36 CHANNELS LED DRIVER EVALUATION BOARD GUIDE

DESCRIPTION

IS31FL3236A is comprised of 36 constant current channels each with independent PWM control, designed for driving LEDs, PWM frequency can be 3kHz or 22kHz. The output current of each channel can be set at up to 38mA (Max.) by an external resistor and independently scaled by a factor of 1, 1/2, 1/3 and 1/4. The average LED current of each channel can be changed in 256 steps by changing the PWM duty cycle through an I2C interface.

The chip can be turned off by pulling the SDB pin low or by using the software shutdown feature to reduce power consumption.

FEATURES

- 2.7V to 5.5V supply
- I2C interface, automatic address increment function
- Four selectable I2C addresses
- SDB rising edge reset I2C module
- Internal reset register
- Modulate LED brightness with 256 steps PWM
- Each channel can be controlled independently
- Each channel can be scaled independently by 1, 1/2, 1/3 and 1/4
- PWM frequency selectable
  - 3kHz (default)
  - 22kHz
- -40°C to +85°C temperature range
- RoHS & Halogen-Free Compliance
- TSCA Compliance

QUICK START



Figure 1 Photo of IS31FL3236A Evaluation Board
(Please refer to Appendix I if MCU is LPC922)

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 IS31FL3236A 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 (DC IN) (From version V01C the DC in is replaced by a Micro-USB power in.).
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.

EVALUATION BOARD OPERATION

The IS31FL3236A 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 board show a color changing light bar moving pattern.
2) Two groups of blue LEDs display a tailing effect moving from right to left.
3) Two groups of blue LEDs display a tailing effect moving in opposite directions.
4) Blue LEDs perform digital number display.
5) Two groups of blue LEDs flash together from two sides to middle and then turn off slowly from both sides to middle.
6) The blue LEDs are put into four “8” digits and to show a twist light effect.

Note: IS31FL3236A solely controls the FxLED function on the evaluation board.

ORDERING INFORMATION

Part No.	Temperature Range	Package
IS31FL3236A-QFLS2-EB	-40°C to +85°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.

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 IS31FL3236A 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.

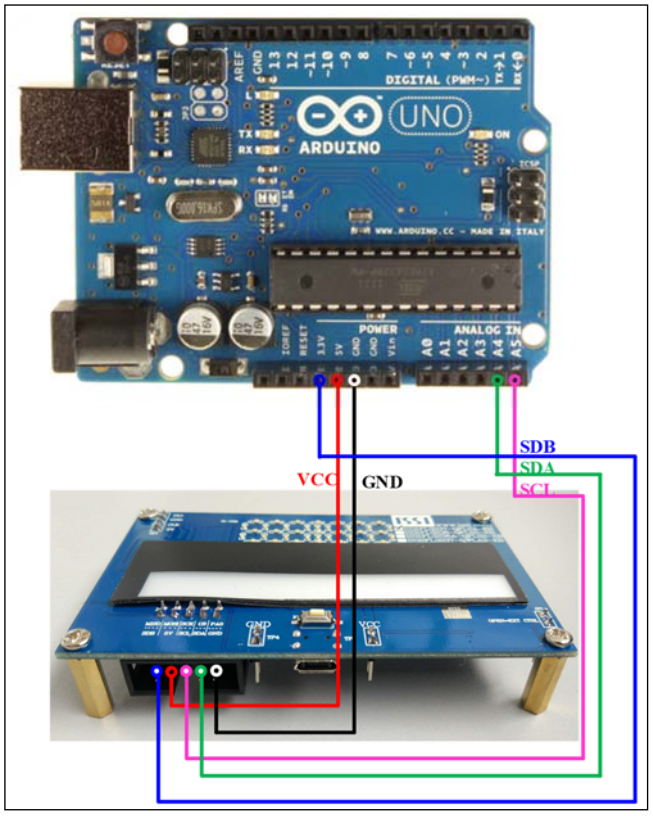


Figure 2 Photo of Arduino UNO connected to Evaluation Board

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 IS31FL3236A 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 IS31FL3236A EVB:
   a) Arduino 5V pin to IS31FL3236A EVB VCC.
   b) Arduino GND to IS31FL3236A EVB GND.
   c) Arduino SDA (A4) to IS31FL3236A EVB SDA.
   d) Arduino SCL (A5) to IS31FL3236A EVB SCL.
   e) If Arduino uses 3.3V MCU VCC, connect 3.3V to IS31FL3236A 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.
   (Some early version boards control the single color LEDs or RGB LEDs only, to switch between single color LEDs and RGB power, need to remove U4 and connect VCC to PIN7&8(RGB) or PIN5&6(Single color LED) on U4.)

Please refer to the datasheet to get more information about IS31FL3236A.

