

18 CHANNELS LED DRIVER EVALUATION BOARD GUIDE

DESCRIPTION

IS31FL3208 is comprised of 18 constant current channels each with independent PWM control, designed for driving LEDs, PWM frequency can be 23kHz (default) or 3.45kHz. 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, 11/12, 9/12 and 7/12. 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
- Modulate LED brightness with 256 steps PWM
- Each channel can be scaled independently by 1, 11/12, 9/12 and 7/12
- PWM frequency selectable
 - 23kHz (default)
 - 3.45kHz
- -40°C to +125°C temperature range
- QFN-28 (4mm × 4mm) package

QUICK START



Figure 1: Photo of IS31FL3208 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 IS31FL3208 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 last two pins (Bottom & Left) of TP1 to enable the control of board MCU (default status).
- 2) Connect the 5VDC power to VCC/GND of TP1, or plug in the USB power input to micro-USB.
- 3) 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 IS31FL3208 evaluation board has five display modes. Press K1 to switch configurations:

Note: See Appendix for each mode's detail.

- 4) Two groups single color LEDs chasing each other-A.
- 5) Two groups single color LEDs chasing each other-B.
- 6) Three groups single color LEDs chase after each other.
- 7) Chasing cycle.
- 8) RGB LEDs (RGB1-RGB6) are breathing effect A-mixed color.
- 9) RGB LEDs (RGB1-RGB6) are breathing effect B.

Note: IS31FL3208 solely controls the FxLED function on the evaluation board.

ORDERING INFORMATION

Part No.	Temperature Range	Package
IS31FL3208-QFLS4-EB	-40°C to +125°C, Industrial	QFN-28, Lead-free

Table 1: Ordering Information

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

SOFTWARE SUPPORT

P1 (EXT CTRL) default setting is closed (jumper on). If it is open (when the EVB is powered on by 5V DC or micro-USB, no jumper P1), 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 IS31FL3208 LED driver, the on-board MCU will also configure the U4 to open the VLED (Single color LED+) and close the VRGB.

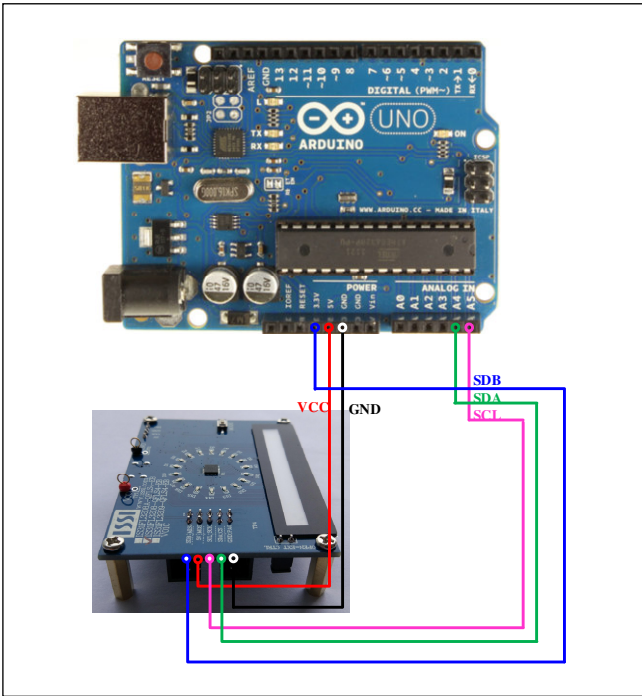


Figure 2: Photo of Arduino UNO connected to Evaluation Board

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 IS31FL3208 test firmware (sketch) from the ISSI website <http://www.issi.com/US/product-analog-fxled-driver.shtml>.

