

# 18 CHANNELS LED DRIVER EVALUATION BOARD GUIDE

## DESCRIPTION

IS31FL3265A is an LED driver with 18 high voltage (40V) constant current channels. Each channel can be pulse width modulated (PWM) by 8 bits for smooth LED brightness control. In addition, each channel has an 8-bit output current control register which allows fine tuning the current for rich RGB color mixing, e.g., a pure white color LED application. The maximum output current of each channel is designed to be 60mA, which can be adjusted by one 8-bit global control register. Proprietary algorithms are used in IS31FL3265A to minimize audible noise caused by the MLCC decoupling capacitor. All registers can be programmed via 1MHz I2C compatible interface.

IS31FL3265A can be turned off with minimum current consumption by either pulling the SDB pin low or by using the software shutdown feature.

IS31FL3265A is available in eTSSOP-28 package. It operates from 2.7V to 5.5V over the temperature range of -40°C to +125°C.

## FEATURES

- 3V to 5.5V supply
- Output current capability and number of outputs: 60mA × 18 outputs, tolerance voltage 40V
- 1MHz I2C interface, automatic address increment function with readout function
- Programmable H/L logic: 1.4V/0.4V, 2.4V/0.6V
- Accurate color rendition
  - 5-bit Global current adjust
  - 8-bit Dot correction
  - 8-bit PWM
- Selectable PWM method (1bit, 200Hz or 25kHz)
- 256-step group blinking with frequency programmable from 24Hz to 10.73s and duty cycle from 0% to 99.6%
- Sync clock function
- Fault report (open/thermal roll off(1 bit to control) /thermal shutdown, programmable enable/disable)
- Thermal shutdown
- Thermal roll off programmable
- SDB pull-high reset I2C
- EMI reduction technology
  - Spread spectrum
  - Selectable 9 phase delay
- Operating temperature range, -40°C ~ +125°C
- Package: eTSSOP-28
- Current accuracy (All output on)

Output voltage	Current Accuracy (I <sub>OUT</sub> =20mA)		Output Current
	Between Bits	Between ICs	
≥0.6V	±6%(-40°C ~ +125°C) +/-3%(room)	±6%(-40°C ~ +125°C) +/-3%(room)	0mA ~ 60mA

## QUICK START

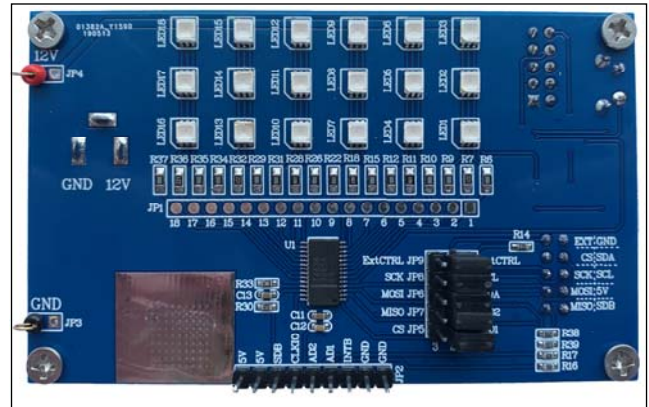


Figure 1: Photo of IS31FL3265A Evaluation Board

## RECOMMENDED EQUIPMENT

- 12V, ≥1A power supply

## ABSOLUTE MAXIMUM RATINGS

- VIN+, ≤15V power supply

**Caution:** EVB is designed for 12V application, higher than 12V will cause extra-heat on the IC and if VIN (JP4 or CON2) is higher than 15V, the IS31FL3265A will be too hot and enter thermal shutdown mode, if VIN (JP4 or CON2) exceeds the conditions listed above, the board may be damaged.

## PROCEDURE

The IS31FL3265A 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 JP4 (12V), or connect the DC power to the connector (CON2).
- 2) Turn on the power supply and pay attention to the supply current. If the current exceeds 0.5A, please check for circuit fault.
- 3) Enter the desired mode of display by toggling the MODE button (K1).

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## ORDERING INFORMATION

Part No.	Temperature Range	Package
IS31FL3265A-ZLS4-EB	-40°C to +125°C (Industrial)	eTSSOP-28, Lead-free

Table 1: Ordering Information

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

## EVALUATION BOARD OPERATION

The IS31FL3265A evaluation board has 4 display modes. Press MODE button (K1) to switch configurations.