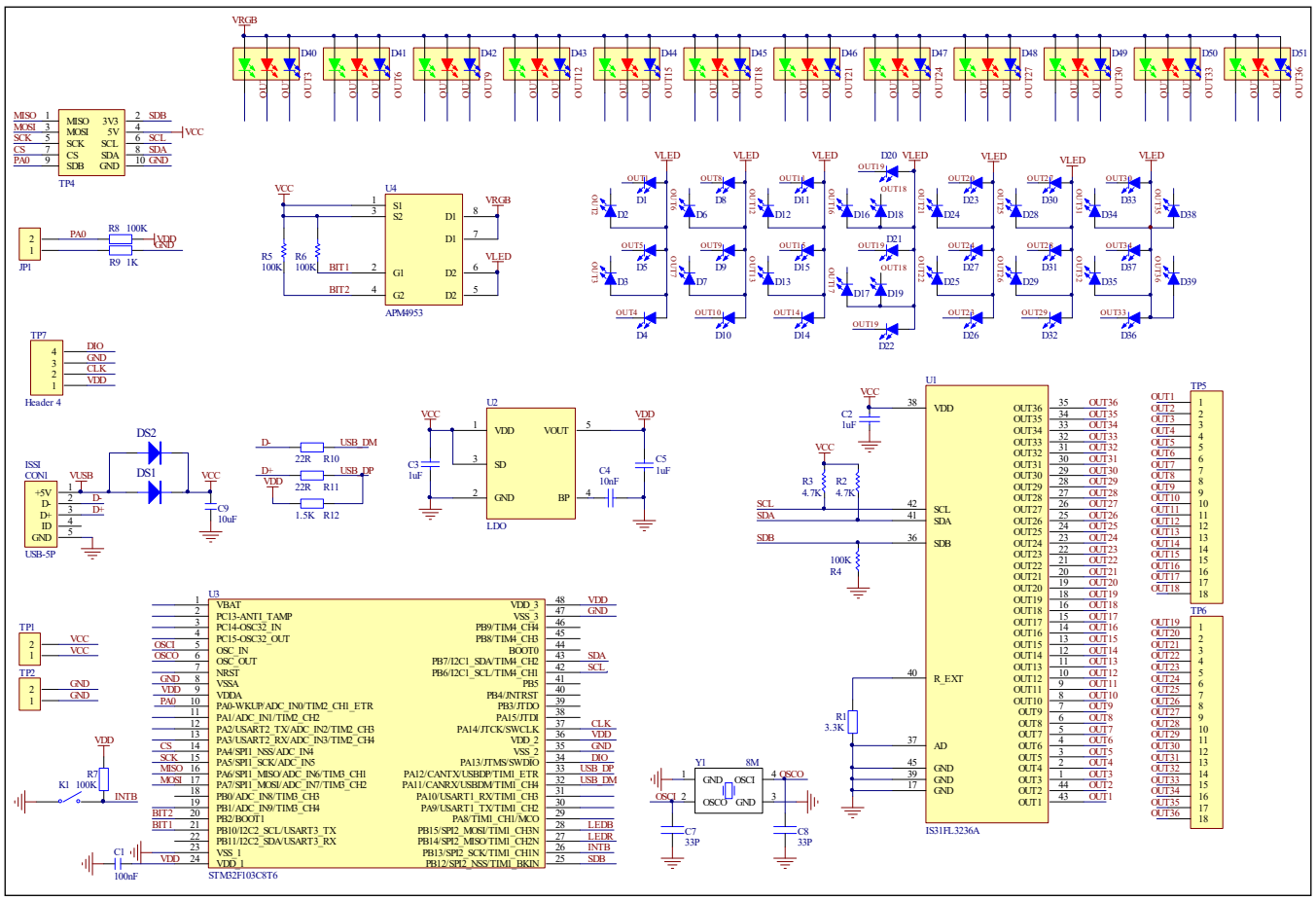


Figure 3 IS31FL3236A Application Schematic

BILL OF MATERIALS

Name	Symbol	Description	Qty	Supplier	Part No.
LED Driver	U1	36CH FxLED Driver	1	Lumissil	IS31FL3236A
LDO	U2	Low-dropout Regulator	1	PAM	PAM3101
MCU	U3	Microcontroller	1	STM	STM32F103C8T6
PMOS	U4	Dual PMOS	1	ANPEC	APM4953
Crystal	Y1	Crystal, 8MHz	1	JB	HC-49S
Diode	D1~D39	Diode, LED Blue, SMD	39	Everlight	19-217/BHC-ZL1M2RY/3T
Diode	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
Capacitor	C1	CAP,100nF,16V,±20%,SMD	1	Yageo	CC0603MRX7R7BB104
Capacitor	C2, C3, C5	CAP,1μF,16V,±10%,SMD	3	Yageo	CC0603KRX7R7BB105
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	CC0603MRX5R7BB106
Button	K1	Button SMD	1		

Bill of Materials, refer to Figure 3 above.

