

# 16x8/15x9 MATRIX LED DRIVER

## DESCRIPTION

The IS31FL3719 is a general purpose 15x9 or 16x8 LED Matrix driver programmable via 1MHz I2C compatible interface. All LED can be turned on and off individually, and 9x7 or 8x8 of the matrix's LED can be dimmed individually with 8-bit PWM data. All LED has a global 7-bit current control (GCC) data which allowing 128 steps of linear DC current adjustable levels.

Additionally, each LED open and short state can be detected. IS31FL3719 store the open or short information in Open-Short Registers which can be read out by MCU via I2C compatible interface, inform MCU whether there are LEDs open or short and the locations of such open or short LEDs.

## FEATURES

- Supply voltage range: 2.7V to 5.5V
- 16 current sinks
- Support 15xn (n=1~9), 16x8 LED matrix configurations
- Individual on/off control steps for all LEDs
- Individual 256 PWM control steps for 9x7/8x8 LEDs
- 128 global current steps
- SDB rising edge reset I2C module
- 256kHz PWM frequency or 28.4kHz scanning rate when n=9
- 1MHz I2C-compatible interface
- Individual open and short error detect function
- PWM 180-degree phase shift
- De-ghost - reduced inactive LED reverse bias to improve LED reliability
- QFN-32 (4mmx4mm) and eTQFP-32 packages

## QUICK START

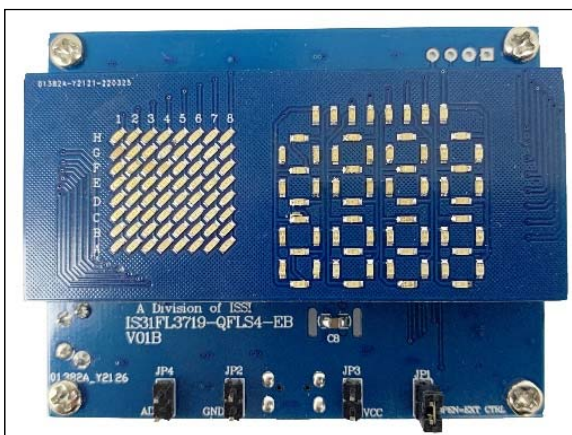


Figure 1: Photo of IS31FL3719-QFLS4 Evaluation Board

## RECOMMENDED EQUIPMENT

- 5.0V, 2A power supply

## ABSOLUTE MAXIMUM RATINGS

- ≤ 5.5V power supply

**Caution: Do not exceed the conditions listed above, otherwise the board will be damaged.**

## PROCEDURE

The IS31FL3719 evaluation board is fully assembled and tested. Follow the steps listed below to verify board operation.

**Caution: Do not turn on the power supply until all connections are completed.**

- 1) Short JP1.
- 2) Connect the 5V DC power to VCC (JP3) / GND (JP2), or plug in the USB power input to micro-USB (CON1).
- 3) Turn on the power supply/Plug in the Micro USB  
Pay attention to the supply current. If the current exceeds 1A, please check for circuit fault.

## EVALUATION BOARD OPERATION

The IS31FL3719 evaluation board has three animation display modes. Toggling the MODE button (S1) can switch the modes.

- 1) Rainbow wave & number #1
- 2) Rainbow wave & number #2
- 3) Raining mode
- 4) Swing mode
- 5) All LED on mode

**Note: IS31FL3719 solely controls the FxLED function on the evaluation board.**

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## ORDERING INFORMATION

Part No.	Temperature Range	Package
IS31FL3719-QFLS4-EB	-40°C to +125°C (Industrial)	QFN-32, Lead-free

Table 1: Ordering Information

For pricing, delivery, and ordering information, please contact Lumissil's analog marketing team at [analog@lumissil.com](mailto:analog@lumissil.com) or (408) 969-6600.

## SOFTWARE SUPPORT

JP1 default setting is closed (jumper on). If it is open (no jumper), the on-board MCU will configure its own I2C/SDB/AD pins to High Impedance status so an external source can driver the I2C/SDB signals to control the IS31FL3719 LED driver.

The AD pin is pulled low via R5 setting the device address of IS31FL3719 to 0x68.

