36 CHANNELS LED DRIVER EVALUATION BOARD GUIDE

DESCRIPTION

IS31FL3246A is comprised of 36 constant current channels, each channel can be pulse width modulated (PWM) by total 8 bits+10 bits (261890 steps) for smooth LED brightness control or color mixing control, 8 bits PWM (LFP) operate at 127Hz (can be disabled), 10 bits (HFP) operate at 32kHz, to minimize the audible noise. The output current of each channel can be set at up to 25mA (Max.), all channels are grouped as G group (OUT1, OUT4, OUT7...), R group (OUT2, OUT5, OUT8...), B group (OUT3, OUT6, OUT9...) and each group has an 8 bits output current control register which allows fine tuning the current for rich global RGB color mixing.

Proprietary programmable technology is used to minimize audible noise caused by MLCC decoupling capacitors. All registers can be programmed via a high speed I2C bus interface (1MHz).

FEATURES

- 2.7V to 5.5V supply
- Pin to Pin with IS31FL3236A/IS31FL3237 (QFN-44, 5mm×5mm)
- I2C with register address automatic increment
- Four selectable I2C addresses
- SDB rising edge reset I2C module
- Resistor sets operating current of 25mA (Max.)
- Accurate color rendition
  - Three 8-bit global DC current adjust
    - 8-bit DC current adjust for all green channels
    - 8-bit DC current adjust for all red channels
    - 8-bit DC current adjust for all blue channels
  - Each channel total 8-bit+10-bit PWM (261890 steps)
    - 8-bit PWM at 127Hz/254Hz/508Hz (LFP)
    - 10-bit/8-bit PWM at 32kHz (8-bit mode can be at 64kHz or 128kHz, HFP)
    - 14-bit with 4-bit dithering PWM at 32kHz
- Group dimming to reduce RGB coding
- EMI reduction technology
  - Selectable 6 phase delay
  - Selectable 180 degree clock phase
  - Spread Spectrum
- -40°C to +125°C extended industrial temperature range

QUICK START

Figure 1: Photo of IS31FL3246A 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 IS31FL3246A 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) Connect the ground terminal of the power supply to the GND and the positive terminal to the VCC. Or connect the DC power to the connector (TP1&TP4).

2) Turn on the power supply and pay attention to the supply current. If the current exceeds 1.2A, please check for circuit fault.

3) Enter the desired mode of display by toggling the MODE button.

ORDERING INFORMATION

Part No.	Temperature Range	Package
IS31FL3246A-QFLS4-EB	-40°C to +125°C (Industrial)	QFN-44, 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.

EVALUATION BOARD OPERATION

The IS31FL3246A evaluation board has six display modes. Toggling the MODE button (K1) can switch the modes.

1) (Default mode) The 12 RGB LEDs in the middle of the bard show a color changing light bar moving pattern.
2) Two groups of blue LED on above display a tailing effect move from right to left.
3) Two groups of blue LED on above display a tailing effect move in opposite directions.
4) Blue LED on above perform timer display.
5) Two groups of blue LED on above flash together from two sides to middle and then turn off slowly from both sides to middle.
6) The blue LEDs on above are put into four '8' digits and to show a twist effect.