- 1) (Default mode) Loop mode 2 to 4.
- 2) Turn light pattern 1.
- 3) Turn light pattern 2.
- 4) Rainbow mode.

**Note:** IS31FL3265A solely controls the FxLED function on the evaluation board.

## SOFTWARE SUPPORT

JP9 default setting is 'IntCTRL' (Internal Control). If it is set to 'ExtCTRL' (External Control), the on-board MCU will configure all the IO pins to high impedance mode and enter sleep mode. The I2C pins and SDB pin are also set to High Impedance. External I2C and SDB signals can be connected to TP1 to control the IS31FL3265A LED driver.

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 IS31FL3265A test firmware (sketch) from the Lumissil website <http://www.lumissil.com/products/led-driver/fxled>.

- 1) Open '1' and '2' and short '3' and '2' of JP9 to set to 'ExtCTRL' (External Control).
- 2) Connect 5 pins from Arduino board to IS31FL3265A EVB:
  - a) Arduino 5V pin to IS31FL3265A EVB VCC.
  - b) Arduino GND to IS31FL3265A EVB GND.
  - c) Arduino SCL (A5) to IS31FL3265A EVB SCL.
  - d) Arduino SDA (A4) to IS31FL3265A EVB SDA.
  - e) If Arduino use 3.3V MCU VCC, connect 3.3V to IS31FL3265A EVB SDB, if Arduino use 5.0V MCU VCC, connect 5.0V to EVB SDB.  
(Arduino UNO's VCC (VOH) is 5.0V, so SDB=5.0V)
- 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 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 IS31FL3265A.