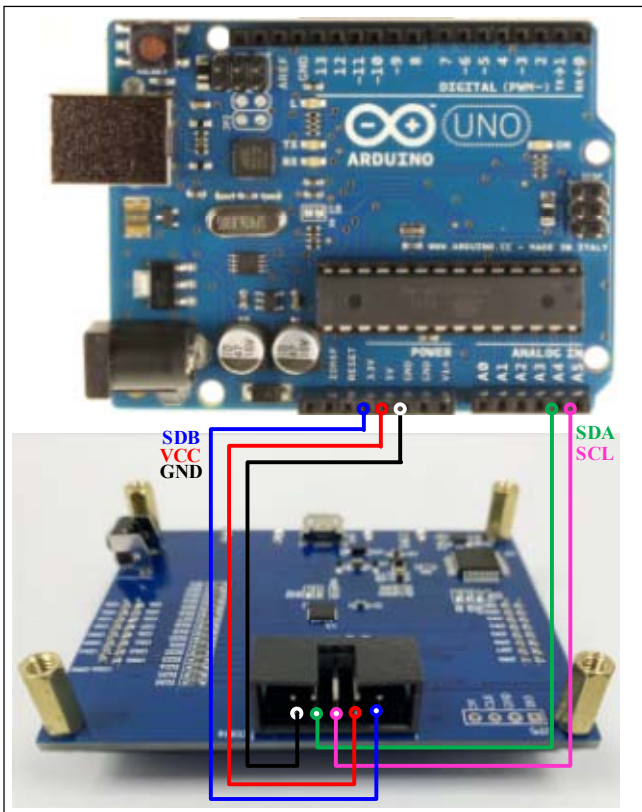


Figure 2: Photo of Arduino UNO connected to Evaluation Board

The steps listed below is an example of using the Arduino for external control.

The Arduino hardware consists of an Atmel microcontroller with a bootloader allowing quick firmware updates. First download the latest Arduino Integrated Development Environment IDE (1.6.12 or greater) from [www.arduino.cc/en/Main/Software](http://www.arduino.cc/en/Main/Software). Also download the Wire.h library from [www.arduino.cc/en/reference/wire](http://www.arduino.cc/en/reference/wire) and verify that pgmspace.h is in the directory ...program Files(x86)/Arduino/hardware/tools/avr/avr/include/avr/. Then download the latest IS31FL3719 test firmware (sketch) from the Lumissil website <http://www.lumissil.com/products/led-driver/fxled>.

- 1) Open JP1.
- 2) Connect the 5 pins from Arduino board to IS31FL3719 EVB:
  - a) Arduino 5V pin to IS31FL3719 EVB PVCC.
  - b) Arduino GND to IS31FL3719 EVB GND.
  - c) Arduino SDA (A4) to IS31FL3719 EVB P1.
  - d) Arduino SCL (A5) to IS31FL3719 EVB P3.
  - e) If Arduino use 3.3V MCU VCC, connect 3.3V to IS31FL3719 EVB SDB, if Arduino use 5.0V MCU VCC, connect 5.0V to EVB SDB. (Arduino UNO MCU VCC is 5V, so SDB can be 5V or 3.3V)
- 3) Use the test code in appendix I or download the test firmware (sketch) from the Lumissil website, a .txt file and copy the code to Arduino IDE, compile and upload to Arduino.
- 4) Run the Arduino code as appendix I.
- 5) In EVB code, the AD pin is pulled low via 10k, so the device address is 0x68. When JP1 is open, the AD pin can be changed by connecting the AD as follows:
  - a) AD=VCC, device address=0x6E.
  - b) AD=SCL, device address=0x6A.
  - c) AD=SDA, device address=0x6C.

Please refer to the datasheet to get more information about IS31FL3719.

