

12-CHANNEL LED DRIVER EVALUATION BOARD GUIDE

DESCRIPTION

The IS31FL3752 is a general purpose 12×n (n=1~2) LED Matrix programmed via 1MHz I2C compatible interface. Each LED can be dimmed individually with 12-bit PWM data and each current sink has 8-bit DC scaling (Color Calibration) data which allowing 4096 steps of linear PWM dimming and 256 steps of DC current adjustable level.

Additionally each LED open and short state can be detected, IS31FL3752 store 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.

FEATURES

- Supply voltage range: 2.7V to 5.5V
- 12 current sinks
- Support 12×n (n=1~2) LED matrix configurations
- Ultra-low operational current (720 μA typ. 900μA max. at VCC=3.6V)
- Accurate color rendition
 - 8/12-bit PWM for each dot
 - 8-bit correction/CS
 - 8-bit global current adjust
- SDB rising edge reset I2C module
- 60kHz PWM frequency (8-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
- De-ghost
- QFN-20 (3mm×3mm) package

QUICK START



Figure 1: Photo of IS31FL3752 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 IS31FL3752 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) If using external DC power supply connect the ground terminal of the power supply to the evaluation board's GND pin and the positive terminal to the VCC pin. The evaluation board can also be powered via the Micro USB connector.
- 2) Short P1 to close external control.
- 3) Open P2 to pull AD pin down to GND.
- 4) Turn on the power supply/Plug in the Micro USB and pay attention to the supply current. If the current exceeds 1A, please check for circuit fault.
- 5) Enter the desired mode of display by toggling the MODE button (K1).

EVALUATION BOARD OPERATION

The IS31FL3752 evaluation board has five display modes. Press K1 to switch configurations:

Note: See Appendix for each mode's detail.

- 1) Rainbow mode(default).
- 2) Three colors breath mode 1.
- 3) Three colors breath mode 2.
- 4) White mode.

Note: IS31FL3752 solely controls the FxLED function on the evaluation board.

12-CHANNEL LED DRIVER EVALUATION BOARD GUIDE

ORDERING INFORMATION

Part No.	Temperature Range	Package
IS31FL3752-QFLS4-EB	-40°C to +125°C, Industrial	QFN-20, Lead-free

Table 1: Ordering Information

For pricing, delivery, and ordering information, please contact Lumissil's analog marketing team at analog@lumissil.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 pins to High Impedance status so an external source can driver the I2C/SDB signals to control the IS31FL3752 LED driver. When P2 open, AD pin pulled down to GND by R18.

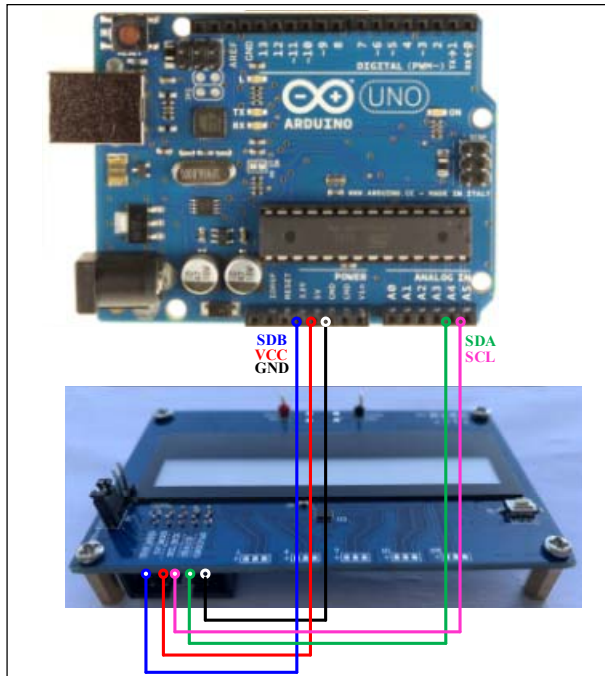


Figure 2: Photo of Arduino UNO connected to Evaluation Board

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 IS31FL3752 test firmware (sketch) from the Lumissil website <http://www.lumissil.com/products/led-driver/fxled>.

- 1) Open P1.
- 2) Connect the 5 pins from Arduino board to IS31FL3752 EVB:
 - a) Arduino 5V pin to IS31FL3752 EVB VCC.
 - b) Arduino GND to IS31FL3752 EVB GND.
 - c) Arduino SDA (A4) to IS31FL3752 EVB SDA.
 - d) Arduino SCL (A5) to IS31FL3752 EVB SCL.
 - e) If Arduino use 3.3V MCU VCC, connect 3.3V to IS31FL3752 EVB SDB, if Arduino use 5.0V MCU VCC, connect 5.0V to EVB SDB.
(Arduino UNO 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.