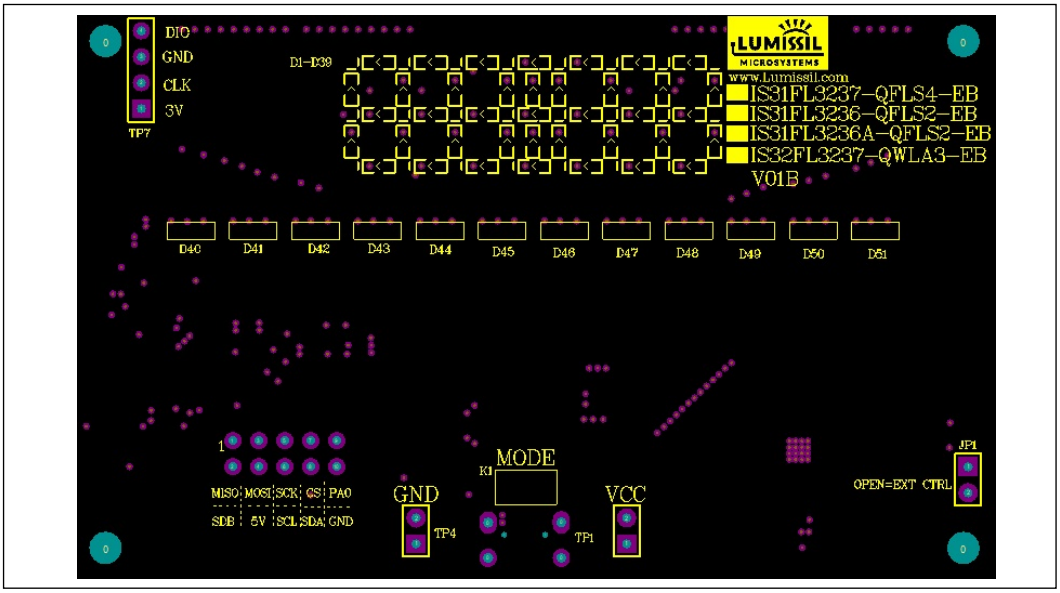


Figure 4 Board Component Placement Guide - Top Layer

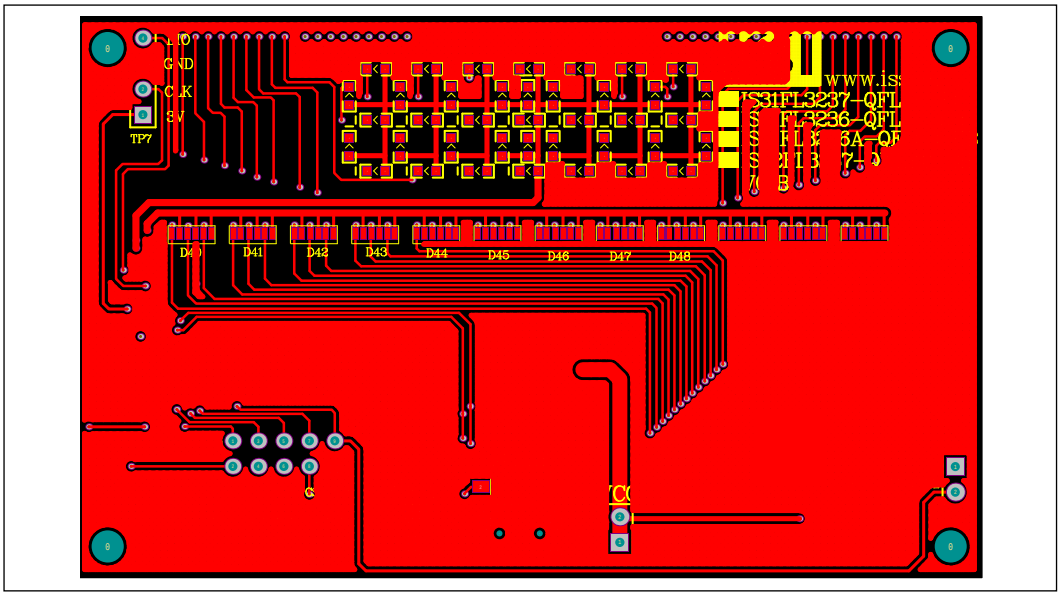


Figure 5 Board PCB Layout - Top Layer

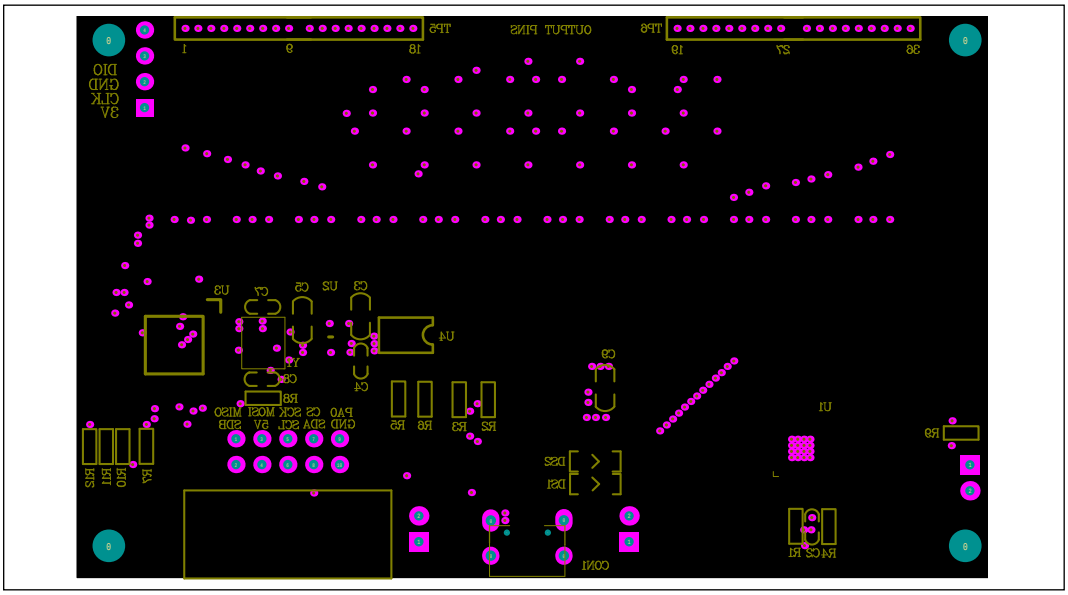


Figure 6 Board Component Placement Guide - Bottom Layer

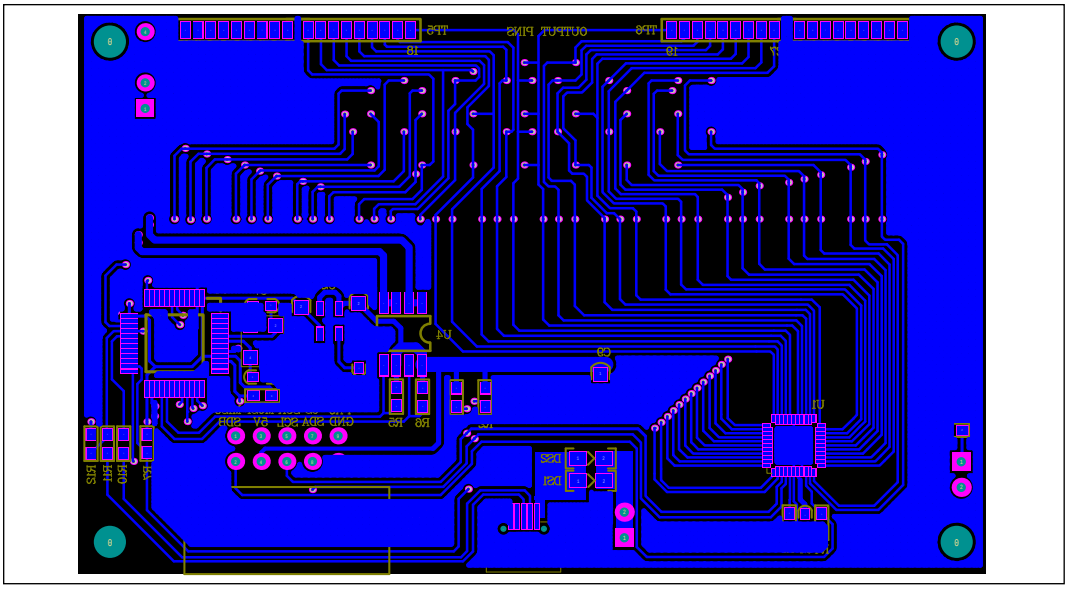


Figure 7 Board PCB Layout - Bottom Layer

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a.) the risk of injury or damage has been minimized;
b.) the user assume all such risks; and
c.) potential liability of Lumissil Microsystems is adequately protected under the circumstances

REVISION HISTORY

Revision	Detail Information	Data
A	Initial Release	2016.11.17
B	Remove IS31FL3236 option	2017.08.29
C	New cycle mode board	2017.08.29
D	Update to new MCU, update schematic and PCB layout	2018.12.19
E	Update the BOM	2021.05.08
F	Update the Arduino Code	2021.08.27
G	Update to new Lumissil logo and add RoHS	2025.02.14

APPENDIX Ⅰ: Rev. B Guide

DESCRIPTION

IS31FL3236A is comprised of 36 constant current channels each with independent PWM control, designed for driving LEDs. The output current of each channel can be set at up to 38mA (Max.) by an external resistor and independently scaled by a factor of 1, 1/2, 1/3 and 1/4. The average LED current of each channel can be changed in 256 steps by changing the PWM duty cycle through an I2C interface.

FEATURES

- 2.7V to 5.5V supply
- I2C interface, automatic address increment function
- Internal reset register
- Modulate LED brightness with 256 steps PWM
- Each channel can be controlled independently
- Each channel can be scaled independently by
- QFN-44 (5mm × 5mm) package

QUICK START



Figure 8 Photo of IS31FL3236A Evaluation Board (LPC922 Version)

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 IS31FL3236A 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 (DC IN) (from version V01C the DC in is replaced by a Micro-USB power in.).
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
IS31FL3236A-QFLS2-EB	-40°C to +85°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 IS31FL3236A 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 board show a color changing light bar moving pattern.
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4) Blue LEDs perform digital number display.
5) Two groups of blue LEDs flash together from two sides to middle and then turn off slowly from both sides to middle.
6) The blue LEDs are put into four “8” digits and to show a twist light effect.