Note: IS31FL3246A solely controls the FxLED function on the evaluation board

SOFTWARE SUPPORT

JP1 default setting is shorted. If it is set to open, the SDA, SCL and SDB pin are set to high impedance and the on-board MCU will be idle. External I2C and SDB signals can be connected to TP4 to control the IS31FL3246A LED driver. During external control mode, toggling the MODE button (K1) can switch the power of single blue color LED and power of RGB LED.
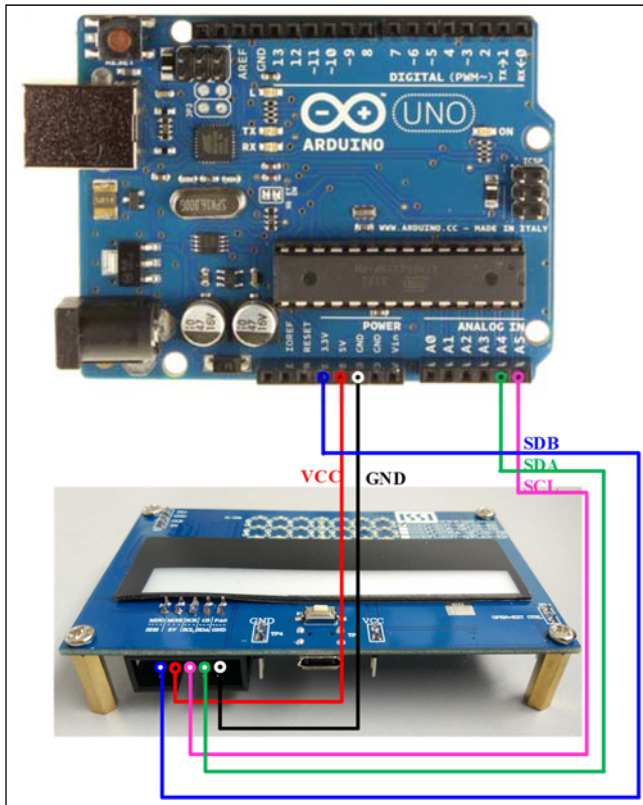

Figure 2: Photo of Arduino UNO connected to Evaluation Board

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 Arduino IS31FL3246A 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 IS31FL3246A EVB:
    a) Arduino 5V pin to IS31FL3246A EVB VCC.
    b) Arduino GND to IS31FL3246A EVB GND.
    c) Arduino SDA (A4) to IS31FL3246A EVB SDA.
    d) Arduino SCL (A5) to IS31FL3246A EVB SCL.
    e) If Arduino uses 3.3V MCU VCC, connect 3.3V to IS31FL3246A EVB SDB, if Arduino uses 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 Ⅱ or download the test firmware (sketch) from the Lumissil website, and copy the code to Arduino IDE, compile and upload to Arduino.
4) Run the Arduino code for desired mode setting by Arduino code.
5) During external control mode, toggling the MODE button (K1) can switch the power of single color LEDs and power of RGB LEDs.

Please refer to the datasheet to get more information about IS31FL3246A.

Figure 3: IS31FL3246A Application Schematic

BILL OF MATERIALS

Name	Symbol	Description	Qty	Supplier	Part No.
LED Driver	U1	36CH FxLED Driver	1	Lumissil	IS31FL3246A
LDO	U2	3.3V LDO	1	SGMICRO	SGM2019-3.3YN5G
MCU	U3	Microcontroller	1	STM	STM32F103C8T6
PMOS	U4	Dual PMOS	1	ANPEC	APM4953
Crystal	Y1	Crystal, 8MHz	1	HLX	HC-49S
LED	D1~D39	Diode, LED Blue, SMD	39	Everlight	19-217/BHC-ZL1M2RY/3T
LED	D40~D51	Diode, LED RGB, SMD	12	Everlight	99-235/RSGBB7C-A22/2D or 99-235/RGBC/TR8
Diode	DS1, DS2	Diode, SMD	2	DIODES	DFLS240
Resistor	R1	RES,3.3k,1/10W,±5%,SMD	1	Yageo	RC0603JR-073K3L
Resistor	R2~R3	RES,4.7k,1/10W,±5%,SMD	2	Yageo	RC0603JR-074K7L
Resistor	R4~R8	RES,100k,1/10W,±5%,SMD	5	Yageo	RC0603JR-07100KL
Resistor	R9	RES,1k,1/10W,±5%,SMD	1	Yageo	RC0603JR-071KL
Resistor	R10, R11	RES,22R,1/10W,±5%,SMD	1	Yageo	RC0603JR-0722RL
Resistor	R12	RES,1.5k,1/10W,±5%,SMD	1	Yageo	RC0603JR-071K5L
Resistor	R13	RES,10k,1/10W,±5%,SMD	1	Yageo	RC0603JR-0710KL
Capacitor	C2	CAP,100nF,16V,±20%,SMD	1	Yageo	CC0603MRX7R7BB104
Capacitor	C3, C5	CAP, 1µF,16V,±10%,SMD	2	Yageo	AC0805KKX7R7BB105
Capacitor	C4	CAP,10nF,16V,±10%,SMD	1	Yageo	CC0603KRX7R7BB103
Capacitor	C7, C8	CAP,33pF,50V,±5%,SMD	2	Yageo	CQ0603JRNPO9BN360
Capacitor	C9	CAP,10µF,16V,±20%,SMD	1	Yageo	CC0805KKX5R7BB106
Capacitor	C10, C11	CAP,4.7µF,16V,±20%,SMD	2	Yageo	CC0805KKX5R7BB475
Button	K1	Button SMD	1		