- 1) Keep the P1 shorted.
- 2) Power on the Arduino UNO.
- 3) Connect the 2 pins from Arduino board to IS31FL3208 EVB:
 - a) Arduino GND to IS31FL3208 EVB GND (TP1).
 - b) Arduino 5V pin to IS31FL3208 EVB VCC (TP2).
- The on-board MCU will start to run in default mode (Mode1).
- 4) Open the P1, the on-board configure the SDA/SCL/SDB to Hi-Z status, all LEDs are turned off.
- 5) Connect the 3 pins from Arduino board to IS31FL3208 EVB:
 - a) Arduino SDA (A4) to IS31FL3208 EVB SDA (TP3).
 - b) Arduino SCL (A5) to IS31FL3208 EVB SCL (TP3).
 - c) If Arduino use 3.3V MCU VCC, connect 3.3V to IS31FL3208 EVB SDB, if Arduino use 5.0V MCU VCC, connect 5.0V to EVB SDB (TP3). (Arduino UNO is 5.0V, so SDB=5.0V)
- 6) 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.
- 7) Run the Arduino code and the single LED will run the Arduino code. If need to swap to RGB display, one way is de-soldering the U4 and short the U4's pin 3 and pin 5 or pin 6 to enable the power of RGB.

Please refer to the datasheet to get more information about IS31FL3208.

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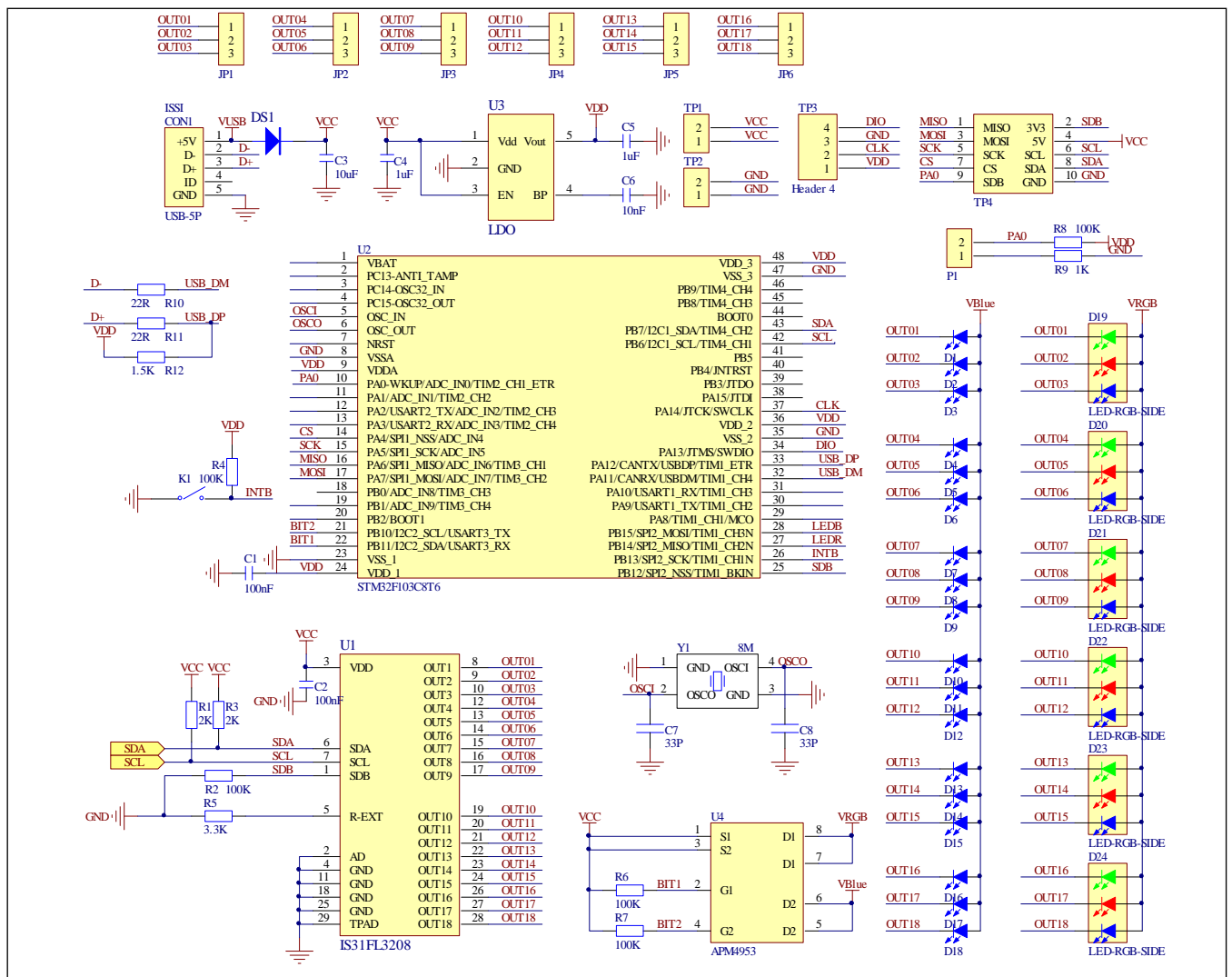