Please refer to the datasheet to get more information about IS31FL3752.

12-CHANNEL LED DRIVER EVALUATION BOARD GUIDE

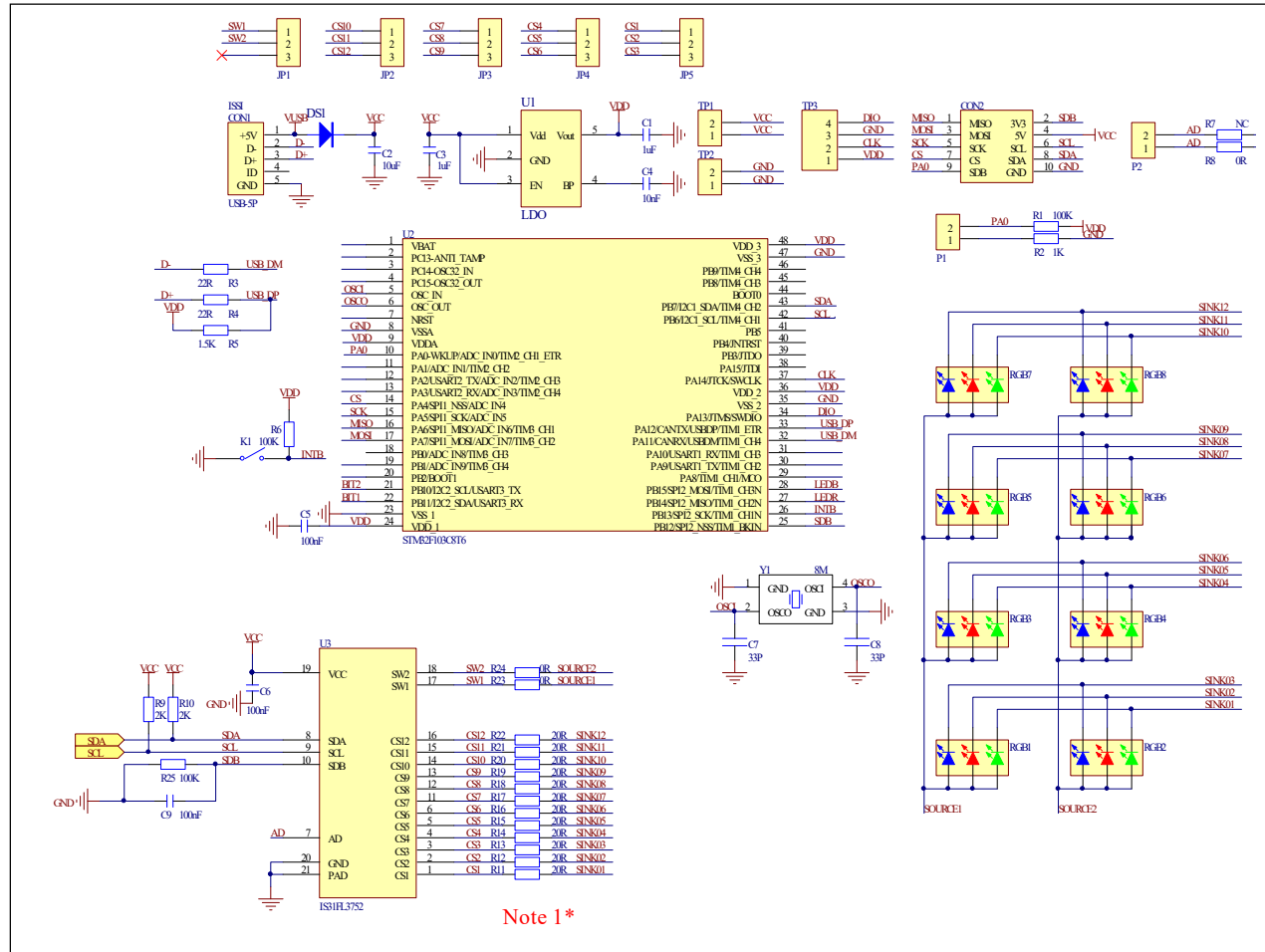


Figure 3: IS31FL3752 Application Schematic

12-CHANNEL LED DRIVER EVALUATION BOARD GUIDE

BILL OF MATERIALS

Name	Symbol	Description	Qty	Supplier	Part No.
LDO	U1	3.0V LDO	1	SGMICRO	SGM2019-3.0YN5G
MCU	U2	Microcontroller	1	STM	STM32F103C8T6
LED Driver	U3	Matrix LED Driver	1	Lumissil	IS31FL3752
RGB LED	RGB1~RGB8	RGB LED, SMD	8	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,R6,R25	RES,100k,1/10W,±5%,SMD	3	Yageo	RC0603JR-07100KL
Resistor	R2	RES,1k,1/10W,±5%,SMD	1	Yageo	RC0603JR-071KL
Resistor	R3,R4	RES,22R,1/10W,±5%,SMD	2	Yageo	RC0603JR-0722RL
Resistor	R5	RES,1.5k,1/10W,±5%,SMD	1	Yageo	RC0603JR-071K5L
Resistor	R7	NC	1		
Resistor	R8,R23,R24	RES,0R,1/10W,±5%,SMD	3	Yageo	RC0603JR-070RL
Resistor	R9,R10	RES,2k,1/10W,±5%,SMD	2	Yageo	RC0603JR-072KL
