8×7/9×6/10×5 MATRIX LED DRIVER EVALUATION BOARD GUIDE

DESCRIPTION

IS31FL3716 is a general purpose 8×7 LED matrix driver. The general LED matrix display defaults to an 8×7 configuration, however, it can be configured for a 9×6, 10×n(n=5~1) dot matrix display. In matrix display, the array is internally scanned, and requires only one-time programming, thus eliminating the need for real time system resource utilization. All LED can be dimmed globally with 7-bit DC data which allowing 128 steps of linear current setting.

It programs the LED array through I2C interface. In the general purpose display mode, each dot of the LED array is independently programmed on or off over time.

FEATURES

- Supply voltage range: 2.7V to 5.5V
- 10 current sinks
- 1~7 power source outputs for row scan control
- 8~10 current sink outputs for column control
- Support 8×7, 9×6, 10×n (n=1~5) matrix configurations
- Individual on/off control
- 128 global current steps
- SDB rising edge reset I2C module
- 50kHz scan frequency
- 400kHz I2C-compatible interface
- Individual open and short error detect function
- De-ghost
- QFN-20 (3mm×3mm) and SOP-20 packages

QUICK START

Figure 1: Photo of IS31FL3716-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 IS31FL3716 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 (OPEN=EXT CTRL) to enable the control of on board MCU (default status).
2) Short 5V and VIO in JP4.
3) Connect the 5V DC power to VCC / GND in JP2/JP3, or plug in the USB power input to micro-USB (CON1).
4) Turn on the power supply, pay attention to the supply current. If the current exceeds 1A, please check for circuit fault.

EVALUATION BOARD OPERATION

The IS31FL3716 evaluation board has three display modes. Press K1 to switch configurations.

1) (Default mode) Fade in and out.
2) Roll.
3) Number Display.

Note: IS31FL3716 solely controls the FxLED function on the evaluation board.

ORDERING INFORMATION

Part No.	Temperature Range	Package
IS31FL3716-QFLS4-EB	-40°C to +125°C (Industrial)	QFN-20, Lead-free

Table 1: Ordering Information

For pricing, delivery, and ordering information, please contacts Lumissil's analog marketing team at analog@Lumissil.com or (408) 969-6600

SOFTWARE SUPPORT

EXT CTRL (JP1) default setting is close circuit. If it is set to open, the on-board MCU will configure the I2C pins and SDB pin to High Impedance and sleep. External I2C and SDB signals can be connected to CON4 to control the IS31FL3716 LED driver.

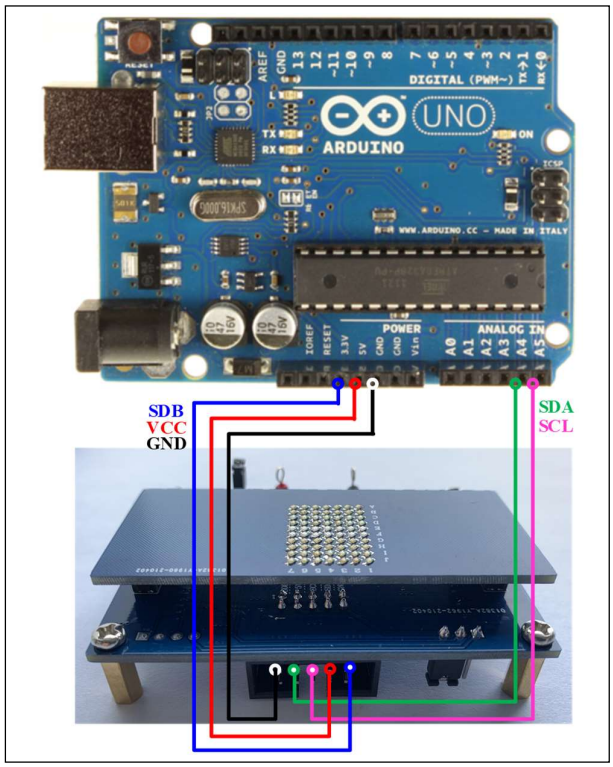

Figure 2: Photo of Arduino UNO connected to Evaluation Board

The steps listed below are an example 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. Also download the Wire.h library from 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 IS31FL3716 test firmware (sketch) from the Lumissil website http://www.lumissil.com/products/led-driver/fxled.