Figure 3: IS31FL3208 Application Schematic

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BILL OF MATERIALS

Name	Symbol	Description	Qty	Supplier	Part No.
LED Driver	U1	Matrix LED Driver	1	ISSI	IS31FL3208
MCU	U2	Microcontroller	1	STM	STM32F103C8T6
LDO	U3	3.0V LDO	1	SGMICRO	SGM2019-3.0YN5G
PMOS	U4	PMOS	1	ANPEC	APM4953
LED	D1~D18	LED, SMD Blue	18	EVERLIGHT	19-217/BHC-AN1P2/3T
RGB LED	D19~D24	RGB LED, SMD	6	ROHM	SMLV56RGB1W1
Diode	DS1	Diode, SMD	1	DIODES	DFLS240
Crystal	Y1	Crystal, 8MHz	1	HLX	HC-49S
Resistor	R2,R4, R6,R7,R8	RES,100k,1/16W,±5%,SMD	5	Yageo	RC0603JR-07100KL
Resistor	R1,R3	RES,2K,1/16W,±5%,SMD	2	Yageo	RC0603JR-072KL
Resistor	R9	RES,1K,1/16W,±5%,SMD	1	Yageo	RC0603JR-071KL
Resistor	R5	RES,3.3K,1/16W,±5%,SMD	1	Yageo	RC0603JR-073K3L
Resistor	R10,R11	RES,1.5K,1/16W,±5%,SMD	2	Yageo	RC0603JR-071K5L
Resistor	R12	RES,22R,1/16W,±5%,SMD	1	Yageo	RC0603JR-0722RL
Capacitor	C7,C8	CAP,33pF,16V,±20%,SMD	2	Yageo	CC0603KKX7R9BB330
Capacitor	C4,C5	CAP,1µF,16V,±20%,SMD	2	Yageo	CC0603KKX7R9BB105
Capacitor	C6	CAP,10nF,16V,±20%,SMD	1	Yageo	CC0603KKX7R9BB103
Capacitor	C3	CAP,10µF,16V,±20%,SMD	1	Yageo	CC0805KKX7R9BB106
Capacitor	C1,C2	CAP,100nF,16V,±20%,SMD	2	Yageo	CC0603KKX7R9BB104
Button	K1(Bottom)	Button	1		
Micro USB	CON1	Micro USB	1		

Bill of Materials, refer to Figure 3 above.

