

## 30×6 DOTS MATRIX LED DRIVER

### DESCRIPTION

The IS31FL3742 is a general purpose 30×6 LED Matrix programmed via an I2C compatible interface. Each LED can be dimmed individually with 8-bit PWM data and 8-bit scaling data which allowing 256 steps of linear PWM dimming and 256 steps of DC current adjustable level.

Additionally each LED open and short state can be detected, IS31FL3742 store the open or short information in Open-Short Registers. The Open-Short Registers allowing MCU to read out via I2C compatible interface. Inform MCU whether there are LEDs open or short and the locations of open or short LEDs.

### FEATURES

- Supply voltage range from 2.7V to 5.5V
- 30 Current Sink × 9 SW matrix size: drive up to 180 LEDs or 60 RGBs
- Individual 256 PWM control steps
- Individual 256 DC current steps
- Global 255 current setting
- SDB rising edge reset I2C module
- Interrupt and state lookup registers
- Individual open and short error detect function
- De-ghost
- QFN-48 (6mm×6mm) package

### QUICK START

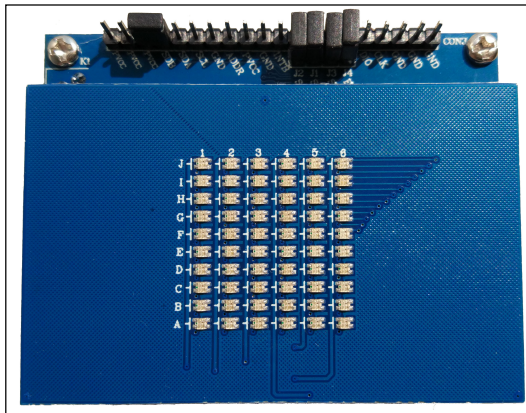


Figure 1: Photo of IS31FL3742 Evaluation Board

### 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 IS31FL3742 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 J4 and EXT (Open=Ext control).
- 2) Short J1 and SDA (Connect SDA to U2).
- 3) Short J2 and SCL (Connect SCL to U2).
- 4) Short J3 and SDB (Connect SDB to U2).
- 5) Turn on the power supply/Plug in the Micro USB  
Pay attention to the supply current. If the current exceeds 1.5A, please check for circuit fault.

### EVALUATION BOARD OPERATION

The IS31FL3742 evaluation board has three animation display modes. Press K1 to switch configurations.

- 1) Rainbow wave#1
- 2) Rainbow wave#2
- 3) Rain
- 4) Visor

**Note:** IS31FL3742 solely controls the FxLED function on the evaluation board.

### ORDERING INFORMATION

| Part No.            | Temperature Range            | Package           |
|---------------------|------------------------------|-------------------|
| IS31FL3742-QFLS4-EB | -40°C to +125°C (Industrial) | QFN-48, Lead-free |

Table 1: Ordering Information

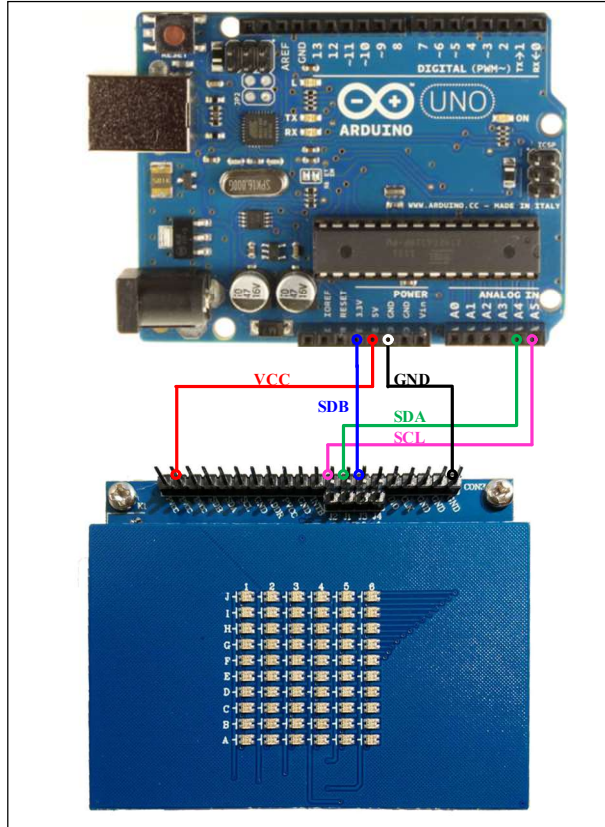
For pricing, delivery, and ordering information, please contacts ISSI's analog marketing team at [analog@issi.com](mailto:analog@issi.com) or (408) 969-6600.