# 16x8/15x9 MATRIX LED DRIVER

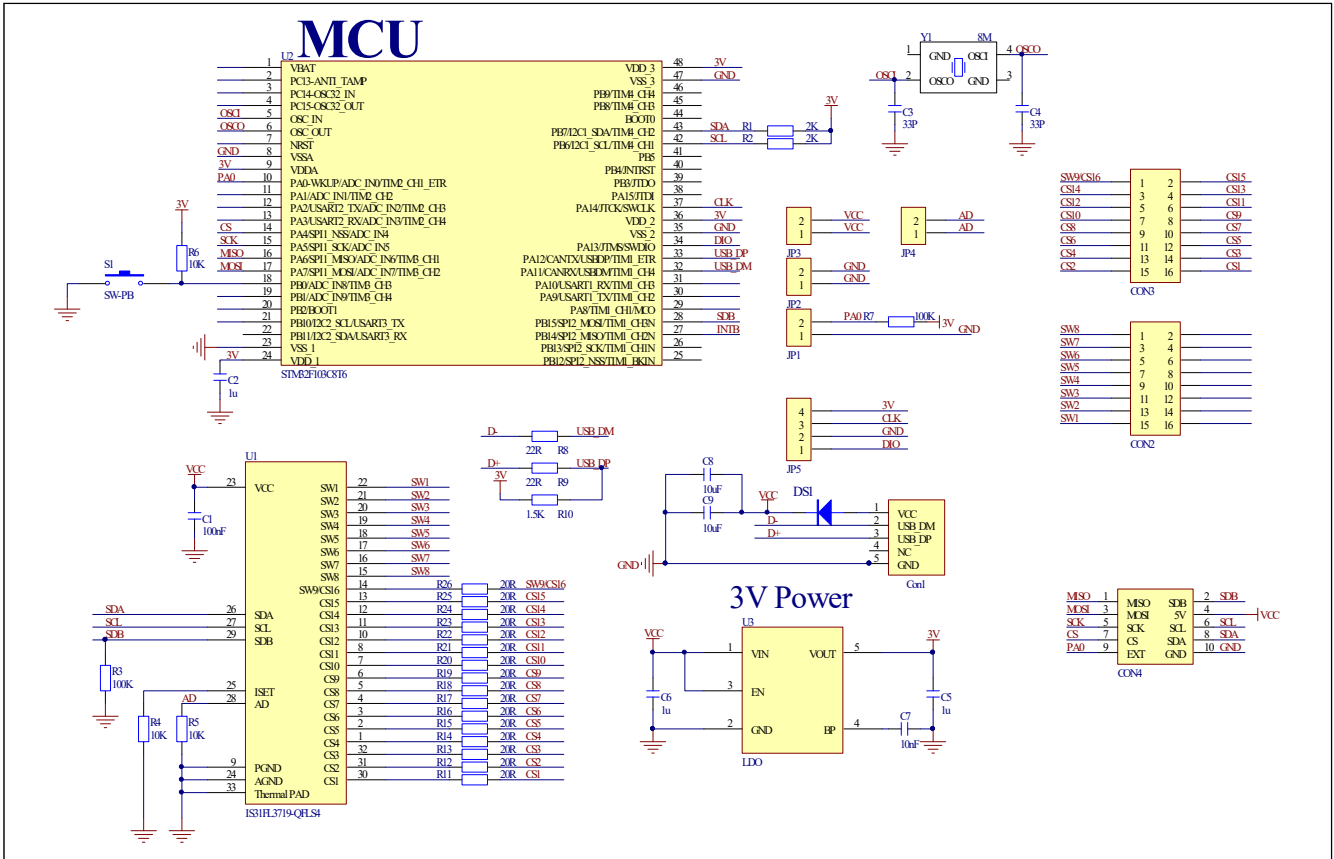


Figure 3: IS31FL3719-QFLS4 Application Schematic

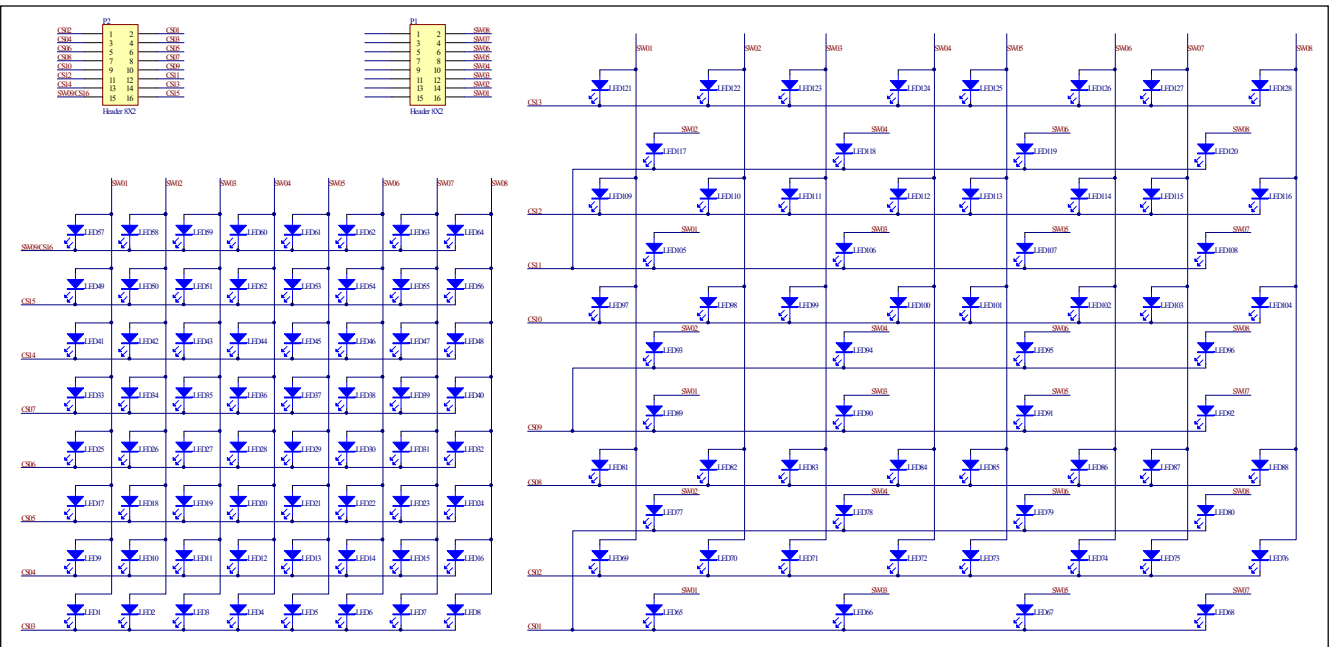


Figure 4: FxLED 8x8 X 8 NUM ARRAY Application Schematic

# 16x8/15x9 MATRIX LED DRIVER

## BILL OF MATERIALS

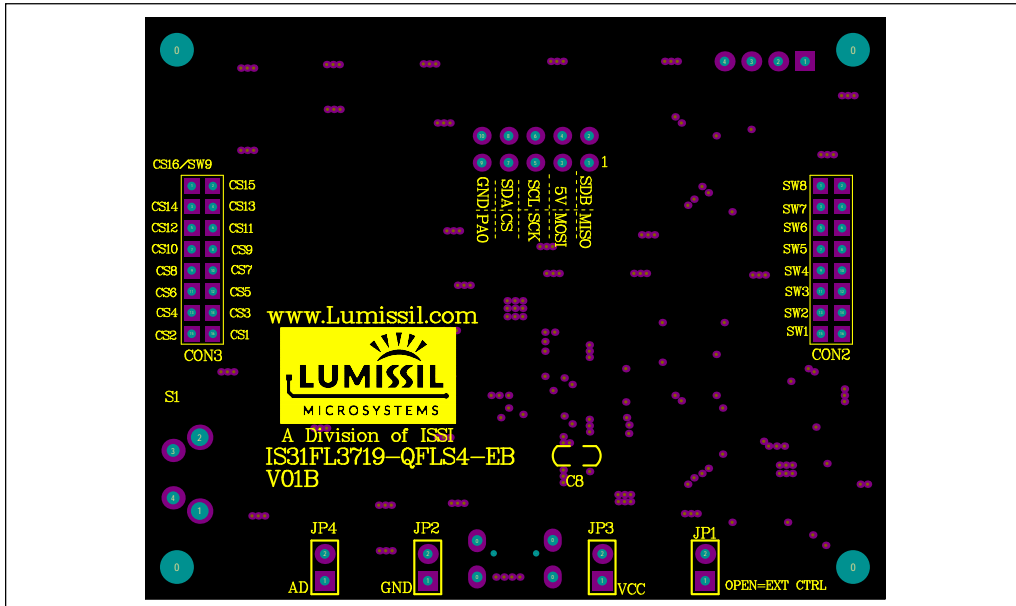
Name	Symbol	Description	Qty	Supplier	Part No.
LED Driver	U1	Matrix LED Driver	1	Lumissil	IS31FL3719
MCU	U2	Microcontroller	1	STM	STM32F103C8T6
LDO	U3	Reduced voltage	1	SGMICRO	SGM2019-3.3V
Crystal	Y1	Crystal, 8MHz	1	JB	HC-49S
Diode	DS1	Diode, SMD	1	DIODES	DFLS240
Resistor	R1,R2	RES,2k,1/16W,±5%,SMD	2	Yageo	RC0603JR-072KL