1) Open EXT CTRL (JP1).
2) Connect the 5 pins from Arduino board to IS31FL3716 EVB:
   a) Arduino 5V pin to IS31FL3716 EVB VCC.
   b) Arduino GND to IS31FL3716 EVB GND.
   c) Arduino SDA (A4) to IS31FL3716 EVB SDA.
   d) Arduino SCL (A5) to IS31FL3716 EVB SCL.
   e) If Arduino use 3.3V MCU VCC, connect 3.3V to IS31FL3716 EVB SDB, if Arduino use 5.0V MCU VCC, connect 5.0V or 3.3V 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 for desired mode setting by Arduino code.

Please refer to the datasheet to get more information about IS31FL3716.

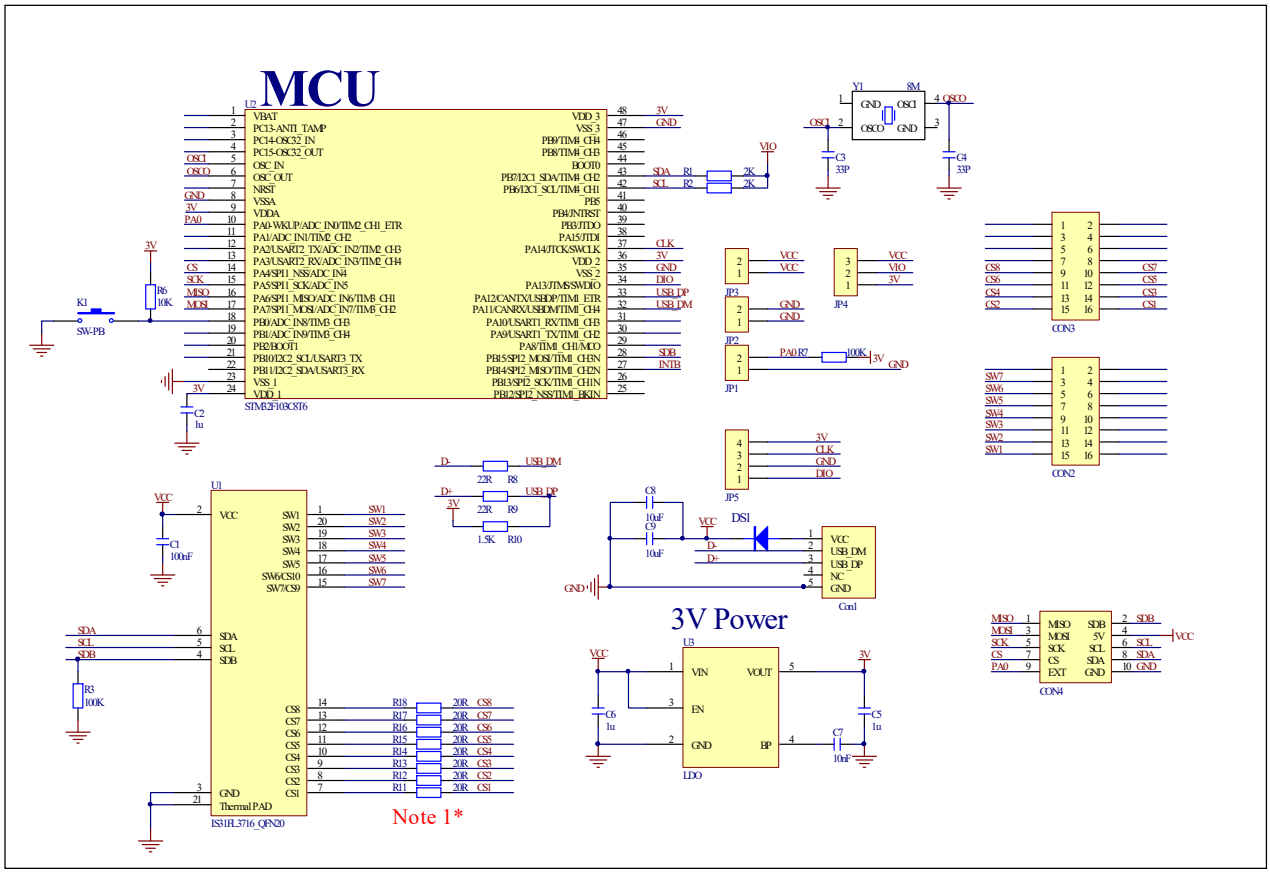

Figure 3: IS31FL3716 Application Schematic

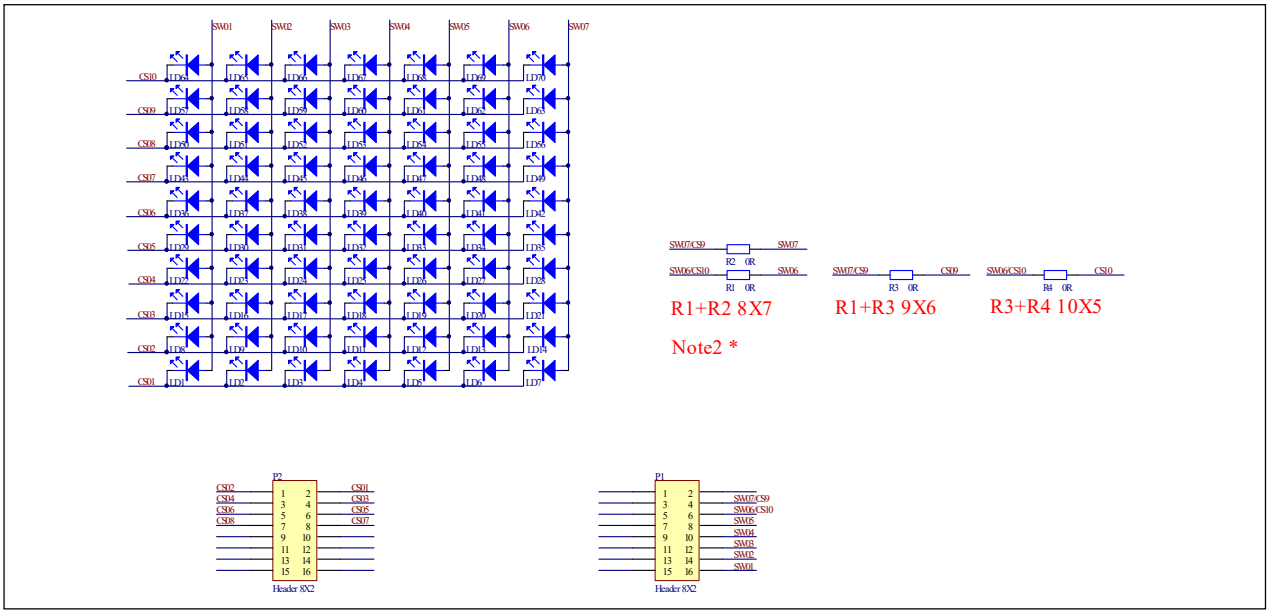

Figure 4: FxLED_8x7_ARRAY Schematic

BILL OF MATERIALS

IS31FL3716

Name	Symbol	Description	Qty	Supplier	Part No.
LED Driver	U1	Matrix LED Driver	1	Lumissil	IS31FL3716
MCU	U2	Microcontroller	1	STM	STM32F103C8T6