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### SOFTWARE SUPPORT

J4 and 3V default setting is closed (jumper on). If it is open (no jumper), the on-board MCU will configure its own I2C/SDB/ADDR pins to High Impedance status so an external source can driver the I2C/SDB signals to control the IS31FL3742 LED driver.

The ADDR pin is pulled low via R34 setting the device address of IS31FL3742 to 0x60.



**Figure 2: Photo of Arduino UNO connected to Evaluation Board**

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

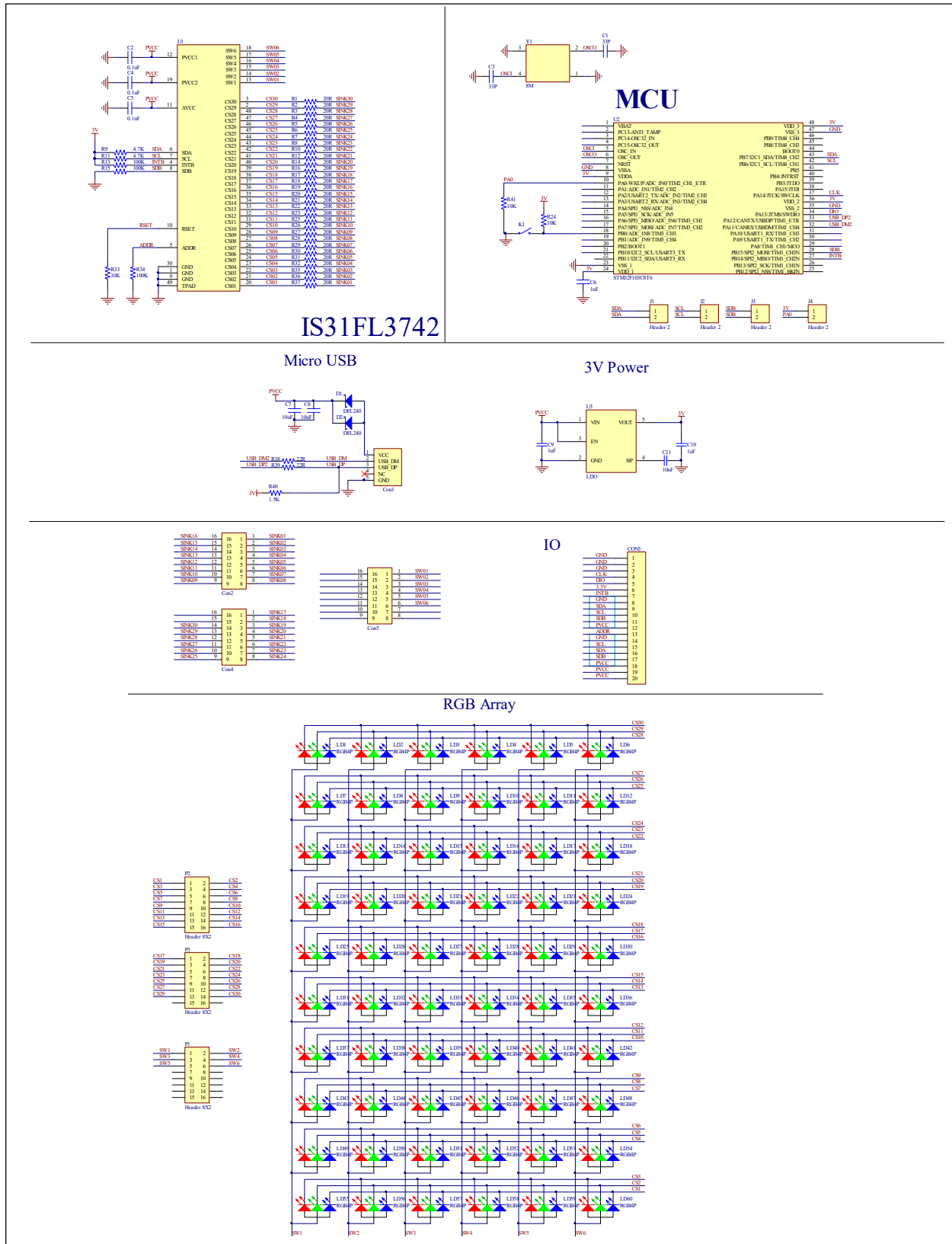
The Arduino hardware consists of an Atmel microcontroller with a bootloader allowing quick