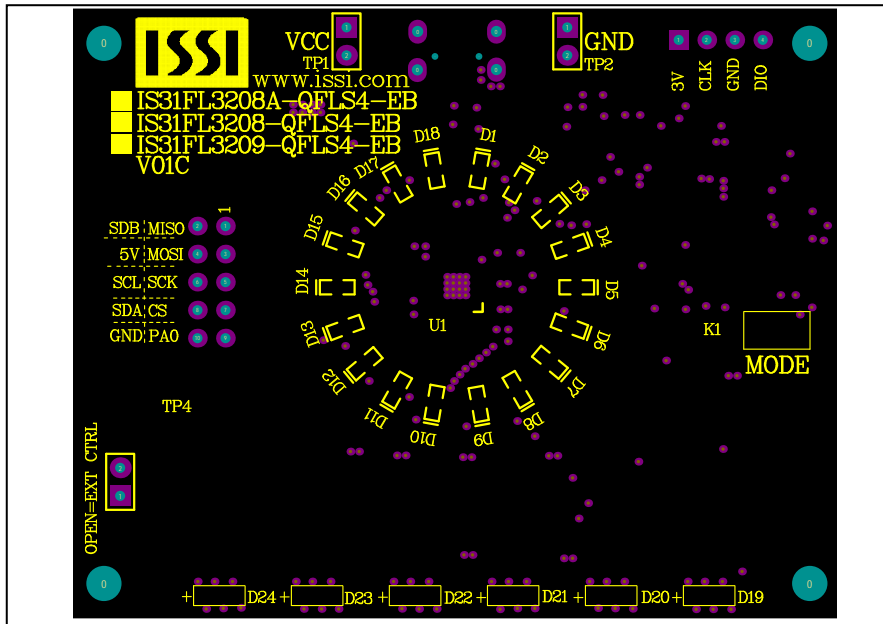


Figure 4: Board Component Placement Guide - Top Layer

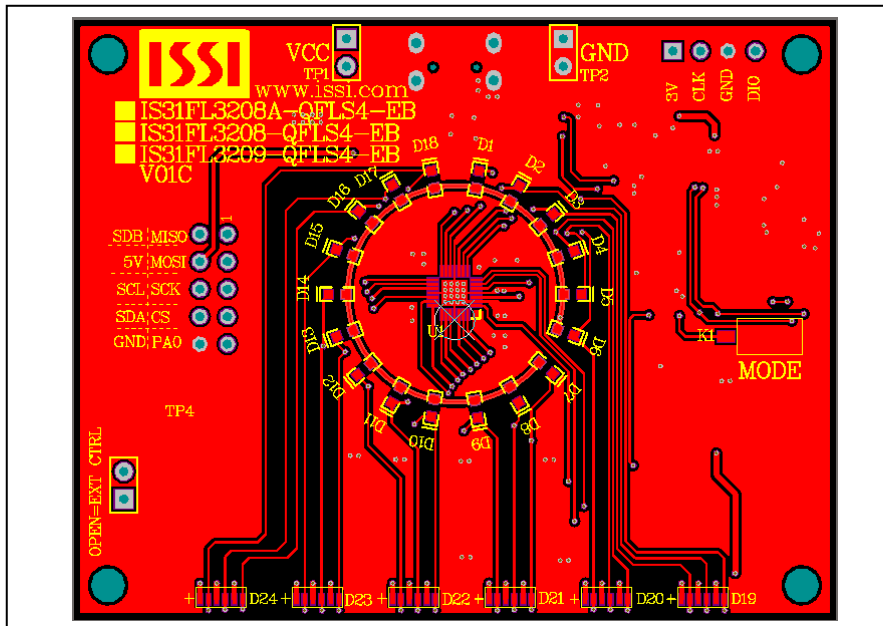


Figure 5: Board PCB Layout - Top Layer

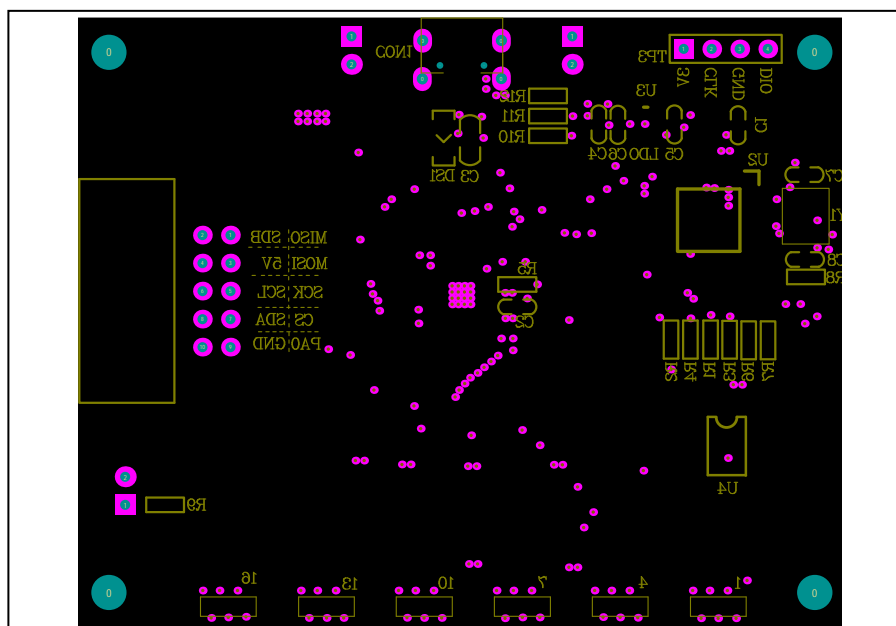


Figure 6: Board Component Placement Guide - Bottom Layer

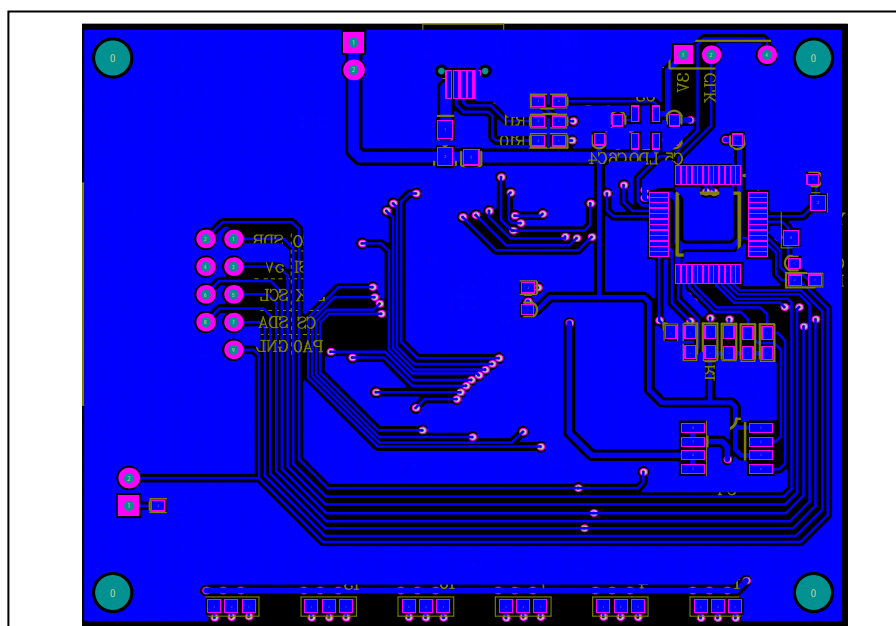


Figure 7: Board PCB Layout - Bottom Layer

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REVISION HISTORY

Revision	Detail Information	Date
A	Initial release	2018.04.27

APPENDIX I : IS31FL3208 Arduino Test Code V01A

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

#define Addr_GND_GND 0xD8

void setup() {
    // put your setup code here, to run once:
    pinMode(13, OUTPUT); // ARDUINO BOARD LED control
    Wire.begin();
    Wire.setClock(400000); // I2C 400kHz
}

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

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 mainloop(void) //
{
    int i, j;
    while(1)
    {
        digitalWrite(13, HIGH); // turn the ARDUINO BOARD LED on (HIGH is the voltage level)
        IS_IIC_WriteByte(Addr_GND_GND, 0x2F, 0x00); // reset IC
        IS_IIC_WriteByte(Addr_GND_GND, 0x00, 0x01); // Enable SSD