Note: ***IS31FL3236A solely controls the FxLED function on the evaluation board.***

SOFTWARE SUPPORT

JP1 default setting is close circuit. If it is set to open, the on-board MCU will stop working. The I2C pins and SDB pin are set to High Impedance. External I2C and SDB signals can be connected to TP3 to control the IS31FL3236A LED driver.

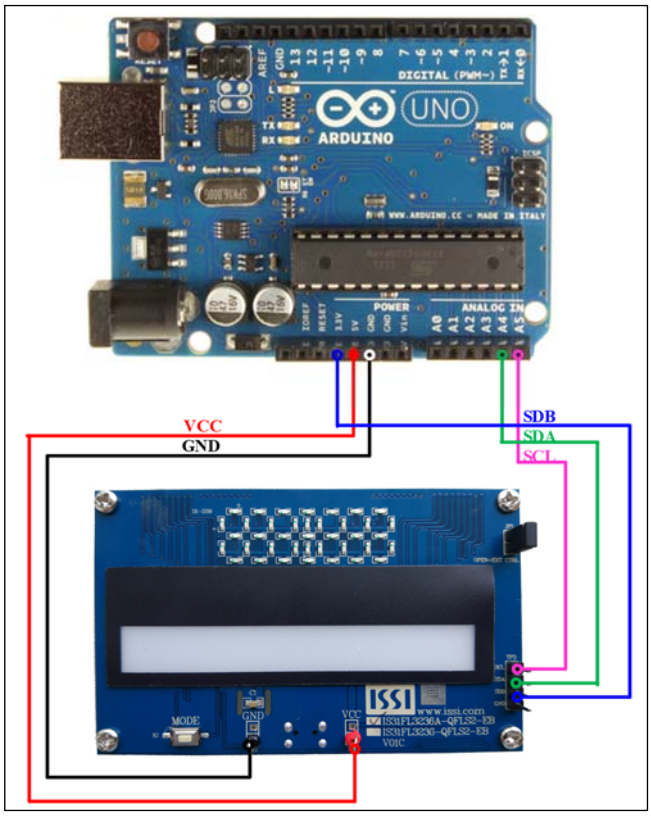


Figure 9 Photo of Arduino UNO connected to Evaluation Board

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

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1) Open JP1.
2) Connect the 5 pins from Arduino board to IS31FL3236A EVB:
   a) Arduino 5V pin to IS31FL3236A EVB VCC (TP1).
   b) Arduino GND to IS31FL3236A EVB GND (TP2).
   c) Arduino SDA (A4) to IS31FL3236A EVB SDA.
   d) Arduino SCL (A5) to IS31FL3236A EVB SCL.
   e) If Arduino use 3.3V MCU VCC, connect 3.3V to IS31FL3236A 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 Ⅱ 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 and the initial mode will change the RGB LED brightness every second. Note: the white color LEDs cannot be controlled when the onboard LPC922 is disabled.
   (Some early board we provided is still controlling the single color LED, if want to switch between single color LED and RGB, remove the U4 and connect the VCC to the LED+)

Please refer to the datasheet to get more information about IS31FL3236A.