firmware updates. First download the latest Arduino Integrated Development Environment IDE (1.6.12 or greater) from [www.arduino.cc/en/Main/Software](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 IS31FL3742 test firmware (sketch) from the ISSI website <http://www.issi.com/US/product-analog-fxled-driver.shtml>.

- 1) Open J4 and 3V.
- 2) Open PVCC and SDB.
- 3) Connect the 5 pins from Arduino board to IS31FL3742 EVB:
  - a) Arduino 5V pin to IS31FL3742 EVB PVCC.
  - b) Arduino GND to IS31FL3742 EVB GND.
  - c) Arduino SDA (A4) to IS31FL3742 EVB J1.
  - d) Arduino SCL (A5) to IS31FL3742 EVB J2.
  - e) If Arduino use 3.3V MCU VCC, connect 3.3V to IS31FL3742 EVB SDB, if Arduino use 5.0V MCU VCC, connect 5.0V to EVB SDB.  
(Arduino UNO is 5.0V, so SDB=5.0V)
- 4) Use the test code in appendix I or download the test firmware (sketch) from the ISSI website, a .txt file and copy the code to Arduino IDE, compile and upload to Arduino.
- 5) Run the Arduino code as appendix I.
- 6) In EVB code, the ADDR pin is pulled low via 100k, so the device address is 0x60. When J1~J4 are disconnect, the ADDR pin can be changed by connecting the ADDR as follows:
  - a) ADDR=VCC, device address=0x66.
  - b) ADDR=SCL, device address=0x62.
  - c) ADDR=SDA, device address=0x64.