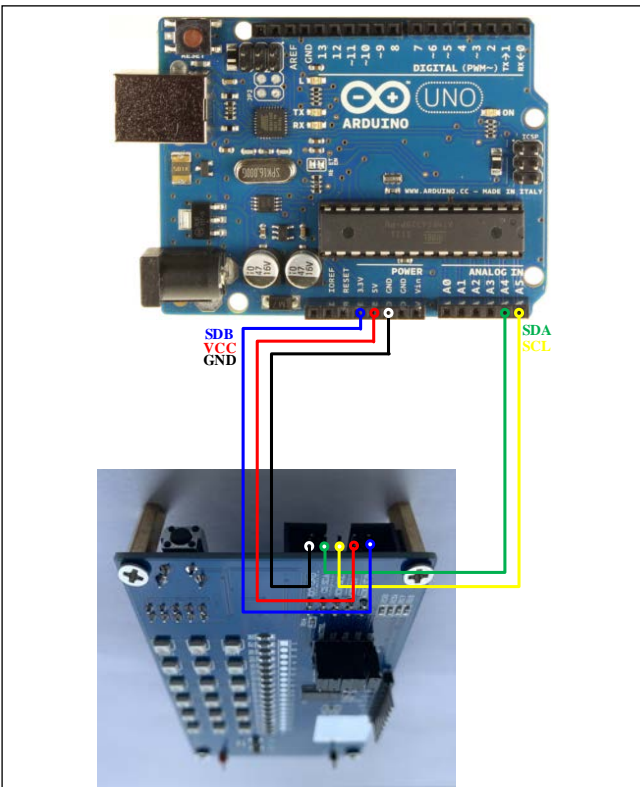


Figure 2: Arduino UNO connected to Evaluation Board

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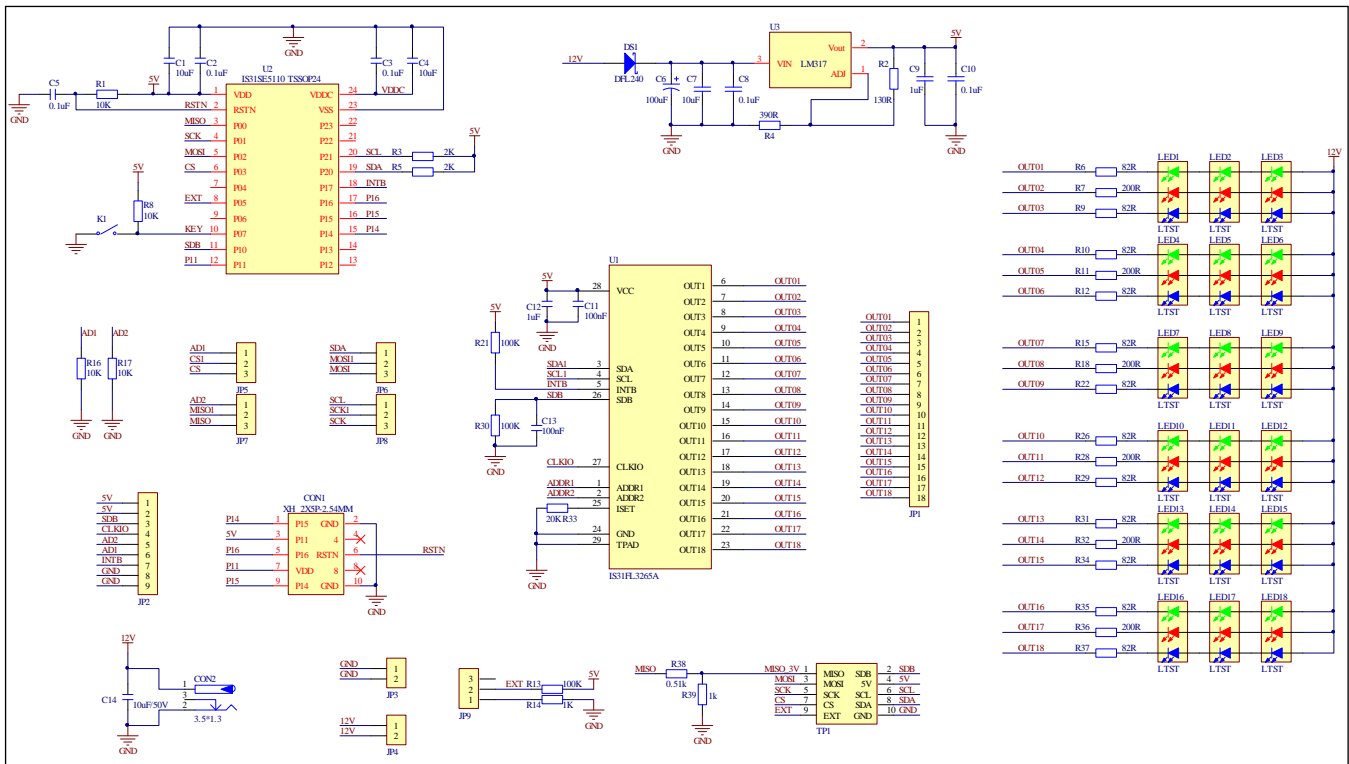


Figure 3: IS31FL3265A Application Schematic

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## BILL OF MATERIALS

Name	Symbol	Description	Qty	Supplier	Part No.
LED Driver	U1	18CH FxLED Driver	1	Lumissil	IS31FL3265A
MCU	U2	Microcontroller	1	Lumissil	IS31SE5110
LDO	U3	Low-dropout Regulator	1	ONSEMI	LM317
LED	LED1~LED18	RGB LED	18	LITEON	LTST-G683GEBW-P2
Diode	DS1	Diode, SMD	1	DIODES	DFLS240
Resistor	R1,R8,R16,R17	RES,10k,1/10W,±5%,SMD	4	Yageo	RC0603JR-0710KL
Resistor	R2	RES,130R,1/10W,±5%,SMD	1	Yageo	RC0603JR-07130RL
Resistor	R3,R5	RES,2k,1/10W,±5%,SMD	2	Yageo	RC0603JR-072KL
Resistor	R4	RES,390R,1/10W,±5%,SMD	1	Yageo	RC0603JR-07390RL
Resistor	R6,R9,R10, R12,R15,R22, R26,R29,R31, R34,R35,R37	RES,100R,1/8W,±5%,SMD	12	Yageo	RC0805JR-07100RL
Resistor	R7,R11,R18, R28,R32,R36	RES,220R,1/8W,±5%,SMD	6	Yageo	RC0805JR-07220RL
Resistor	R13,R21,R30	RES,100k,1/10W,±5%,SMD	3	Yageo	RC0603JR-07100KL
Resistor	R14,R39	RES,1k,1/10W,±5%,SMD	2	Yageo	RC0603JR-071KL
Resistor	R33	RES,20k,1/10W,±5%,SMD	1	Yageo	RC0603JR-0720KL
Resistor	R38	RES,510R,1/10W,±5%,SMD	1	Yageo	RC0603JR-07510RL
Capacitor	C1,C4	CAP,10µF,16V,±20%,SMD	2	Yageo	CC0603MRX5R7BB106
Capacitor	C2,C3,C5, C10,C11,C13	CAP,100nF,16V,±20%,SMD	6	Yageo	CC0603MRX7R7BB104
Capacitor	C6	CAP,100µF,35V,±20%,SMD	1	Lelon	VEU101M1VTR-0810
Capacitor	C7,C14	CAP,10µF, 50V,±10%,SMD	2	Yageo	CC1206KKX5R9BB106
Capacitor	C8	CAP,100nF,25V,±10%,SMD	1	Yageo	AC1206KRX7R8BB104
Capacitor	C9	CAP,1µF,16V,±10%,SMD	1	Yageo	AC0805KFX7R7BB105
Capacitor	C12	CAP, 1µF,16V,±10%,SMD	1	Yageo	CC0603KRX7R7BB105
Button	K1	Button, SMD	1		