Resistor	R3,R7	RES,100K,1/16W,±5%,SMD	2	Yageo	RC0603JR-07100KL
Resistor	R4,R5,R6	RES,10k,1/16W,±5%,SMD	3	Yageo	RC0603JR-0710KL
Resistor	R8,R9	RES,22R,1/16W,±5%,SMD	2	Yageo	RC0603JR-0722RL
Resistor	R10	RES,1.5k,1/16W,±5%,SMD	1	Yageo	RC0603JR-071K5L
Resistor	R11~R26	RES,20R,1/10W,±5%,SMD	16	Yageo	RC0603JR-0720RL
Capacitor	C1	CAP,0.1µF,16V,±20%,SMD	1	Yageo	CC0603MRX7R7BB104
Capacitor	C2,C5,C6	CAP,1µF,16V,±20%,SMD	3	Yageo	CC0603KRX7R7BB105
Capacitor	C3,C4	CAP,33pF,16V,±20%,SMD	2	Yageo	CQ0603JRNPO9BN330
Capacitor	C7	CAP,10nF,16V,±20%,SMD	1	Yageo	CC0603KRX7R7BB103
Capacitor	C8,C9	CAP,10µF,16V, ±20%,SMD	2	Yageo	CC0805MKX5R7BB106
Button	S1	Button SMD	1		