**Please refer to the datasheet to get more information about IS31FL3742.**

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### BILL OF MATERIALS

| Name       | Symbol                                                                                     | Description                       | Qty | Supplier  | Part No.             |
|------------|--------------------------------------------------------------------------------------------|-----------------------------------|-----|-----------|----------------------|
| LED Driver | U1                                                                                         | Matrix LED Driver                 | 1   | ISSI      | IS31FL3742           |
| MCU        | U2                                                                                         | Microcontroller                   | 1   | STM       | STM32F103C8T6        |
| LDO        | U3                                                                                         | Linear Regulator                  | 1   | SGMICRO   | SGM2019-3.3V         |
| Diode      | LD1~LD60                                                                                   | RGB LED, SMD                      | 60  | Everlight | 9-237/R6GHBHC-A01/2T |
| Diode      | D1,D2                                                                                      | Diode, SMD                        | 2   | DIODES    | DFLS240              |
| Crystal    | Y1                                                                                         | Crystal, 8MHz                     | 1   | JB        | HC-49S               |
| Resistor   | R9,R11                                                                                     | RES,4.7k,1/16W,±5%,SMD            | 2   | Yageo     | RC0603JR-074K7L      |
| Resistor   | R13,R15,R34                                                                                | RES,100k,1/16W,±5%,SMD            | 3   | Yageo     | RC0603JR-07100KL     |
| Resistor   | R33,R41,R24                                                                                | RES,10k,1/16W,±5%,SMD             | 3   | Yageo     | RC0603JR-0710KL      |
| Resistor   | R40                                                                                        | RES,1.5k,1/16W,±5%,SMD            | 1   | Yageo     | RC0603JR-071K5L      |
| Resistor   | R38,R39                                                                                    | RES,22R,1/16W,±5%,SMD             | 2   | Yageo     | RC0603JR-0722RL      |
| Resistor   | R1,R4,R7,R12,<br>R17,R20,R23,R27,<br>R30,R35                                               | RES,20R,1/16W,±5%,SMD<br>(Note 1) | 10  | Yageo     | RC0603JR-0720RL      |
| Resistor   | R2,R3,R5,R6,R8,<br>R10,R14,R16,R18,<br>R19,R21,R22,R25,<br>R26,R28,R29,R31,<br>R32,R36,R37 | RES,20R,1/16W,±5%,SMD             | 20  | Yageo     | RC0603JR-0720RL      |
| Capacitor  | C2,C4,C5                                                                                   | CAP,0.1μF,16V,±20%,SMD            | 3   | Yageo     | CC0603KKX7R9BB104    |
| Capacitor  | C6,C9,C10                                                                                  | CAP,1μF,16V,±20%,SMD              | 3   | Yageo     | CC0603KKX7R9BB105    |
| Capacitor  | C1,C3                                                                                      | CAP,33pF,16V,±20%,SMD             | 2   | Yageo     | CC0603KKX7R9BB330    |
| Capacitor  | C11                                                                                        | CAP,10μF,16V,±20%,SMD             | 1   | Yageo     | CC0603KKX7R9BB103    |
| Capacitor  | C7,C8                                                                                      | CAP,10μF,16V, ±20%,SMD            | 2   | Yageo     | CC0805KKX7R9BB106    |
| Button     | K1                                                                                         | Button SMD                        | 1   |           |                      |