Bill of Materials, refer to Figure 3 above.

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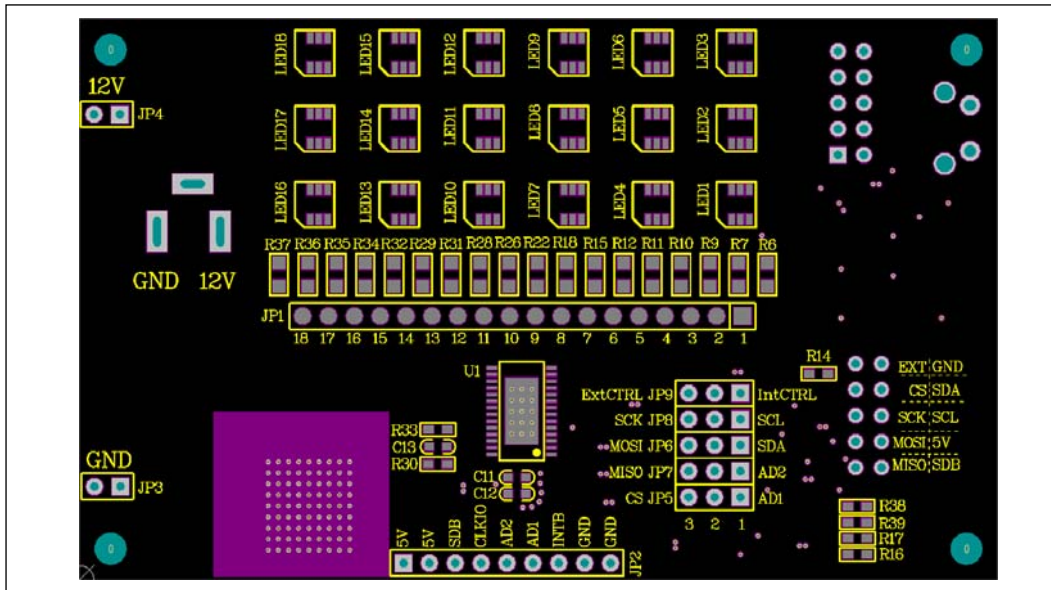


