	0	0	0	0	0	0	0	0
R2	1	0	0	0	1	0	0	0
R3	1	1	0	1	1	0	0	0
R4	1	0	1	0	1	0	0	0
R5	1	0	0	0	1	0	0	0
R6	1	0	0	0	1	0	0	0
R7	1	0	0	0	1	0	0	0
R8	1	0	0	0	1	0	0	0

Applications:

Advertising/Notice Boards
Large led matrices are used in notice and advertising boards for displaying graphics and texts. Here, one led will act as one pixel, and by drawing suitable connections with each row and column, proper text or image can be displayed.



LED Televisions
Like images, the voltage supplies at each row and column can be controlled such that it varies every fraction of seconds. This changing frames can take a form of videos.

Medical Monitors
Matrices are preferred due to the good resolution it can give over other classic views. For example, monitors show real time medical parameters on screen.

AN-038 Rev 1.0

Z2M Part Number: **EMA-00004-A**

LED Matrix
(Application Note)

ZERO2MAKER

Project

To display character created by red LEDs on the 8x8 LED Matrix screen.

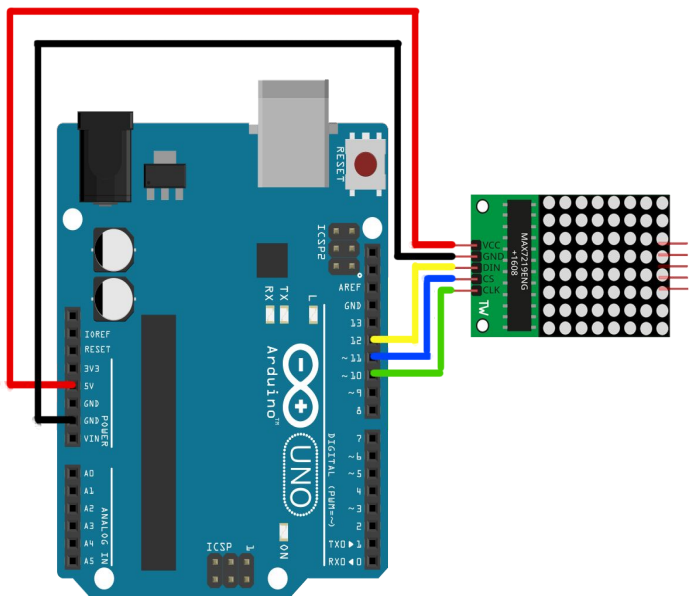
Components Required

Component	Part No.	Qty
Arduino UNO	EMX-00001-A	1
LED Matrix	EMA-00004-A	1

Procedure

1. install the required libraries (h files) from https://tinyurl.com/Z2MLibraries.
2. 8x8 LED Matrix to Arduino:
   - CS -> Pin 11
   - CLK -> Pin 10
   - DIN -> Pin 12
   - GND -> GND
   - VCC -> 5V
3. Use this online binary and hex values generator for any character you want - https://www.riyas.org/2013/12/online-led-matrix-font-generator-with.html

Schematic



Challenge Yourself

1. Create a simple animation story.
2. Connect the LED Matrix to another LED Matrix.

Code

```
/*Include this library*/
#include <LedControl.h>
int DIN = 12;
int CS =  11;
int CLK = 10; /*Binary value for "Z"*/
byte z[8] =
 {
   B11111111,
   B11111111,
   B00001110,
   B00011100,
   B00111000,
   B01110000,
   B11111111,
   B11111111
 };

/*Hex Values for "2" and "M"*/
byte II[8] =
{0x7C,0x7C,0x0C,0x7C,0x7C,0x60,0x7C,0x7C};
byte m[8] =
{0x81,0xc3,0xa5,0x99,0x81,0x81,0x81,0x81};
/*LedControl(dataPin,clockPin,csPin,numDevices)*/
LedControl lc = LedControl(DIN, CLK, CS,
0);

void setup()
{
  /*The MAX72XX is in power-saving mode on startup*/
  lc.shutdown(0, false);
  /* Set the brightness to maximum value*/
  lc.setIntensity(0, 1);
  /* and clear the display */
  lc.clearDisplay(0);
}

void loop()
{
  printByte(z);
  delay(1000);
  printByte(II);
  delay(1000);
  printByte(m);
  delay(1000);
}
```

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