LDO	U3	3.0V LDO	1	SGMICRO	SGM2019-3.0YN5G
Crystal	Y1	Crystal, 8MHz	1	HLX	HC-49S
Diode	D1	Diode, SMD	1	DIODES	DFLS240
Resistor	R13,R14, R15,R16	RES,20R,1/10W,±5%,SMD	12	Yageo	RC0603JR-0720RL
Resistor	R11,R12, R17,R18	RES,20R,1/10W,±5%,SMD (Note 1)	4	Yageo	RC0603JR-0720RL
Resistor	R1,R2	RES,2k,1/10W,±5%,SMD	2	Yageo	RC0603JR-072KL
Resistor	R3,R7	RES,100k,1/10W,±5%,SMD	2	Yageo	RC0603JR-07100KL
Resistor	R6	RES,10k,1/10W,±5%,SMD	1	Yageo	RC0603JR-0710KL
Resistor	R8,R9	RES,22R,1/10W,±5%,SMD	2	Yageo	RC0603JR-0722RL
Resistor	R10	RES,1.5k,1/10W,±5%,SMD	1	Yageo	RC0603JR-071K5L
Resistor	R9	RES,1k,1/10W,±5%,SMD	1	Yageo	RC0603JR-071KL
Capacitor	C1	CAP,100nF,16V,±20%,SMD	1	Yageo	CC0603MRX7R7BB104
Capacitor	C2,C5,C6	CAP, 1μF,16V,±10%,SMD	3	Yageo	CC0603KRX7R7BB105
Capacitor	C3,C4	CAP,33pF,50V,±5%,SMD	2	Yageo	CQ0603JRNPO9BN360
Capacitor	C7	CAP,10nF,16V,±10%,SMD	1	Yageo	CC0603KPX7R7BB103
Capacitor	C8,C9	CAP,10μF,16V,±20%,SMD	2	Yageo	CC0805KKX7R7BB106
Button	K1	Button SMD	1		

Bill of Materials, refer to Figure 3 above.

FxLED 8×7 ARRAY

Name	Symbol	Description	Qty	Supplier	Part No.
LED	LD1~LD14, LD43~56	LED Red, SMD	28	Everlight	19-217/R6C-AL1M2VY/3T
LED	LD15~LD28, LD57~70	LED Green, SMD	28	Everlight	19-217/G7C-AN1P2/3T
LED	LD29~D42	LED Blue, SMD	14	Everlight	19-217/BHC-ZL1M2RY/3T
Resistor	R1,R2	RES,0R,1/10W,±5%,SMD (Note 2)	2	Yageo	RC0603JR-070RL
Resistor	R3,R4	NC (Note 2)	2		

Bill of Materials, refer to Figure 4 above.

Note 1: The value of these resistors on the evaluation board is 20Ω. For PV_{CC}=5V and red LED application, prefer 51Ω for these resistors as shown in datasheet Figure 1.

Note 2: When R1 R2 connect with the 0R resistors, the LED ARRAY board is 8×7. When R1 R3 connect with the 0R resistors, the LED ARRAY board is 9×6. When R3 R4 connect with the 0R resistors, the LED ARRAY board is 10×5.