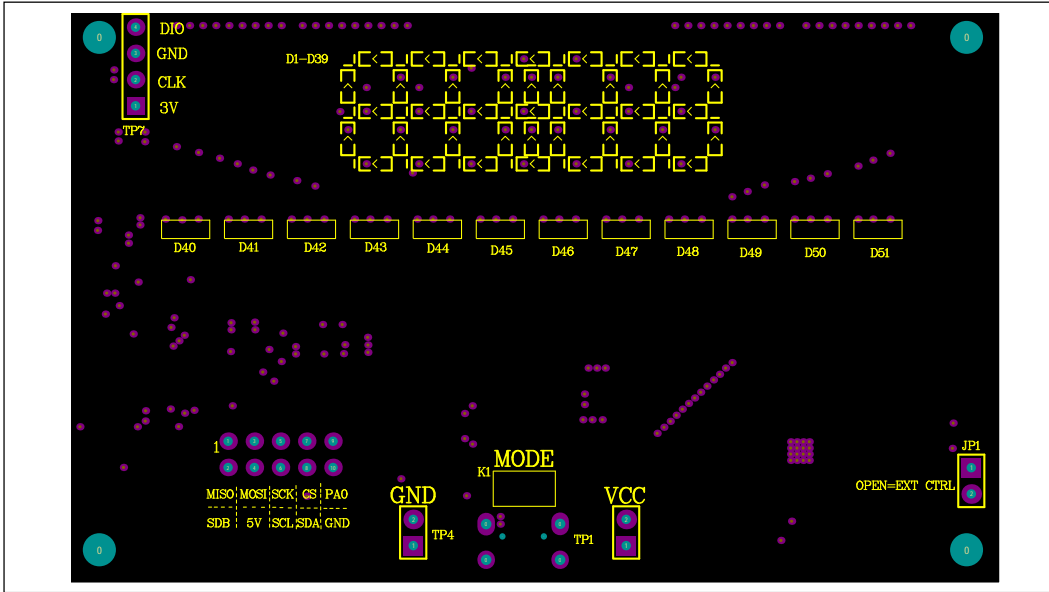*Bill of Materials, refer to Figure 3 above.*