*Bill of Materials, refer to Figure 3 above.*

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

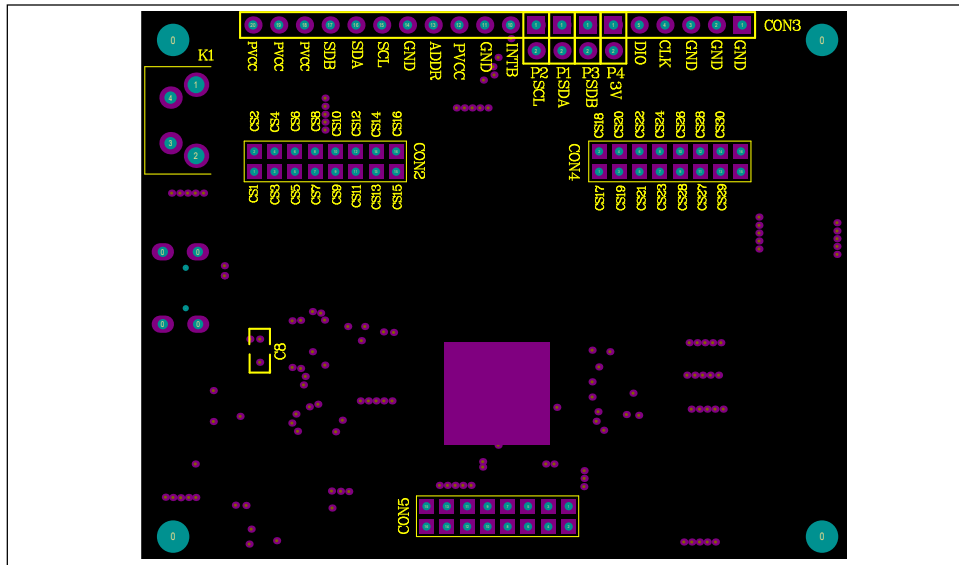


Figure 4: Board Component Placement Guide - Top Layer

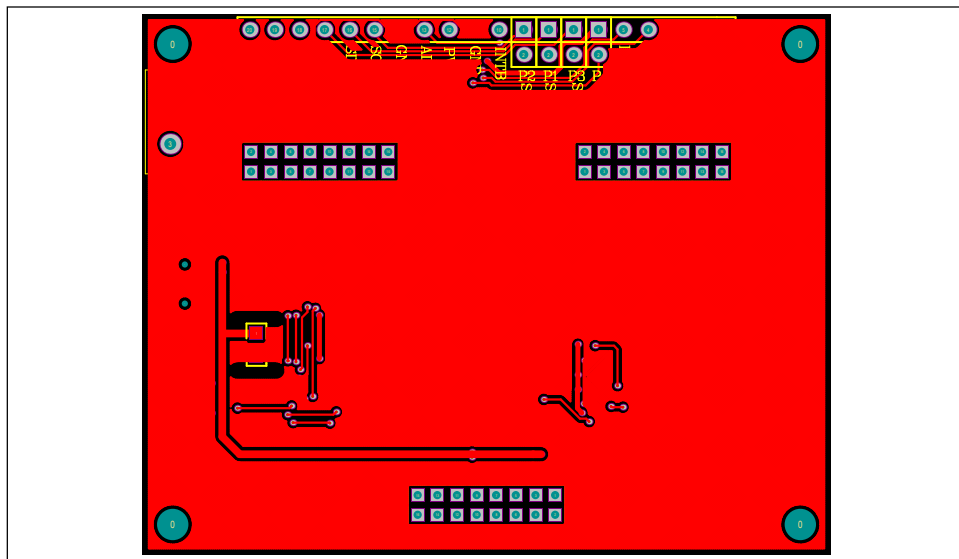


Figure 5: Board PCB Layout - Top Layer

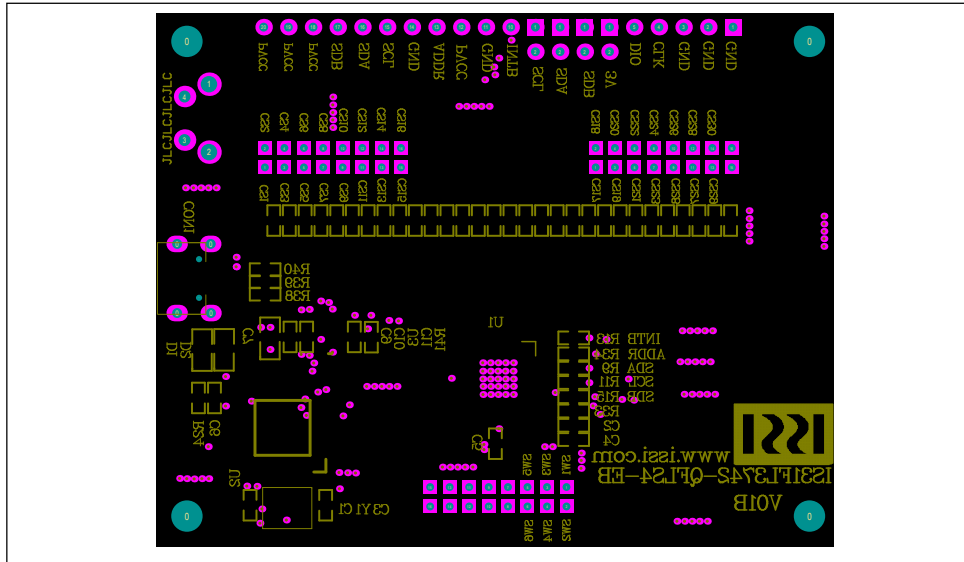


Figure 6: Board Component Placement Guide - Bottom Layer

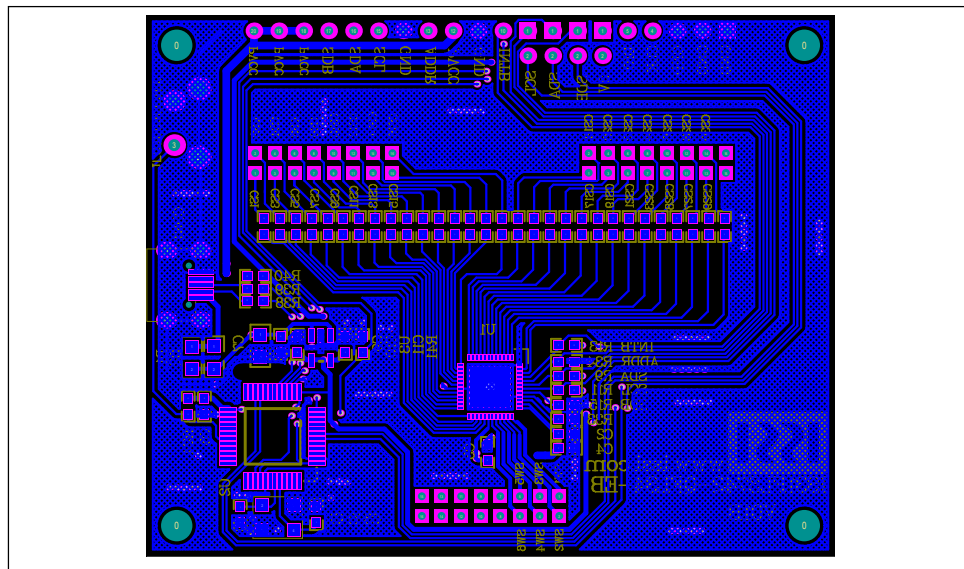


Figure 7: Board PCB Layout - Bottom Layer



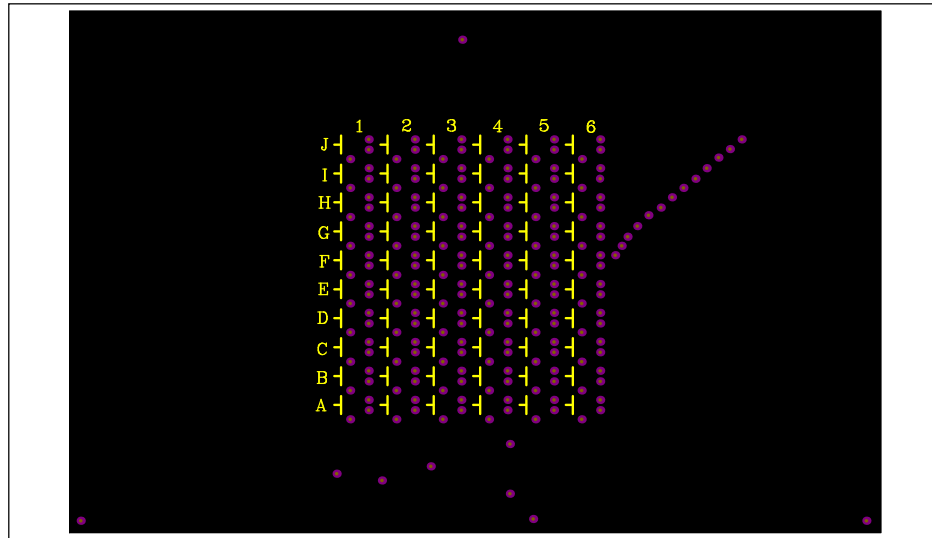


Figure 8: LED Board Component Placement Guide - Top Layer

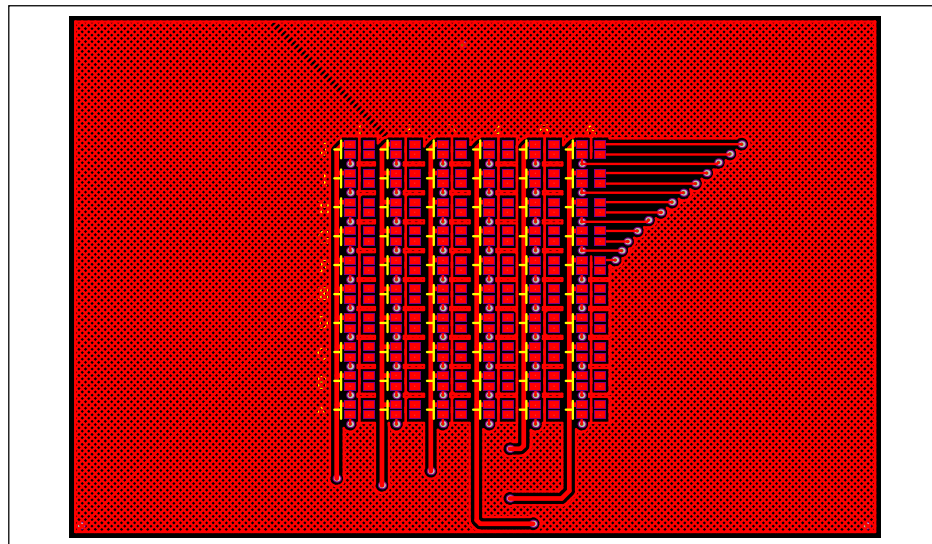


Figure 9: LED Board PCB Layout - Top Layer

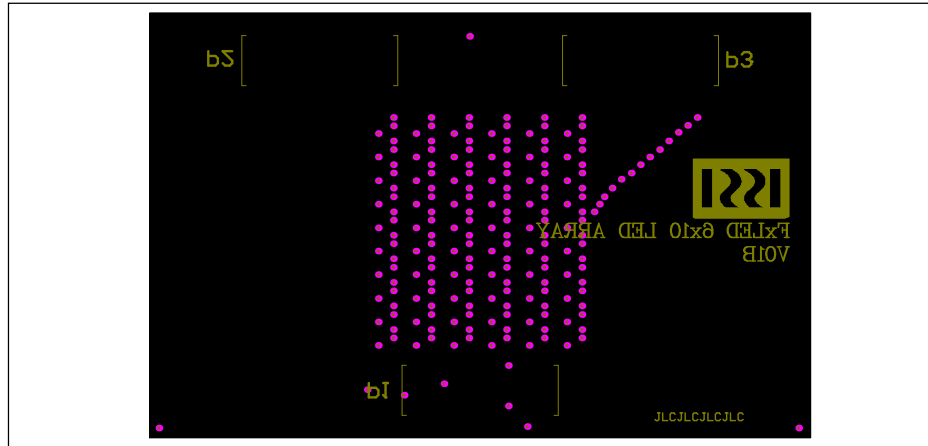


Figure 10: LED Board Component Placement Guide - Bottom Layer

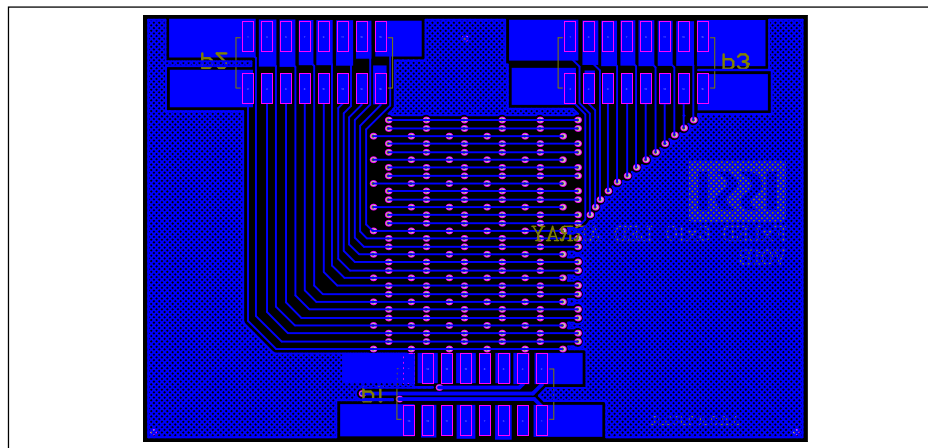