Figure 4: Board Component Placement Guide - Top Layer

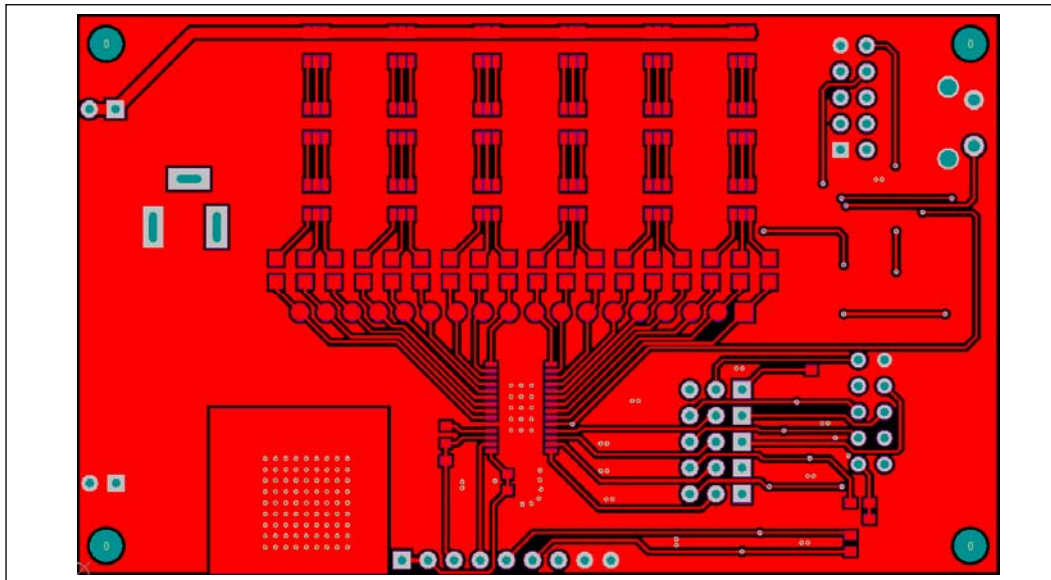


Figure 5: Board PCB Layout - Top Layer

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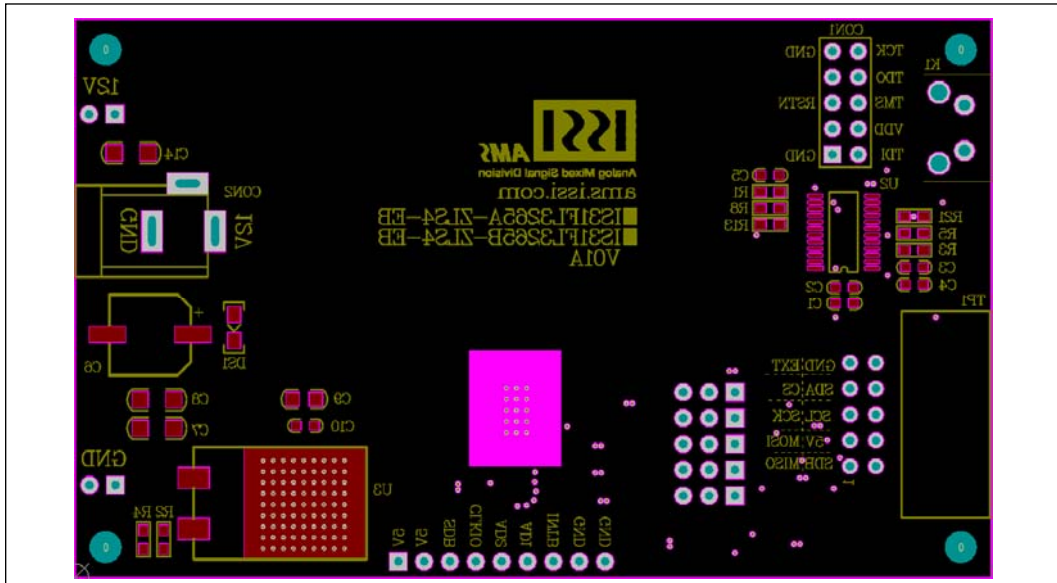