Figure 4: Board Component Placement Guide - Top Layer

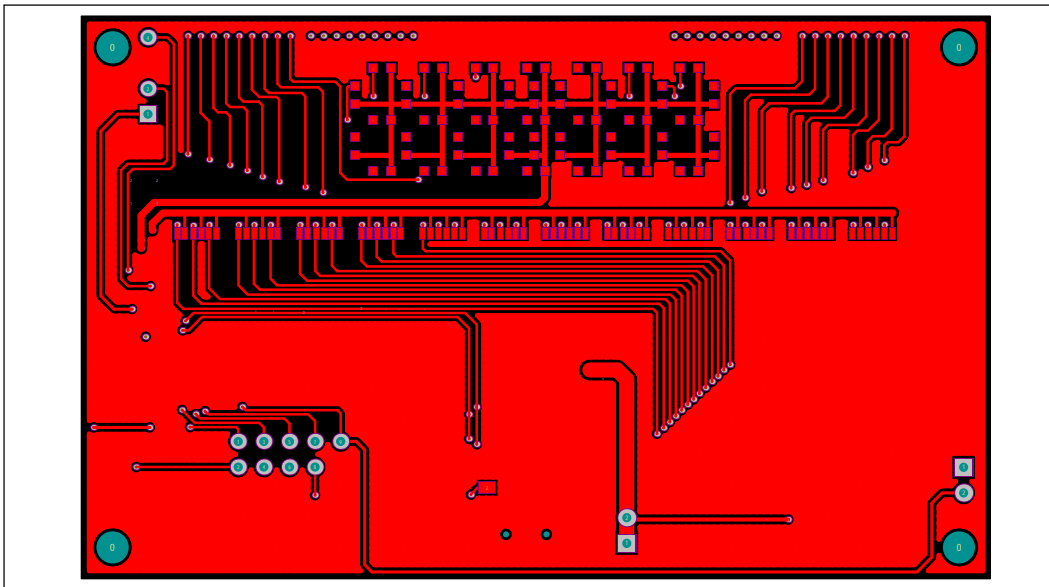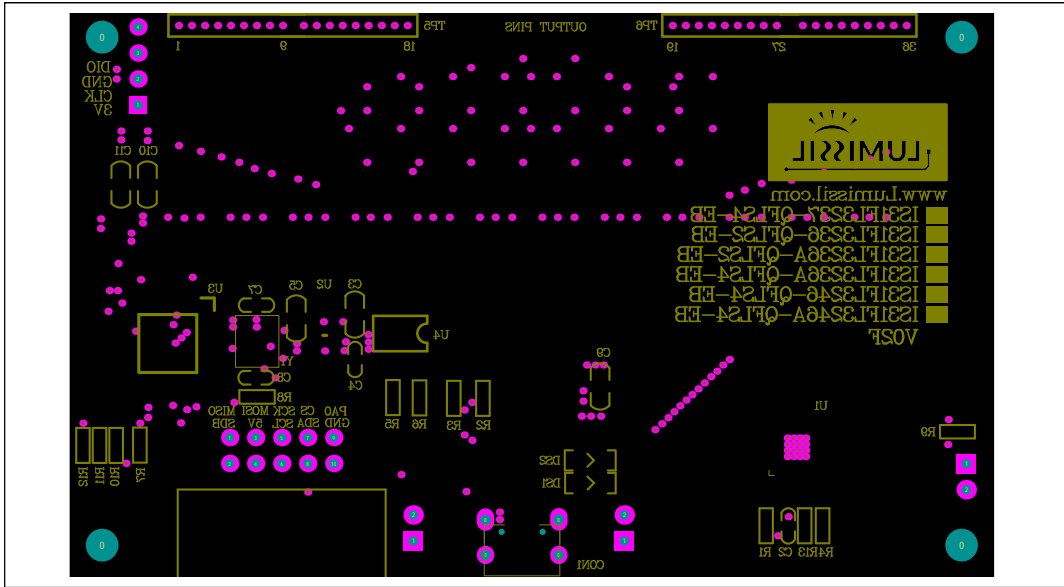*Figure 5: Board PCB Layout - Top Layer*

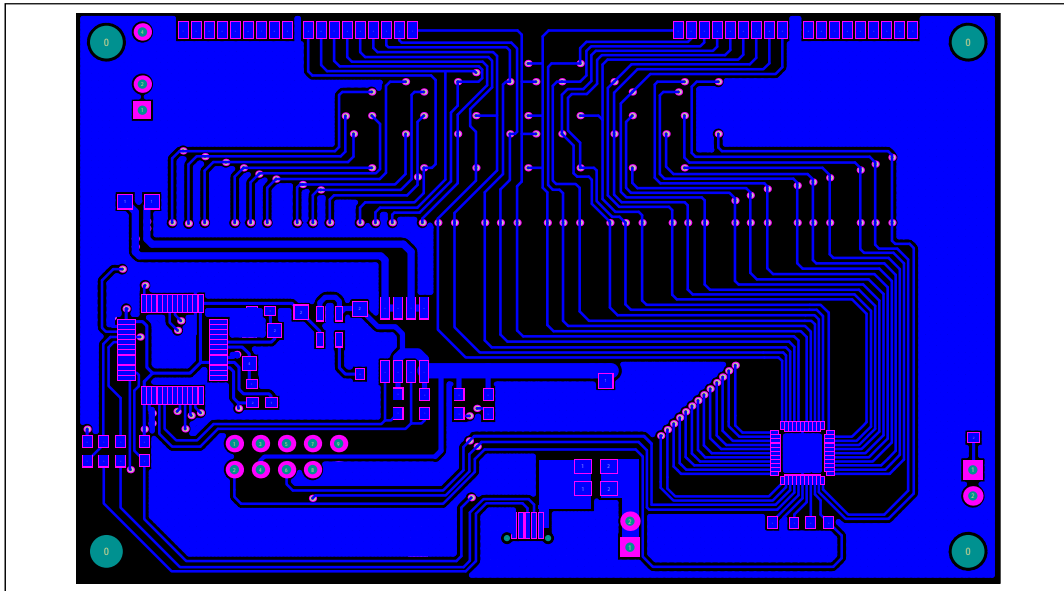*Figure 6: Board Component Placement Guide - Bottom Layer*

