

6-RGB/18-CH LED DRIVER EVALUATION BOARD GUIDE

DESCRIPTION

The IS31FL3018 is an 18 LED current sinks LED driver programmed via 1MHz I2C compatible interface. Each LED can be dimmed individually with 16-bit PWM data and each color current sinks has 8-bit group DC scaling (Color Calibration) data which allowing 65536 steps of linear PWM dimming for each channel and 256 steps of DC current adjustable level for each color group. 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 8 bits output current control register which allows fine tuning the current for rich global RGB color mixing.)

Additionally each LED open and short state can be detected, IS31FL3018 stores 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.

The IS31FL3018 operates from 2.7V to 5.5V and features a very low shutdown and operational current.

IS31FL3018 is available in QFN-32 (4mm×4mm) package. It operates from 2.7V to 5.5V over the temperature range of -40°C to +125°C.

FEATURES

- Supply voltage range: 2.7V to 5.5V
- 18 current sinks
- Accurate color rendition
 - 8/10+4/12/16-bit PWM/channel
 - Three 8-bit global DC current adjust
- SDB rising edge reset I2C module
- 32KHz PWM frequency (10+4-bit PWM mode)
- 1MHz I2C-compatible interface
- Individual open and short error detect function
- 180-degree phase delay operation to reduce power noise
- Spread spectrum
- QFN-32 (4mm×4mm) package
- RoHS & Halogen-Free Compliance
- TSCA Compliance

ORDERING INFORMATION

Part No.	Temperature Range	Package
IS31FL3018-QFLS4-EB	-40°C to +125°C, Industrial	QFN-32, 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.

QUICK START

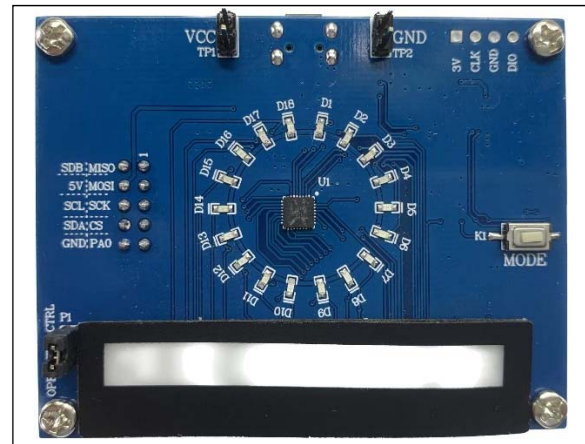


Figure 1: Photo of IS31FL3018 Evaluation Board

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 IS31FL3018 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 of P1 to enable the control of board MCU (default status).
- 2) Connect the 5VDC power to VCC(TP1) /GND(TP2), 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.

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EVALUATION BOARD OPERATION

The IS31FL3018 evaluation board has five display modes. Press K1 to switch configurations:

Note: See Appendix for each mode's detail.

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

Note: IS31FL3018 solely controls the FxLED function on the evaluation board.

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 IS31FL3018 LED driver, the on-board MCU will also configure the U4 to open the VLED (Single color LED+) and close the VRGB. Press K1 to change VLED to VRGB.

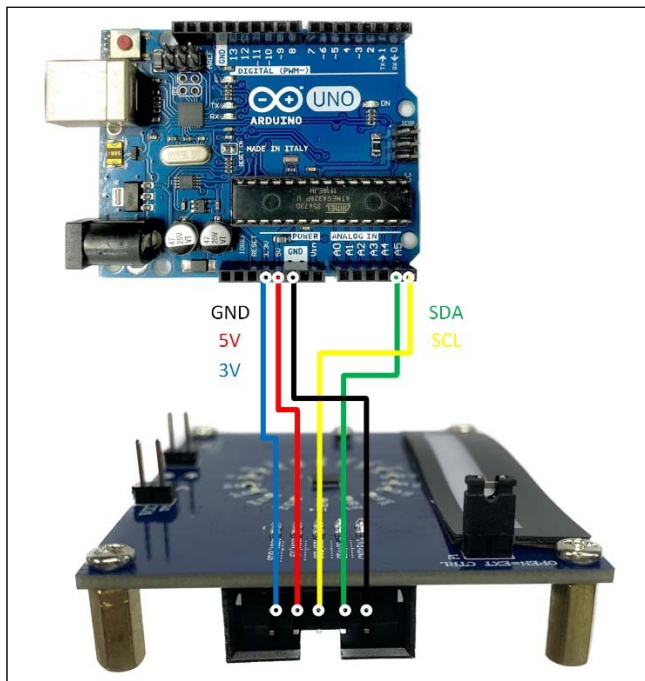


Figure 2: Photo of Arduino UNO connected to Evaluation Board

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 IS31FL3018 test firmware (sketch) from the Lumissil website <http://www.lumissil.com/products/led-driver/fxled>.