Figure 11: LED Board PCB Layout - Bottom Layer

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### REVISION HISTORY

| Revision | Detail Information | Date       |
|----------|--------------------|------------|
| A        | Initial release    | 2018.03.09 |

## APPENDIX I : IS31FL3742 Arduino Test Code V01A

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

#define Addr_GND 0x60
#define R 0xFF
#define G 0x00
#define B 0xFF
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(1000000);//I2C 1MHz
    Init_3742(R, G, B);
}

void loop() {
    IS31FL3742_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_3742(uint8_t Rdata, uint8_t Gdata, uint8_t Bdata)
{
    IS_IIC_WriteByte(Addr_GND,0xfe,0xc5);//unlock
    IS_IIC_WriteByte(Addr_GND,0xfd,0x02);//write page 2
    for(i=2;i<0xB4;i+=3)
```

## 30×6 DOTS MATRIX LED DRIVER

```

{
    IS_IIC_WriteByte(Addr_GND,i,Rdata);//R LED Scaling
}
for(i=1;i<0xB4;i+=3)
{
    IS_IIC_WriteByte(Addr_GND,i,Gdata);//G LED Scaling
}
for(i=0;i<0xB4;i+=3)
{
    IS_IIC_WriteByte(Addr_GND,i,Bdata);//B LED Scaling
}

IS_IIC_WriteByte(Addr_GND,0xfe,0xc5);//unlock
IS_IIC_WriteByte(Addr_GND,0xfd,0x00);//write page 0
for(i=0;i<0xB4;i++)
{
    IS_IIC_WriteByte(Addr_GND,i,0x00);//write all PWM set 0x00
}

IS_IIC_WriteByte(Addr_GND,0xfe,0xc5);//unlock
IS_IIC_WriteByte(Addr_GND,0xfd,0x04);//write page 4
IS_IIC_WriteByte(Addr_GND,0x01,0x7F);//global current
IS_IIC_WriteByte(Addr_GND,0x00,0x01);//normal operation
}

void IS31FL3742_Test_mode1(void)//
{
    IS_IIC_WriteByte(Addr_GND,0xfd,0x00);//write frist frame
    for (j=0;j<64;j++)//all LED ramping up
    {
        IS_IIC_WriteByte(Addr_GND,0xfe,0xc5);//unlock
        IS_IIC_WriteByte(Addr_GND,0xfd,0x00);//write page 0
        for(i=0;i<0xB4;i++)
        {
            IS_IIC_WriteByte(Addr_GND,i,pgm_read_byte_near(&PWM_Gama64[j]));//set all PWM
        }
        delay(10);//10ms
    }
    delay(1000); //keep on 1s

    for (j=63;j>0;j--)//all LED ramping down
    {
        IS_IIC_WriteByte(Addr_GND,0xfe,0xc5);//unlock
        IS_IIC_WriteByte(Addr_GND,0xfd,0x00);//write page 0
        for(i=0;i<0xB4;i++)

```

## 30×6 DOTS MATRIX LED DRIVER

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```
{  
    IS_IIC_WriteByte(Addr_GND,i,pgm_read_byte_near(&PWM_Gama64[j-1]));//set all PWM  
}  
IS_IIC_WriteByte(Addr_GND,0xfe,0xc5);//unlock  
  
    delay(10);//10ms  
}  
delay(500); //keep off 0.5s  
}
```

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