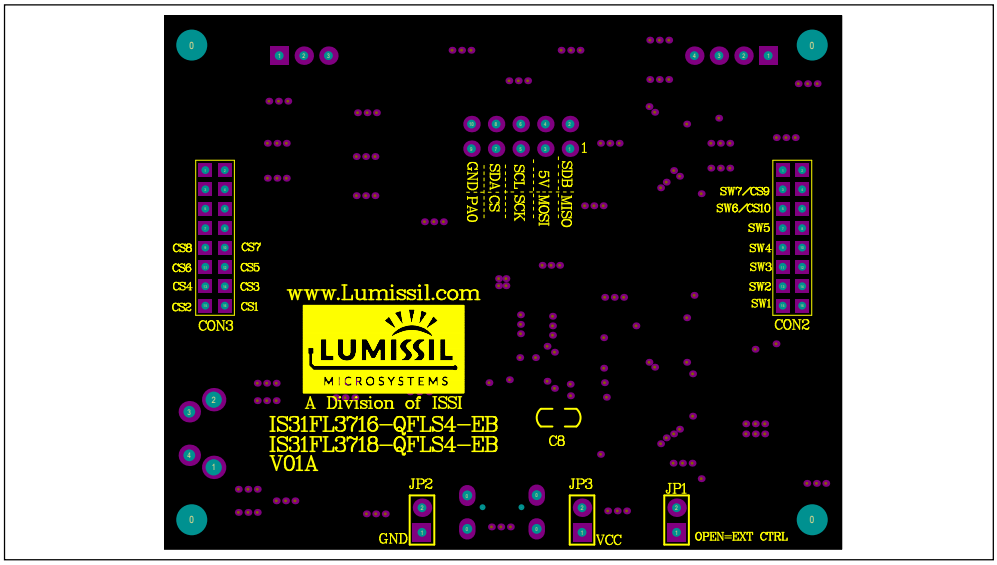

Figure 4: Board Component Placement Guide - Top Layer

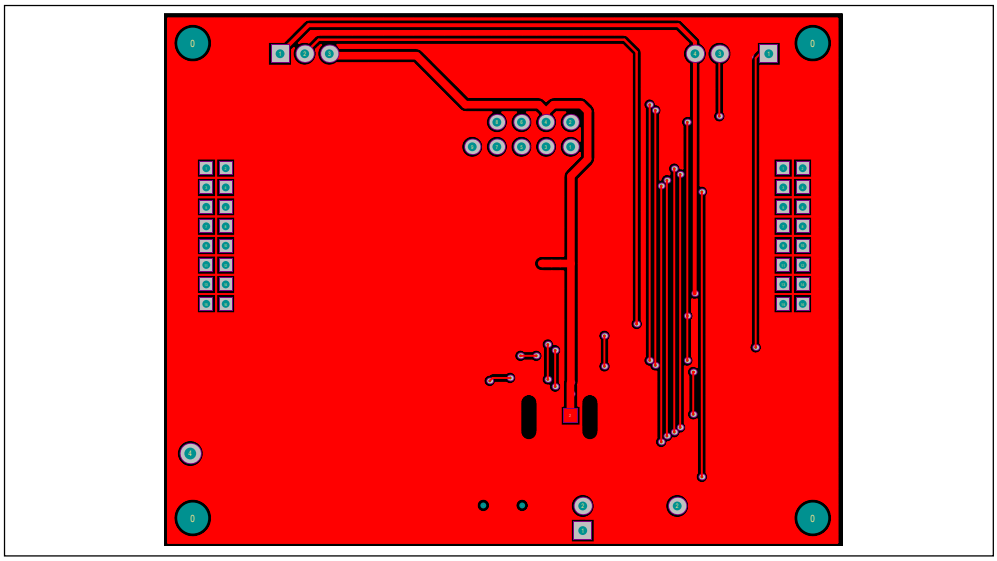

Figure 5: Board PCB Layout - Top Layer

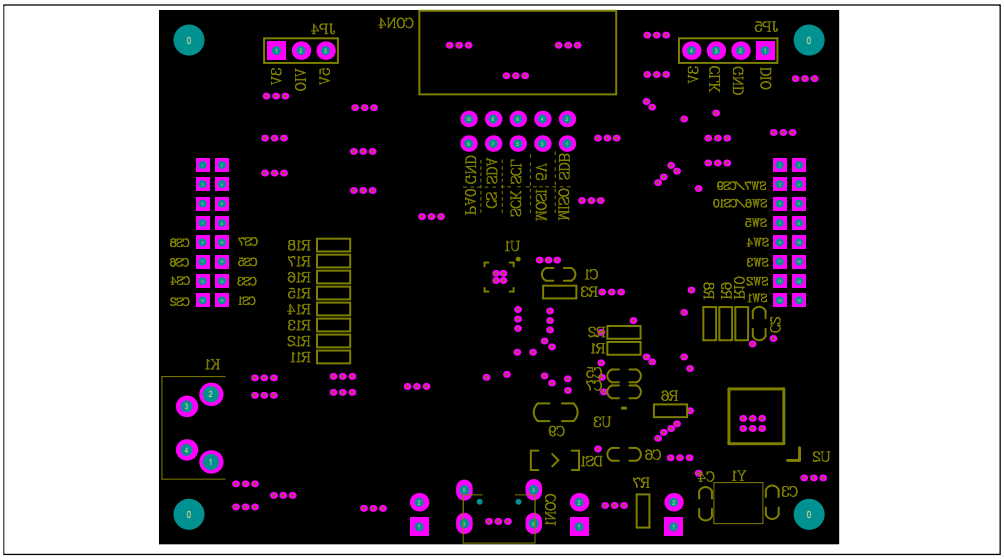

Figure 6: Board Component Placement Guide - Bottom Layer

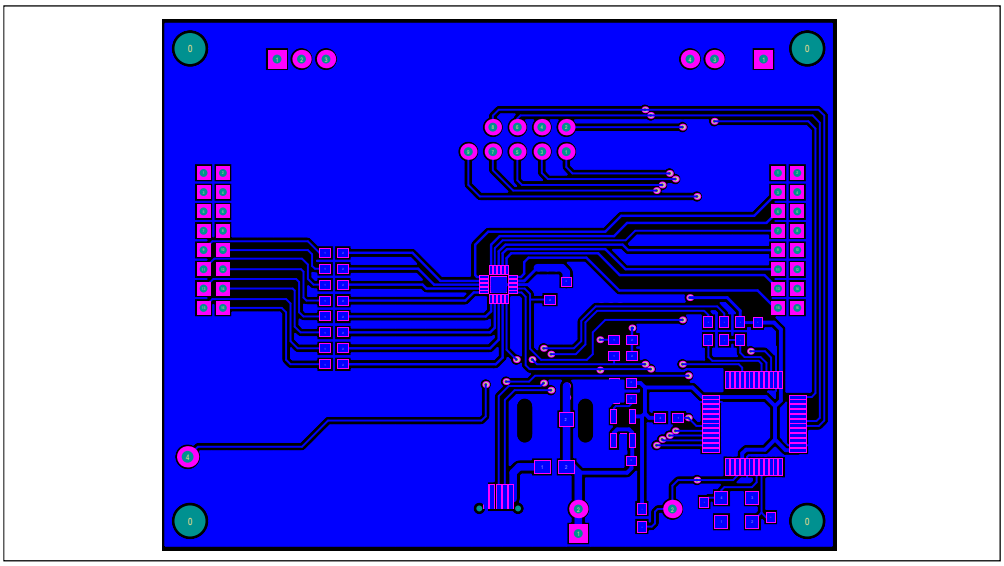

Figure 7: Board PCB Layout - Bottom Layer

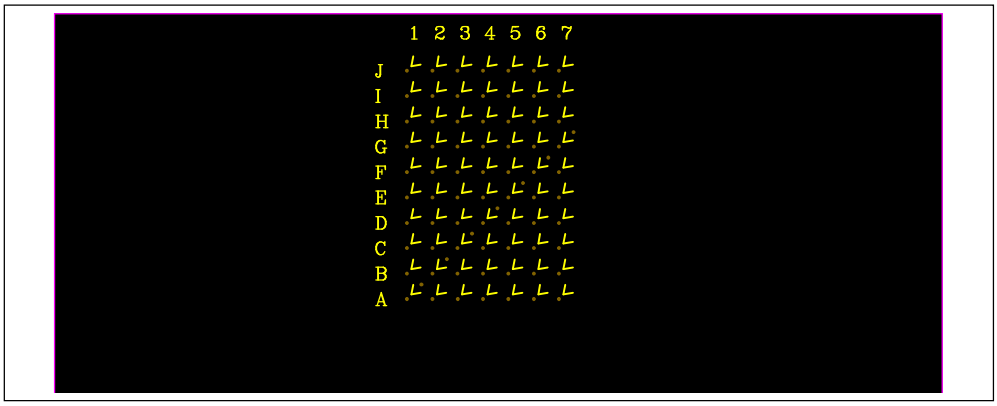

Figure 8: Board Component Placement Guide - Top Layer

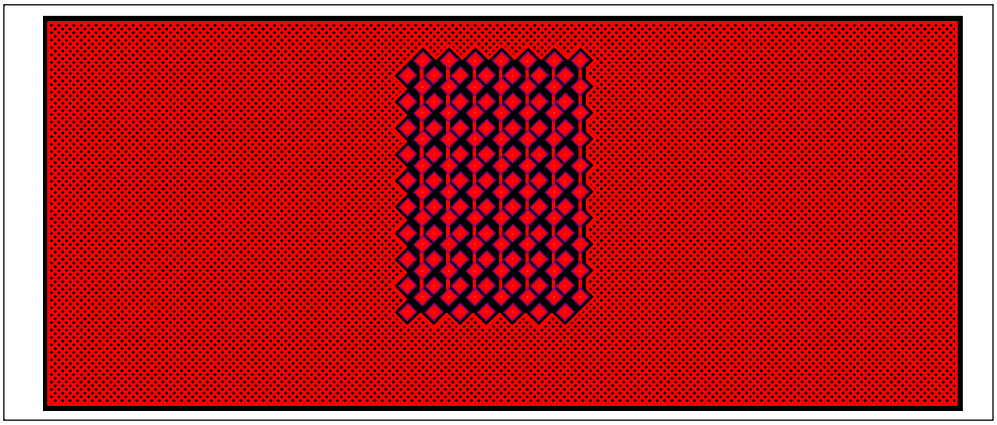

Figure 9: Board PCB Layout - Top Layer

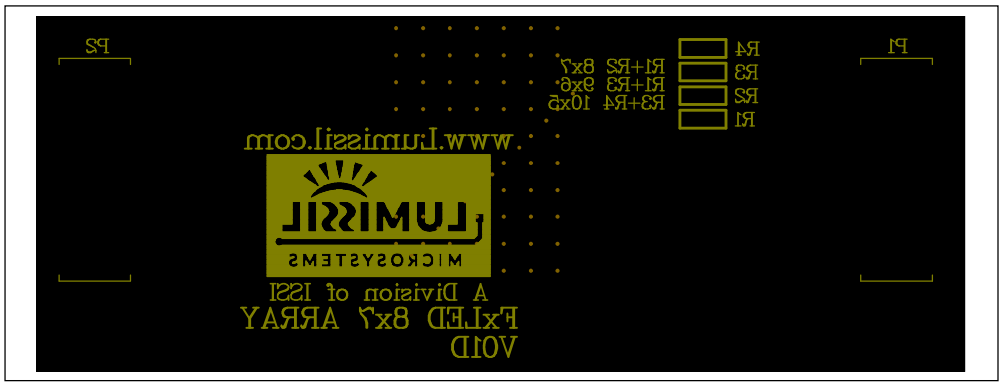

Figure 10: Board Component Placement Guide - Bottom Layer

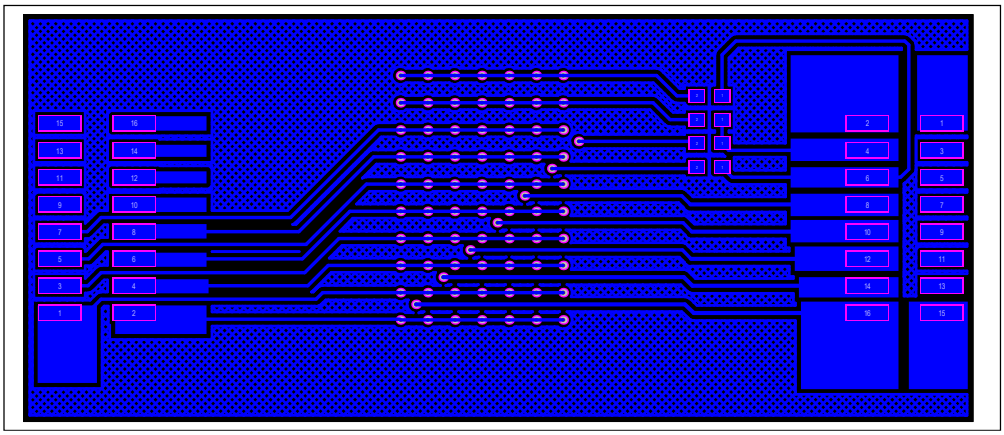

Figure 11: Board PCB Layout - Bottom Layer