Figure 7: Board PCB Layout - Bottom Layer

REVISION HISTORY

Revision	Detail Information	Data
A	Initial Release	2022.02.09
B	Update the PCB and BILL OF MATERIALS	2023.12.12

APPENDIX ll: IS31FL3246A Arduino Test Code V01A

```
#include<Wire.h>
#include<avr/pgmspace.h>
#define Addr_GND 0x60
//7 bit format is 0x3F

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
};

void setup() {
   // put your setup code here, to run once:
   Wire.begin();
   Wire.setClock(400000);//I2C 400kHz
//   pinMode(4,OUTPUT);//SDB
//   digitalWrite(4,HIGH);//SDB_HIGH
   Init_FL3246A();
}

void loop() {
   // put your main code here, to run repeatedly:
     IS31FL3246A_mode1();//breath mode
}

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

void Init_FL3246A(void)
{
   uint8_t i = 0;
   for(i=0x49;i<=0x6C;i++)
   {
      IS_IIC_WriteByte(Addr_GND,i,0x80);//turn on all LED
   }

    for(i=0x01;i<=0x48;i++)
   {
      IS_IIC_WriteByte(Addr_GND,i,0x00);//write all HPWM set 0x00
   }

   IS_IIC_WriteByte(Addr_GND,0x6D,0x00);//update PWM & congtrol registers
   IS_IIC_WriteByte(Addr_GND,0x6E,0xFF);//Global current
   IS_IIC_WriteByte(Addr_GND,0x6F,0xFF);//Global current
   IS_IIC_WriteByte(Addr_GND,0x70,0xFF);//Global current
   IS_IIC_WriteByte(Addr_GND,0x00,0x01);//normal operation and set 32k HFPS & 120 LFPS 8bit
// write 0x11, set 64k HFPS & 240 LFPS 8bit
// write 0x31, set 128k HFPS & 480 LFPS 8bit
// write 0x03, set 32k HFPS & 120 LFPS 10bit

}

void IS31FL3246A_mode1(void)//white LED
{
   int8_t i = 0;
   int8_t j = 0;

   for(i=1;i<=24;i+=2)//R LED running
   {
      IS_IIC_WriteByte(Addr_GND,(i*3),0xFF);//set    HPWM_L
      IS_IIC_WriteByte(Addr_GND,0x6D,0x00);//update PWM & congtrol registers
```

```
        delay(80);//100ms
    }
    delay(500); //keep 0.5s

    for(i=23;i>0;i-=2)//G LED running
    {
        IS_IIC_WriteByte(Addr_GND,(i*3-2),0xFF);//set   HPWM_L
        IS_IIC_WriteByte(Addr_GND,0x6D,0x00);//update PWM & congtrol registers
        delay(80);//100ms
    }
    delay(500); //keep 0.5s

    for(i=1;i<=24;i+=2)//B LED running
    {
        IS_IIC_WriteByte(Addr_GND,(i*3+2),0xFF);//set   HPWM_L
        IS_IIC_WriteByte(Addr_GND,0x6D,0x00);//update PWM & congtrol registers
        delay(80);//100ms
    }
    delay(500); //keep 0.5s

     for (j=63;j>=0;j--)//all LED breath falling
    {
        for(i=1;i<=0x48;i+=2)
        {
            IS_IIC_WriteByte(Addr_GND,i,PWM_Gamma64[j]);//set all HPWM_L
        }
        IS_IIC_WriteByte(Addr_GND,0x6D,0x00);//update PWM & congtrol registers
        delay(30);//20ms
    }
    delay(500); //keep o 0.5s
}
```