Bill of Materials, refer to Figure 3 above.

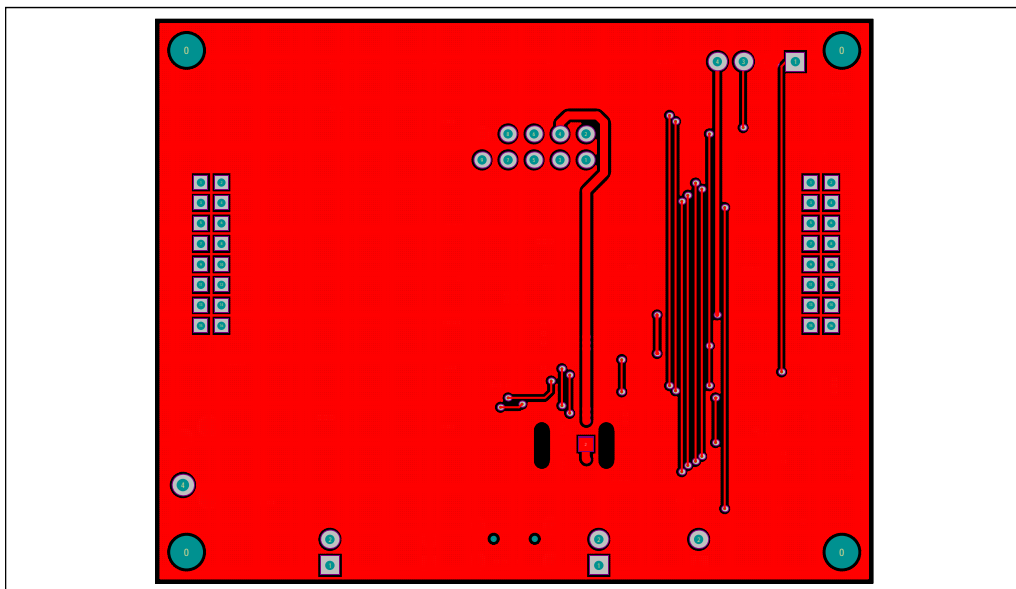
## FxLED 8x8 X 8 NUM ARRAY

Name	Symbol	Description	Qty	Supplier	Part No.
LED	LED1~LED128	Diode, LED Blue, SMD	128	Everlight	19-217/BHC-ZL1M2RY/3T

Bill of Materials, refer to Figure 4 above.