- 1) Open the P1 (EXT CTRL)
- 2) Connect the 5 pins from Arduino board to IS31FL3018 EVB:
 - a) Arduino GND to IS31FL3018 EVB GND (TP2).
 - b) Arduino 5V pin to IS31FL3018 EVB VCC (TP1).
 - c) Arduino SDA (A4) to IS31FL3018 EVB SDA (TP4).
 - d) Arduino SCL (A5) to IS31FL3018 EVB SCL (TP4).
 - e) If Arduino use 3.3V MCU VCC, connect 3.3V to IS31FL3018 EVB SDB, if Arduino use 5.0V MCU VCC, connect 5.0V to EVB SDB (TP4).
(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 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 IS31FL3018.

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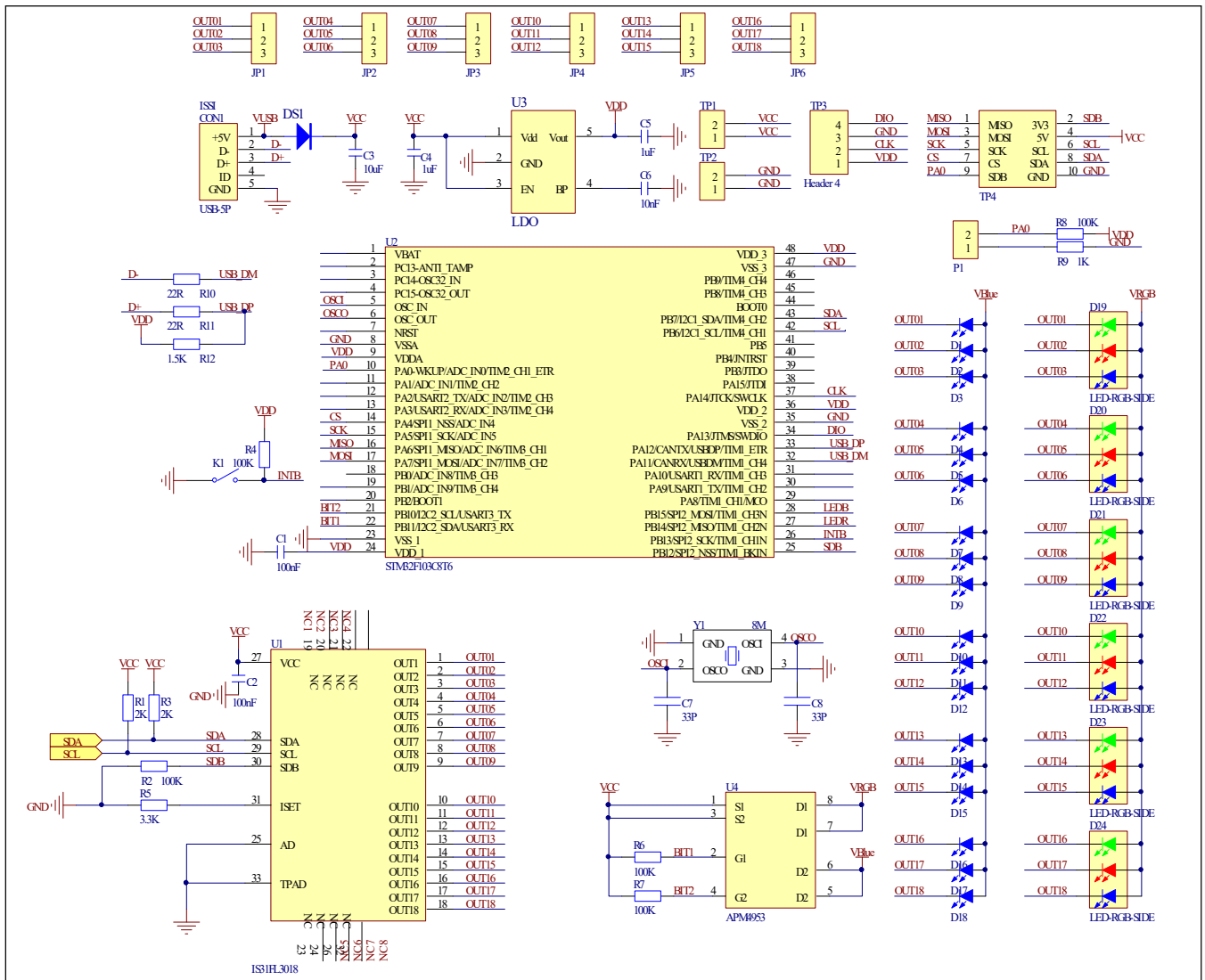