        for(i=0x14; i<=0x25; i++)
        {
            IS_IIC_WriteByte(Addr_GND_GND, i, 0x10); // enable all LED channel
        }
        IS_IIC_WriteByte(Addr_GND_GND, 0x26, 0x00); // GCC
        IS_IIC_WriteByte(Addr_GND_GND, 0x27, 0x00); // frequency

        for(j=0; j<=0xFF; j++)
        {
            for(i=0x01; i<=0x12; i=i+1)
            {
```


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```
IS_IIC_WriteByte(Addr_GND_GND,i,j);//write all channel PWM with 0x10
}
IS_IIC_WriteByte(Addr_GND_GND,0x13,0x00);//update PWM and ON/OFF
delay(5);
}

digitalWrite(13, LOW); // turn the ARDUINO BOARD LED off by making the voltage LOW
// IS_IIC_WriteByte(Addr_GND_GND,0x2F,0x00);//reset IC
IS_IIC_WriteByte(Addr_GND_GND,0x00,0x01);//Enable SSD
for(i=0x14;i<=0x25;i++)
{
    IS_IIC_WriteByte(Addr_GND_GND,i,0x10);//enable all LED channel
}
IS_IIC_WriteByte(Addr_GND_GND,0x26,0x00);//GCC
IS_IIC_WriteByte(Addr_GND_GND,0x27,0x00);//frequency

for(j=0xFF;j>=0;j--)
{
    for(i=0x01;i<=0x12;i=i+1)
    {
        IS_IIC_WriteByte(Addr_GND_GND,i,j);//write all channel PWM with 0x10
    }
    IS_IIC_WriteByte(Addr_GND_GND,0x13,0x00);//update PWM and ON/OFF
    delay(5);
}
}
```