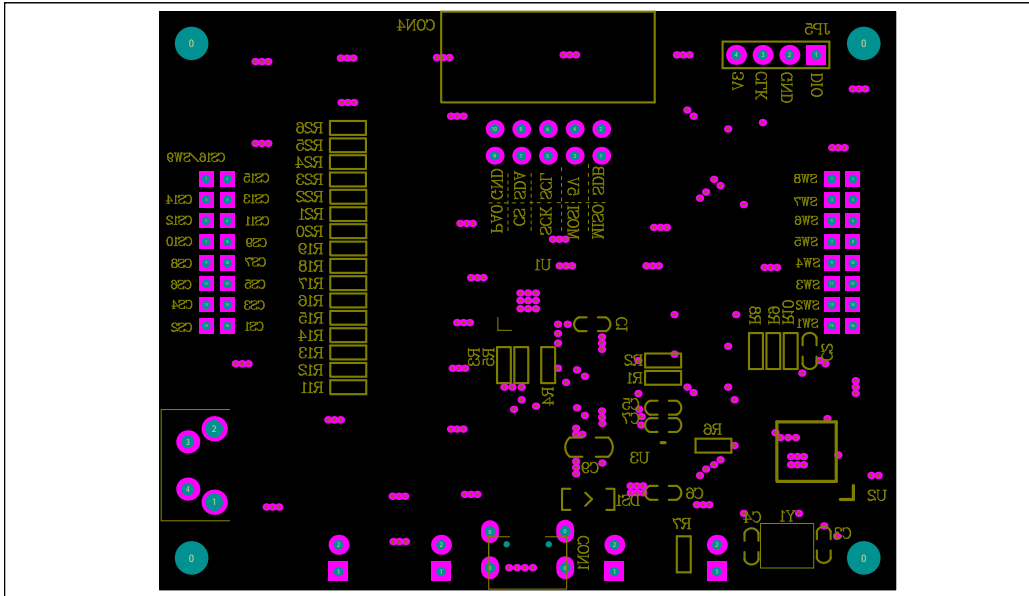


**Figure 5: Board Component Placement Guide - Top Layer**

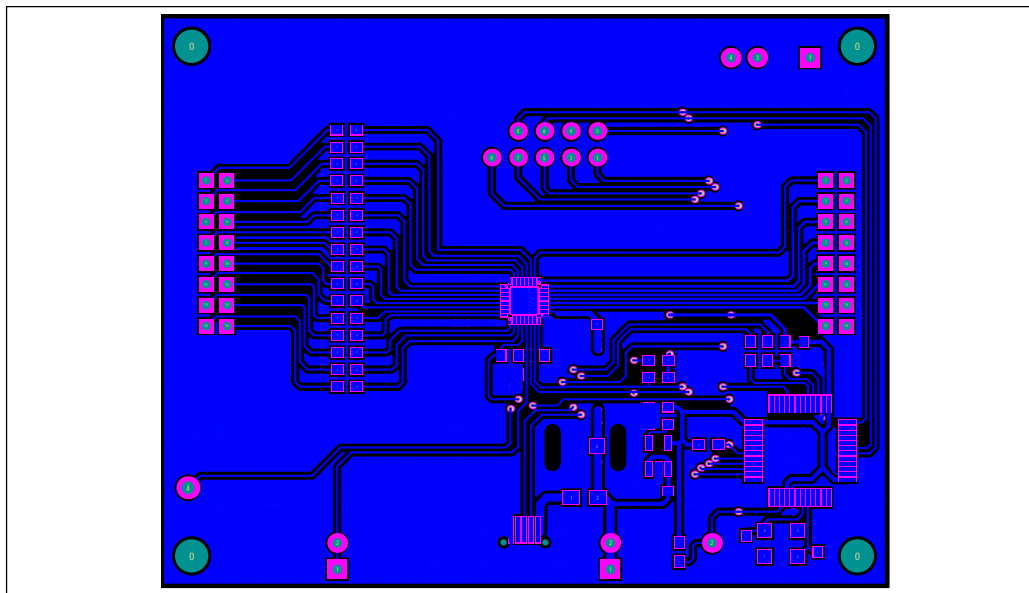


**Figure 6: Board PCB Layout - Top Layer**

# 16x8/15x9 MATRIX LED DRIVER

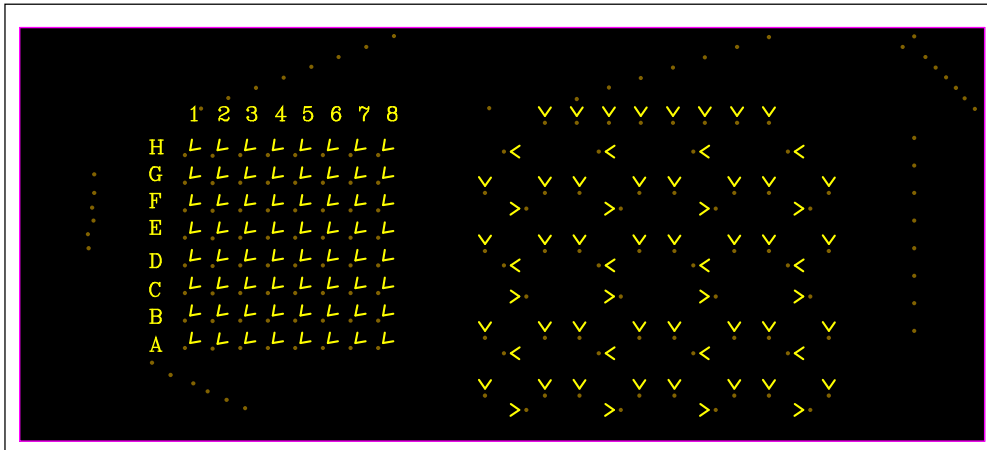


**Figure 7: Board Component Placement Guide - Bottom Layer**

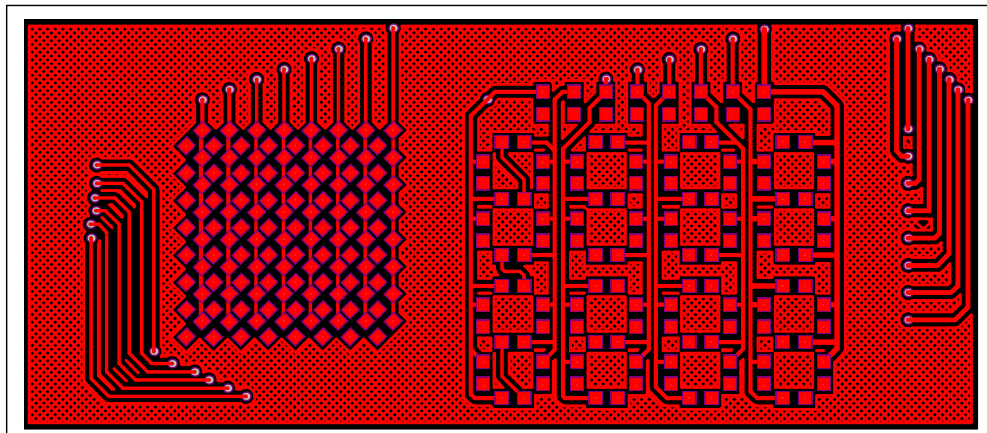


**Figure 8: Board PCB Layout - Bottom Layer**

**16x8/15x9 MATRIX LED DRIVER**



*Figure 9: LED Board Component Placement Guide - Top Layer*



*Figure 10: LED Board PCB Layout - Top Layer*

# 16x8/15x9 MATRIX LED DRIVER



Figure 11: LED Board Component Placement Guide - Bottom Layer

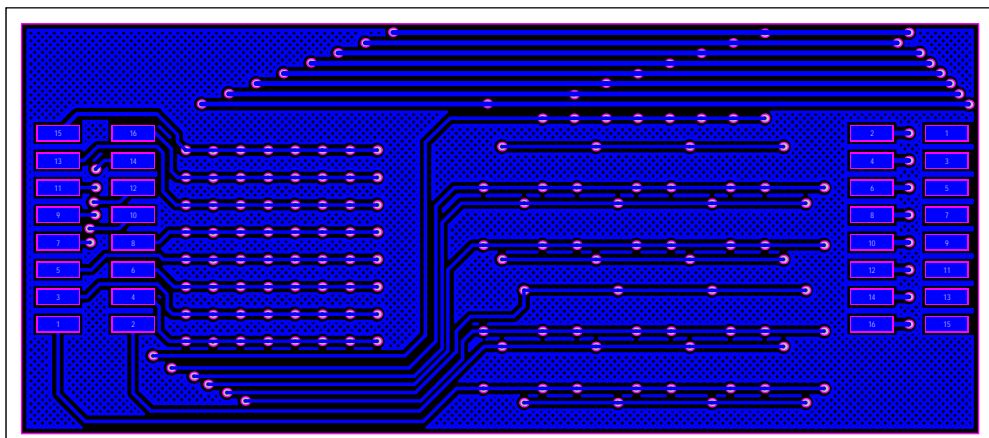


Figure 12: LED Board PCB Layout - Bottom Layer

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## REVISION HISTORY

Revision	Detail Information	Date
A	Initial release	2022.04.15

## 16x8/15x9 MATRIX LED DRIVER

### APPENDIX I : IS31FL3719 Arduino Test Code V01A

```
#include<Wire.h>