REVISION HISTORY

Revision	Detail Information	Data
A	Initial Release	2021.10.18
B	Update the PCB	2021.12.08

APPENDIX Ⅰ: IS31FL3716 Arduino Test Code V01A

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

#define Addr_GND 0xB4

void setup() {
  // put your setup code here, to run once:
  Wire.begin();
  Wire.setClock(400000);//I2C 400kHz
}


byte PWM_Gamma64[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
};

byte ROLLUP_IS31FL3716[136]=
{
    0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,
    0X7F,0X00,0X00,0X00,0X00,0X00,0X00,0X00,
    0X7F,0X7F,0X00,0X00,0X00,0X00,0X00,0X00,
    0X7F,0X7F,0X7F,0X00,0X00,0X00,0X00,0X00,
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    0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X7F,
    0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,
};


void IS_IIC_WriteByte(uint8_t Dev_Add,uint8_t Reg_Add,uint8_t Reg_Dat)//writing an LED register
{
  Wire.beginTransmission(Dev_Add/2);
  Wire.write(Reg_Add); // sends regaddress
  Wire.write(Reg_Dat); // sends regaddress
  Wire.endTransmission(); // stop transmitting
}

void loop() {
  // put your main code here, to run repeatedly:
  mainloop();
}
void Init3716(void)
{
  int i,j;
  for(i=0X01;i<0x0A;i++)
  {
    IS_IIC_WriteByte(Addr_GND,i,0x00);//on off control
  }
  IS_IIC_WriteByte(Addr_GND,0x0C,0x01);//CH Scan Frequency
  IS_IIC_WriteByte(Addr_GND,0x0B,0x3F);//GCC
  IS_IIC_WriteByte(Addr_GND,0x00,0x01);//
}

void mainloop(void)//
{
```

```
    int i;
    Init3716();
    while(1)
    {
          for(i=0;i<135;i=i+8)
          {
             IS_IIC_WriteByte(Addr_GND,0x01,ROLLUP_IS31FL3716[i]);
             IS_IIC_WriteByte(Addr_GND,0x02,ROLLUP_IS31FL3716[i+1]);
             IS_IIC_WriteByte(Addr_GND,0x03,ROLLUP_IS31FL3716[i+2]);
             IS_IIC_WriteByte(Addr_GND,0x04,ROLLUP_IS31FL3716[i+3]);
             IS_IIC_WriteByte(Addr_GND,0x05,ROLLUP_IS31FL3716[i+4]);
             IS_IIC_WriteByte(Addr_GND,0x06,ROLLUP_IS31FL3716[i+5]);
             IS_IIC_WriteByte(Addr_GND,0x07,ROLLUP_IS31FL3716[i+6]);
             IS_IIC_WriteByte(Addr_GND,0x08,ROLLUP_IS31FL3716[i+7]);
             delay(500);
          }
        }

}
```