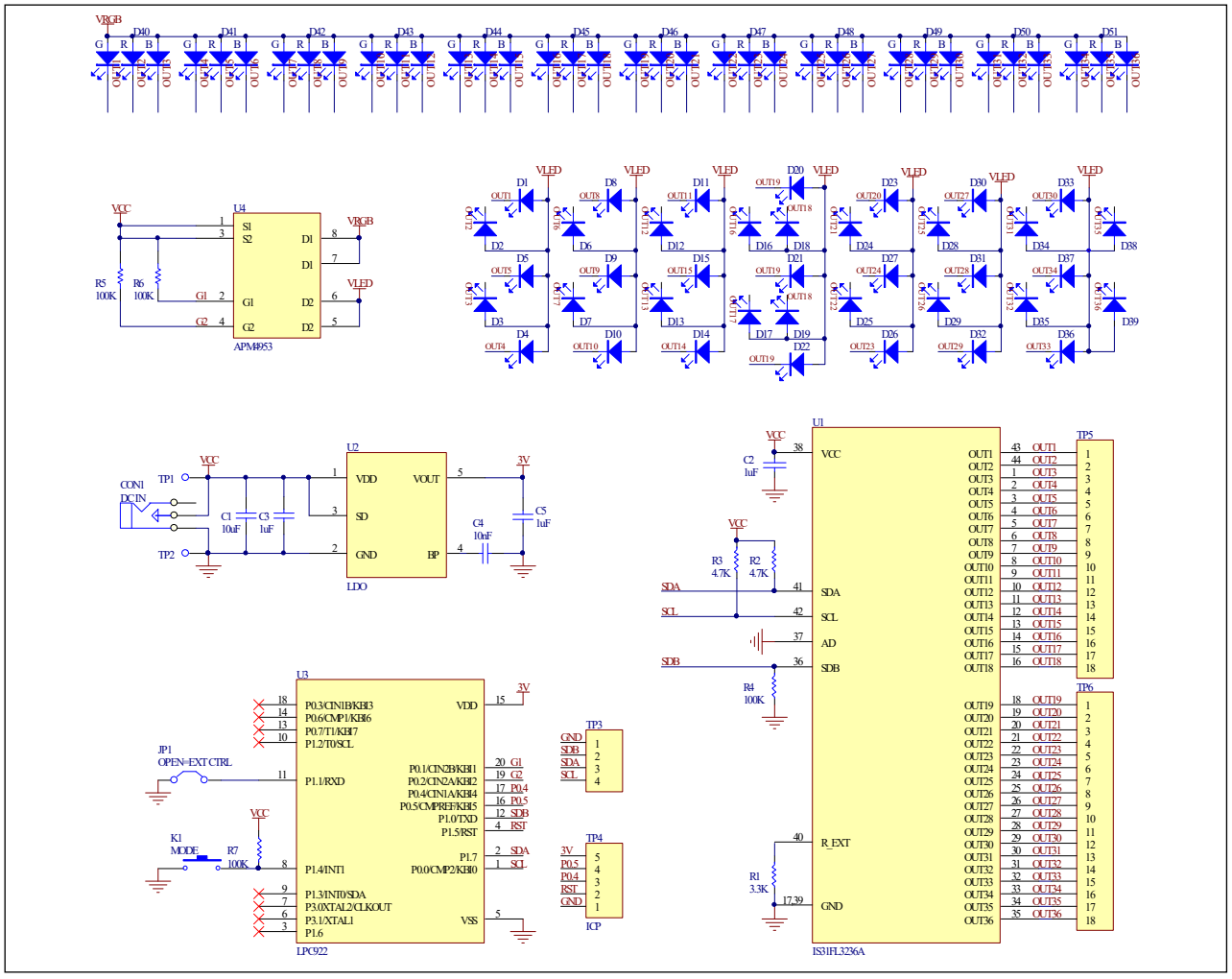


Figure 10 IS31FL3236A Application Schematic

BILL OF MATERIALS

Name	Symbol	Description	Qty	Supplier	Part No.
LED Driver	U1	36CH FxLED Driver	1	Lumissil	IS31FL3236A
LDO	U2	Low-dropout Regulator	1	PAM	PAM3101
MCU	U3	Microcontroller	1	NXP	LPC922
PMOS	U4	Dual PMOS	1	ANPEC	APM4953
Diode	D1~D39	Diode, LED Blue, SMD	39	Everlight	19-217/BHC-ZL1M2RY/3T
Diode	D40~D51	Diode, LED RGB, SMD	12	Everlight	99-235/RSGBB7C-A22/2D or 99-235/RGBC/TR8
Resistor	R1	RES,3.3k,1/16W,±5%,SMD	1	Yageo	RC0603JR-073K3L
Resistor	R2~R3	RES,4.7k,1/16W,±5%,SMD	2	Yageo	RC0603JR-074K7L
Resistor	R4~R7	RES,100k,1/16W,±5%,SMD	4	Yageo	RC0603JR-07100KL
Capacitor	C1	CAP,10μF,16V,±20%,SMD	1	Yageo	CC0603KKX7R9BB106
Capacitor	C2,C3,C5	CAP,1μF,16V,±20%,SMD	3	Yageo	CC0603KKX7R9BB105
Capacitor	C4	CAP,10nF,16V,±20%,SMD	1	Yageo	CC0603KKX7R9BB103
Button	K1	Button SMD	1		

Bill of Materials, refer to Figure 10 above.