#include<avr/pgmspace.h>

#define AD_GND 0x68
uint8_t i,j;

const PROGMEM byte PWM_Gama64[64]=
{
  0x00,0x01,0x02,0x03,0x04,0x05,0x06,0x07,
  0x08,0x09,0x0b,0x0d,0x0f,0x11,0x13,0x16,
  0x1a,0x1c,0x1d,0x1f,0x22,0x25,0x28,0x2e,
  0x34,0x38,0x3c,0x40,0x44,0x48,0x4b,0x4f,
  0x55,0x5a,0x5f,0x64,0x69,0x6d,0x72,0x77,
  0x7d,0x80,0x88,0x8d,0x94,0x9a,0xa0,0xa7,
  0xac,0xb0,0xb9,0xbf,0xc6,0xcb,0xcf,0xd6,
  0xe1,0xe9,0xed,0xf1,0xf6,0xfa,0xfe,0xff
};

void setup() {
  Wire.begin();
  Wire.setClock(400000);//I2C 400KHz
  Init_3719();
}

void loop() {
  IS31FL3719_Test_mode1();//breath mode
}

void IS_IIC_WriteByte(uint8_t Dev_Add,uint8_t Reg_Add,uint8_t Reg_Dat)
{
  Wire.beginTransmission(Dev_Add/2); // transmit to device IS31FL373x
  Wire.write(Reg_Add); // sends regaddress
  Wire.write(Reg_Dat); // sends regaddress
  Wire.endTransmission(); // stop transmitting
}

void Init_3719(void)
{
  IS_IIC_WriteByte(AD_GND,0xA0,0x00);//shutdown down
  for(i=0x10;i<=0x56;i++)
  {