Figure 3: IS31FL3018 Application Schematic

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BILL OF MATERIALS

Name	Symbol	Description	Qty	Supplier	Part No.
LED Driver	U1	18-CH LED Driver	1	Lumissil	IS31FL3018
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	EVERLIGHT	99-235/RSGBB7C-A22/2D or 99-235/RGBC/TR8
Diode	DS1	Diode, SMD	1	DIODES	DFLS240
Crystal	Y1	Crystal, 8MHz	1	HLX	HC-49S
Resistor	R1,R3	RES,2K,1/16W,±5%,SMD	2	Yageo	RC0603JR-072KL
Resistor	R2,R4, R6,R7,R8	RES,100k,1/16W,±5%,SMD	5	Yageo	RC0603JR-07100KL
Resistor	R5	RES,3.3K,1/16W,±5%,SMD	1	Yageo	RC0603JR-073K3L
Resistor	R9	RES,1K,1/16W,±5%,SMD	1	Yageo	RC0603JR-071KL
Resistor	R10, R11	RES,22R,1/16W,±5%,SMD	2	Yageo	RC0603JR-0722RL
Resistor	R12	RES,1.5K,1/16W,±5%,SMD	1	Yageo	RC0603JR-071K5L
Capacitor	C1,C2	CAP,100nF,16V,±20%,SMD	2	Yageo	CC0603KKX7R9BB104
Capacitor	C3	CAP,10µF,16V,±20%,SMD	1	Yageo	CC0805KKX7R9BB106
Capacitor	C4,C5	CAP,1µF,16V,±20%,SMD	2	Yageo	CC0603KKX7R9BB105
Capacitor	C6	CAP,10nF,16V,±20%,SMD	1	Yageo	CC0603KKX7R9BB103
Capacitor	C7,C8	CAP,33pF,16V,±20%,SMD	2	Yageo	CC0603KKX7R9BB330
Button	K1(Bottom)	Button	1		
Micro USB	CON1	Micro USB	1		

Bill of Materials, refer to Figure 3 above.

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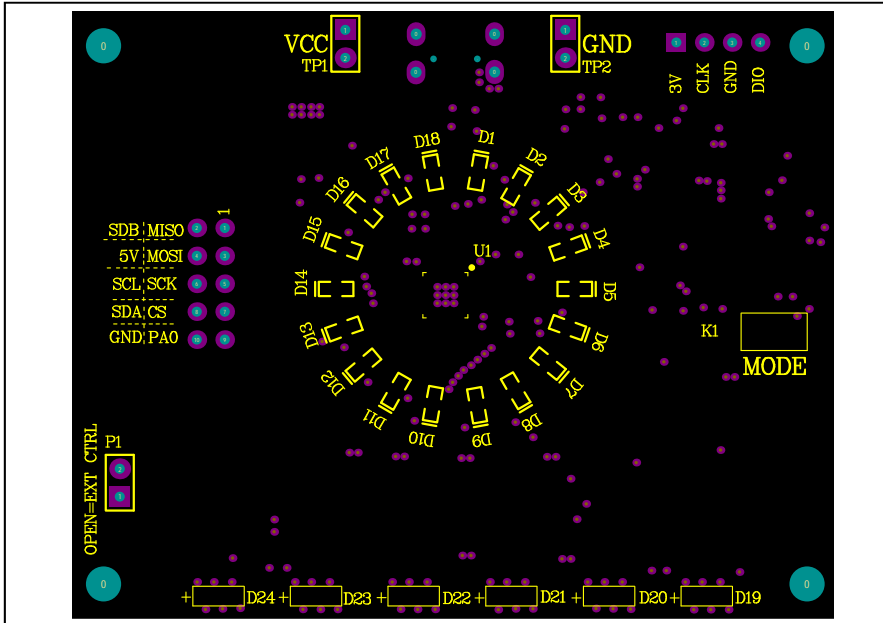