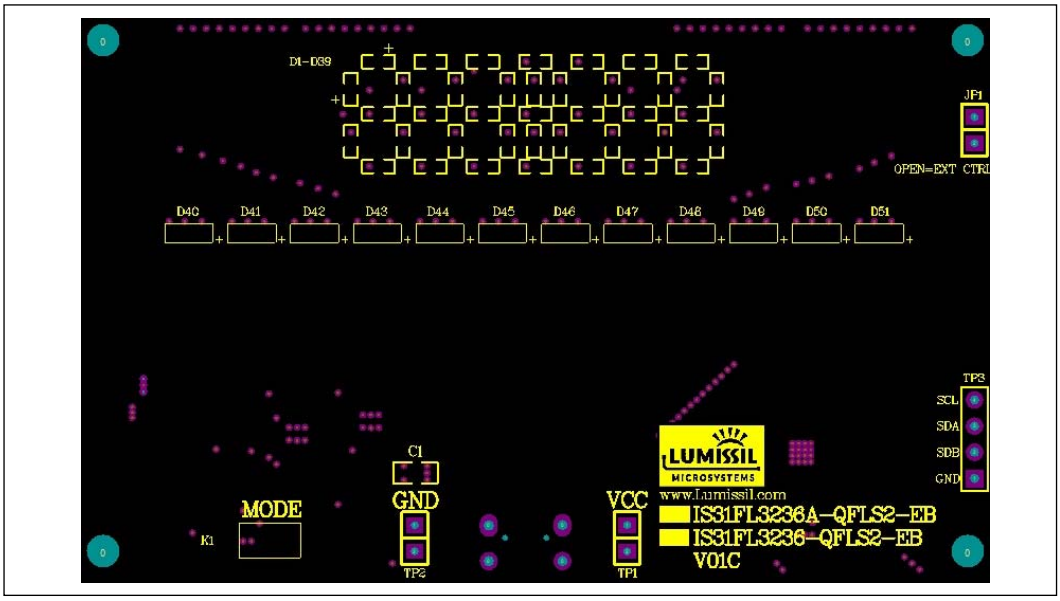


Figure 11 Board Component Placement Guide - Top Layer

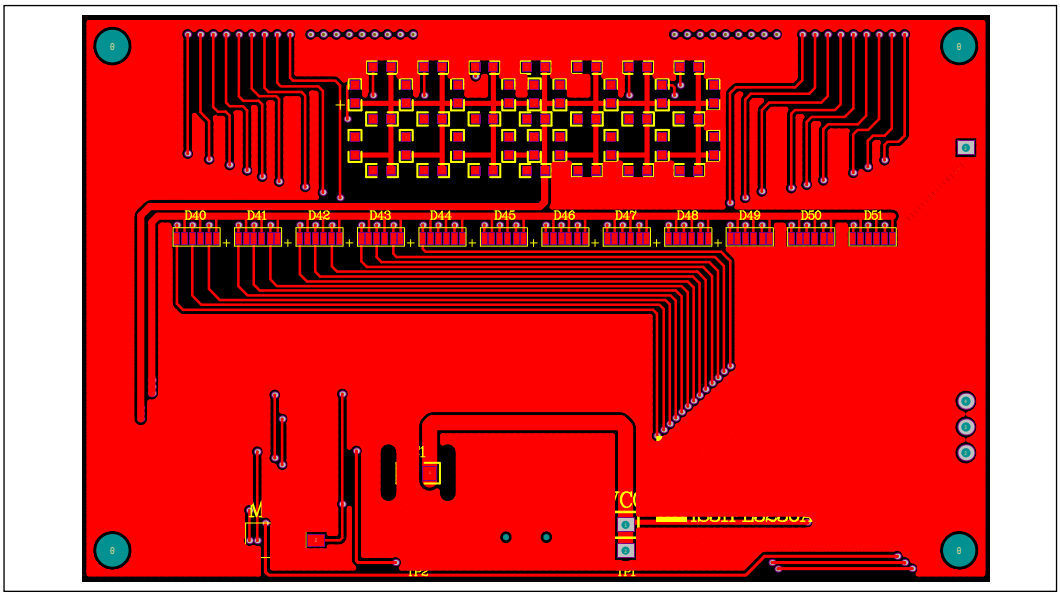


Figure 12 Board PCB Layout - Top Layer

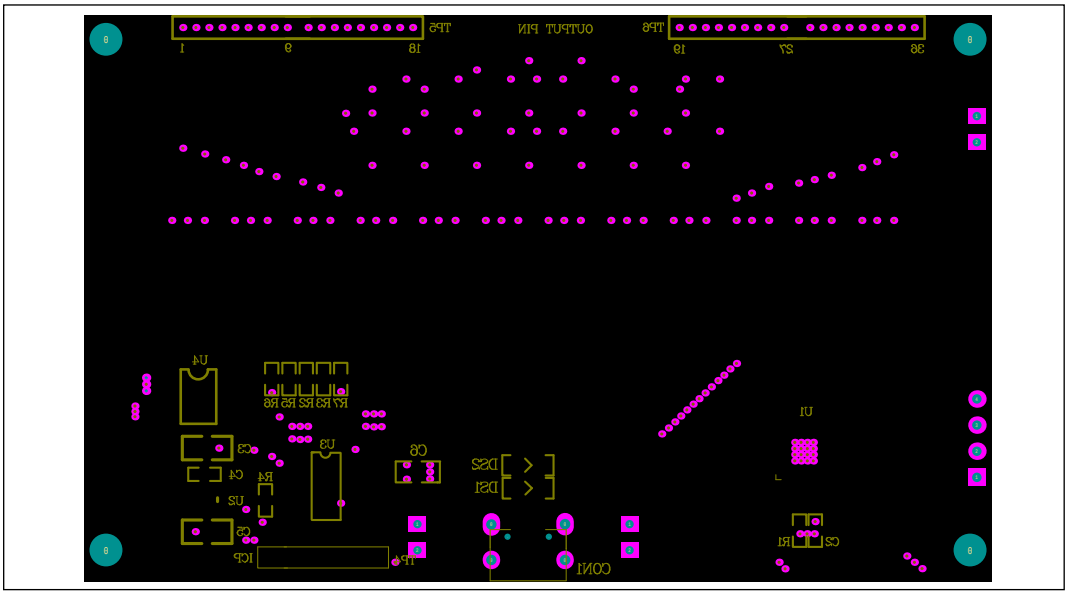


Figure 13 Board Component Placement Guide - Bottom Layer

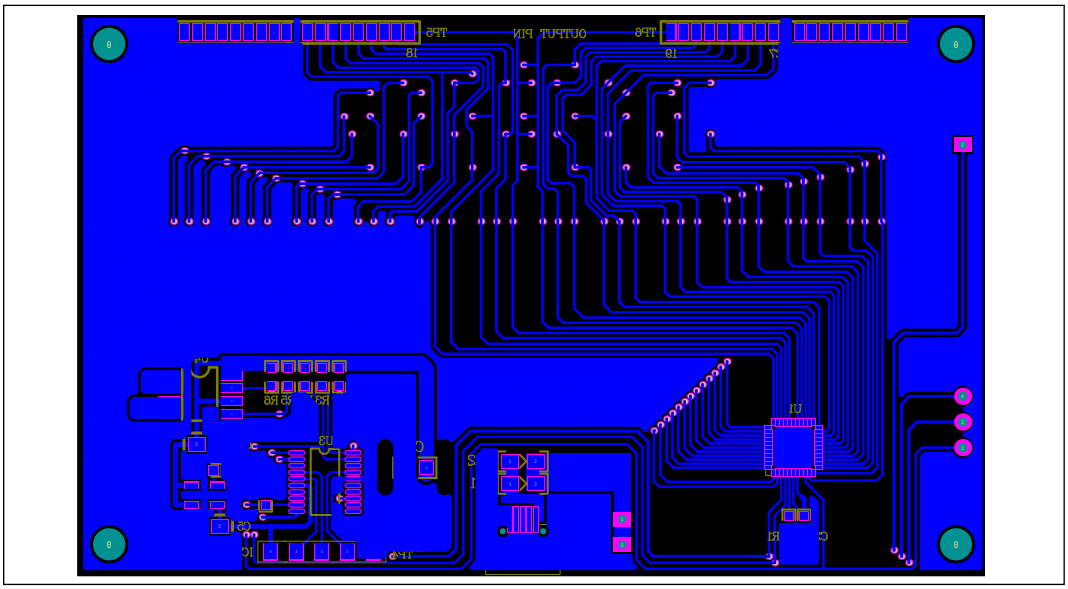


Figure 14 Board PCB Layout - Bottom Layer

APPENDIX Ⅱ: IS31FL3236A Arduino Test Code V01B

```
#include<Wire.h>
#include<avr/pgmspace.h>
#define Addr_GND 0x78
//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_FL3236A();
}

void loop() {
   // put your main code here, to run repeatedly:
    IS31FL3236A_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_FL3236A(void)
{
   uint8_t i = 0;
   for(i=0x26;i<=0x49;i++)
   {
      IS_IIC_WriteByte(Addr_GND,i,0xff);//turn on all LED
   }

    for(i=0x01;i<=0x24;i++)
   {
      IS_IIC_WriteByte(Addr_GND,i,0x00);//write all PWM set 0x00
   }

   IS_IIC_WriteByte(Addr_GND,0x25,0x00);//update PWM & congtrol registers
   IS_IIC_WriteByte(Addr_GND,0x4B,0x01);//frequency setting 22KHz
   IS_IIC_WriteByte(Addr_GND,0x00,0x01);//normal operation