    IS_IIC_WriteByte(AD_GND,i,0x00);//PWM
  }
}
```

## 16x8/15x9 MATRIX LED DRIVER

```

for(i=0x61;i<=0x69;i++)
{
    IS_IIC_WriteByte(AD_GND,i,0x00);//ON OFF
}

IS_IIC_WriteByte(AD_GND,0xA0,0x11);//normal operation
IS_IIC_WriteByte(AD_GND,0xA1,0x40);//global current
IS_IIC_WriteByte(AD_GND,0xA4,0xA2);//SW and CS pull
IS_IIC_WriteByte(AD_GND,0xA2,0x02);//PWM frequency set 2Khz

}

void IS31FL3719_Test_mode1(void)//
{

for (j=0;j<64;j++)//all LED ramping up
{
    for(i=0x10;i<=0x56;i++)
    {
        IS_IIC_WriteByte(AD_GND,i,pgm_read_byte_near(&PWM_Gama64[j]));//set all PWM
    }
    delay(10);//10ms
}
for(i=0x61;i<=0x69;i++)
{
    IS_IIC_WriteByte(AD_GND,i,0xFF);//ON OFF
}
delay(1000); //keep on 1s

for (j=63;j>0;j--)//all LED ramping down
{
    for(i=0x10;i<=0x56;i++)
    {
        IS_IIC_WriteByte(AD_GND,i,pgm_read_byte_near(&PWM_Gama64[j-1]));//set all PWM
    }
    delay(10);//10ms
}
for(i=0x61;i<=0x69;i++)
{
    IS_IIC_WriteByte(AD_GND,i,0x00);//ON OFF
}
delay(500); //keep off 0.5s
}

```