Figure 4: Board Component Placement Guide - Top Layer

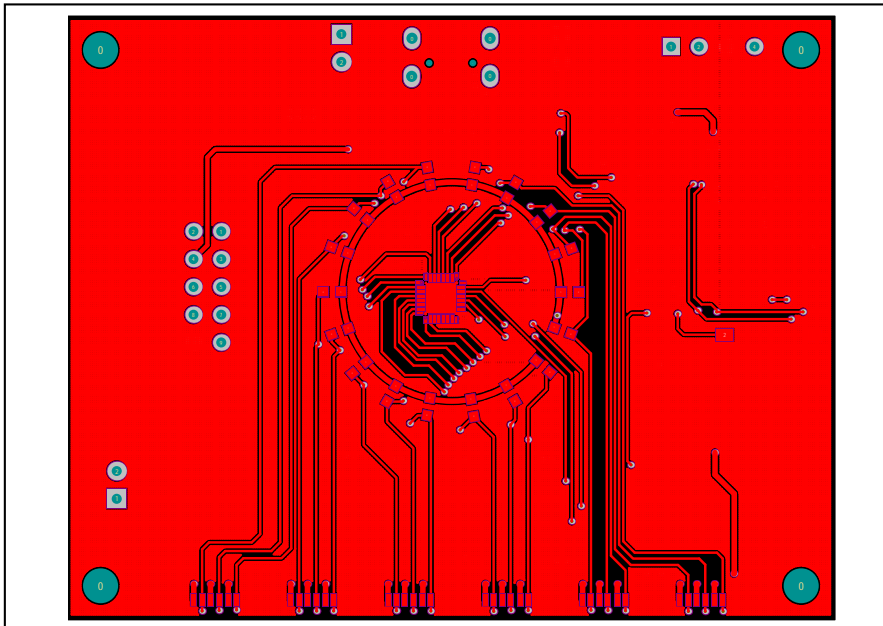


Figure 5: Board PCB Layout - Top Layer

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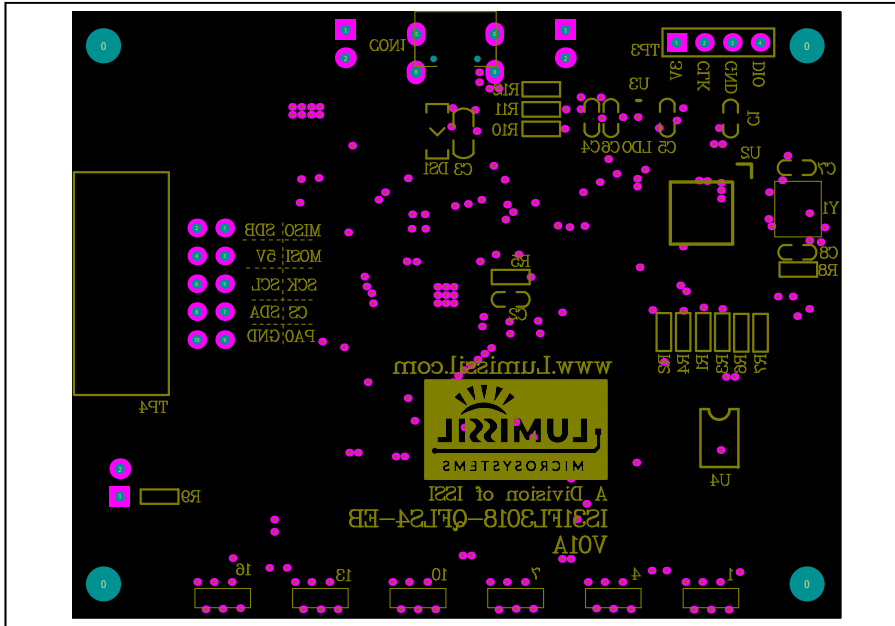