}

void IS31FL3236A_mode1(void)//white LED
{
   uint8_t i = 0;
   int8_t j = 0;

   for(i=1;i<13;i++)//R LED running
   {
      IS_IIC_WriteByte(Addr_GND,(i*3-1),0xFF);//set   PWM
      IS_IIC_WriteByte(Addr_GND,0x25,0x00);//update PWM & congtrol registers
      delay(100);//100ms
   }
   delay(500); //keep 0.5s

   for(i=12;i>0;i--)//G LED running
   {
      IS_IIC_WriteByte(Addr_GND,(i*3-2),0xFF);//set   PWM
```

```
      IS_IIC_WriteByte(Addr_GND,0x25,0x00);//update PWM & congtrol registers
      delay(100);//100ms
   }
   delay(500); //keep 0.5s

   for(i=1;i<13;i++)//B LED running
   {
      IS_IIC_WriteByte(Addr_GND,(i*3-0),0xFF);//set    PWM
      IS_IIC_WriteByte(Addr_GND,0x25,0x00);//update PWM & congtrol registers
      delay(100);//100ms
   }
   delay(500); //keep 0.5s

    for (j=63;j>=0;j--)//all LED breath falling
   {
       for(i=1;i<37;i++)
      {
         IS_IIC_WriteByte(Addr_GND,i,PWM_Gamma64[j]);//set all PWM
      }
      IS_IIC_WriteByte(Addr_GND,0x25,0x00);//update PWM & congtrol registers
      delay(20);//20ms
   }
   delay(500); //keep o 0.5s
}
```