Figure 6: Board Component Placement Guide - Bottom Layer

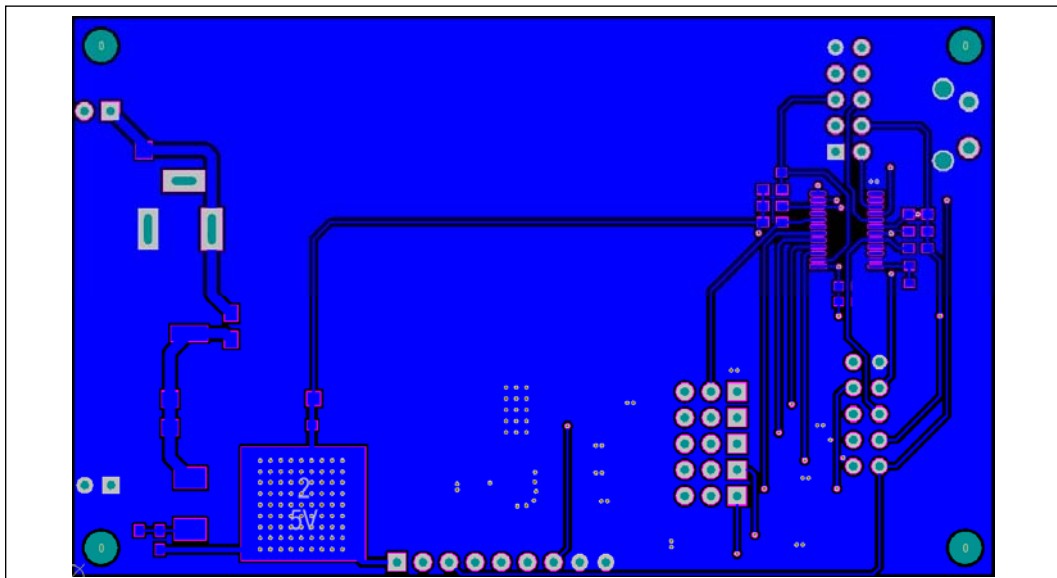


Figure 7: Board PCB Layout - Bottom Layer

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## REVISION HISTORY

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Revision	Detail Information	Data
A	Initial Release	2019.06.26

## APPENDIX I : IS31FL3265A Arduino Test Code V01A

```
#include<Wire.h>
#include<avr/pgmspace.h>
#define Addr_GND 0x80

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()
{
  Wire.begin();
  Wire.setClock(400000);//I2C 400kHz
  pinMode(4, OUTPUT);//SDB
  digitalWrite(4,HIGH);//SDB_HIGH
  Init3265A();
}

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

void Init3265A(void)
{
  int i;
  IS_IIC_WriteByte(Addr_GND,0x00,0x01);
  for(i=0x02;i<=0x13;i++)
  {
    IS_IIC_WriteByte(Addr_GND,i,0xFF);//SL
  }

  for(i=0x1F;i<=0x30;i++)
  {
    IS_IIC_WriteByte(Addr_GND,i,0x00);//PWM
  }

  IS_IIC_WriteByte(Addr_GND,0x01,0x20); //GCC 0x20
  IS_IIC_WriteByte(Addr_GND,0x00,0x01);
  IS_IIC_WriteByte(Addr_GND,0x37,0x00);//update
  IS_IIC_WriteByte(Addr_GND,0x36,0x00);//update
}

void mainloop(void)//
{
  int i,j;
  for(j=0;j<63;j++)
  {
    for(i=0x1F;i<0x31;i=i+3)
    {
      IS_IIC_WriteByte(Addr_GND,i,PWM_Gamma64[j]);//pwm
    }
    for(i=0x20;i<0x31;i=i+3)
    {
      IS_IIC_WriteByte(Addr_GND,i,PWM_Gamma64[63-j]);//pwm
    }
  }
}
```



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```

    for(i=0x21;i<0x31;i=i+3)
    {
        IS_IIC_WriteByte(Addr_GND,i,0);//pwm
    }
    IS_IIC_WriteByte(Addr_GND,0x37,0x00);//pwm update
    delay(60);
}

for(j=0;j<63;j++)
{
    for(i=0x1F;i<0x31;i=i+3)
    {
        IS_IIC_WriteByte(Addr_GND,i,PWM_Gamma64[63-j]);//pwm
    }
    for(i=0x20;i<0x31;i=i+3)
    {
        IS_IIC_WriteByte(Addr_GND,i,0);//pwm
    }
    for(i=0x21;i<0x31;i=i+3)
    {
        IS_IIC_WriteByte(Addr_GND,i,PWM_Gamma64[j]);//pwm
    }
    IS_IIC_WriteByte(Addr_GND,0x37,0x00);//pwm update
    delay(60);
}

for(j=0;j<63;j++)
{
    for(i=0x1F;i<0x31;i=i+3)
    {
        IS_IIC_WriteByte(Addr_GND,i,0);//pwm
    }
    for(i=0x20;i<0x31;i=i+3)
    {
        IS_IIC_WriteByte(Addr_GND,i,PWM_Gamma64[j]);//pwm
    }
    for(i=0x21;i<0x31;i=i+3)
    {
        IS_IIC_WriteByte(Addr_GND,i,PWM_Gamma64[63-j]);//pwm
    }
    IS_IIC_WriteByte(Addr_GND,0x37,0x00);//pwm update
    delay(60);
}
}

```