Figure 6: Board Component Placement Guide - Bottom Layer

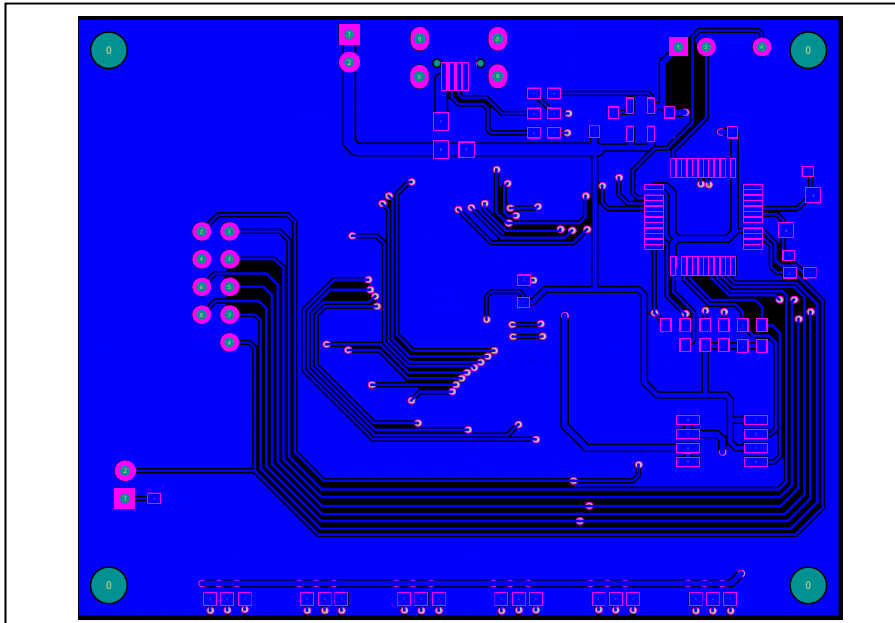


Figure 7: Board PCB Layout - Bottom Layer

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REVISION HISTORY

Revision	Detail Information	Date
A	Initial release	2023.08.20

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APPENDIX I : IS31FL3018 Arduino Test Code V01A

```
#include<Wire.h>
#include<avr/pgmspace.h>
#define Addr_GND 0x68
//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
    //delay(100); //keep 0.5s
    Init_FL3018();
}

void loop() {
    // put your main code here, to run repeatedly:
    // delay(50);
    //Init_FL3018 ();
    IS31FL3018_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
}
```


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```

void Init_FL3018(void)
{
    uint8_t i = 0;
    for(i=0x01;i<=0x24;i++)
    {
        IS_IIC_WriteByte(Addr_GND,i,0x00);//write PWM
    }
    IS_IIC_WriteByte(Addr_GND,0x26,0xff);//GCC-R
    IS_IIC_WriteByte(Addr_GND,0x27,0xff);//GCC-G
    IS_IIC_WriteByte(Addr_GND,0x28,0xff);//GCC-B
    IS_IIC_WriteByte(Addr_GND,0x25,0x00);//update PWM & congtrol registers
    IS_IIC_WriteByte(Addr_GND,0x00,0x03);//normal operation 8BIT
}

void IS31FL3018_mode1(void)//white LED
{
    int i=0,j=0;
    for(j=0;j<=63;j++)
    {
        for(i=0x01;i<=0x24;i=i+2)
        {
            IS_IIC_WriteByte(Addr_GND,i, PWM_Gamma64[j]);//write all PWM
            IS_IIC_WriteByte(Addr_GND,0x25,0x00);//update PWM & congtrol registers
        }
        delay(10); //keep 0.5s
    }
    for(j=63;j>=0;j--)
    {
        for(i=0x01;i<=0x24;i=i+2)
        {
            IS_IIC_WriteByte(Addr_GND,i, PWM_Gamma64[j]);//write all PWM
            IS_IIC_WriteByte(Addr_GND,0x25,0x00);//update PWM & congtrol registers
        }
        delay(10); //keep 0.5s
    }
}

```