Resistor	R12,R15,R18, R21	RES,20R,1/10W,±5%,SMD (Note 1)	4	Yageo	RC0603JR-0720RL
Resistor	R11,R13,R14, R16,R17,R19, R20,R22	RES,20R,1/10W,±5%,SMD	8	Yageo	RC0603JR-0720RL
Capacitor	C1,C3	CAP, 1µF,16V,±10%,SMD	2	Yageo	CC0603KRX7R7BB105
Capacitor	C2	CAP,10µF,16V,±20%,SMD	1	Yageo	CC0603MRX5R7BB106
Capacitor	C4	CAP,10nF,16V,±10%,SMD	1	Yageo	CC0603KPX7R7BB103
Capacitor	C5,C6,C9	CAP,100nF,16V,±20%,SMD	3	Yageo	CC0603MRX7R7BB104
Capacitor	C7,C8	CAP,33pF,50V,±5%,SMD	2	Yageo	CQ0603JRNPO9BN360
Button	K1(Bottom)	Button	1		
Micro USB	CON1	Micro USB	1		

Bill of Materials, refer to Figure 3 above.

Note 1: The value of these resistors on the evaluation board is 20Ω. For PVCC=5V and red LED application, prefer 51Ω for these resistors as shown in datasheet Figure 1.

12-CHANNEL LED DRIVER EVALUATION BOARD GUIDE

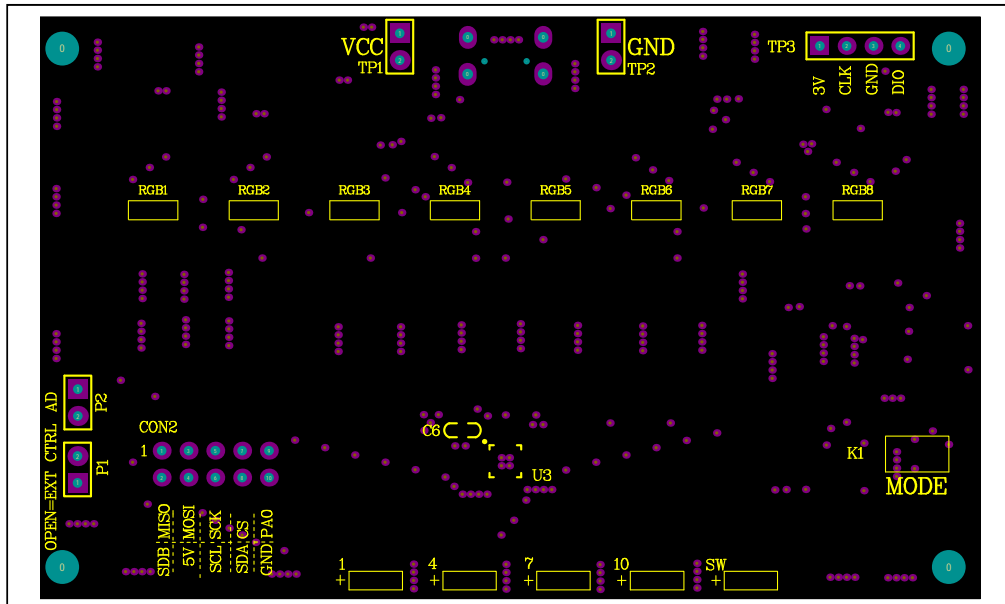


Figure 4: Board Component Placement Guide - Top Layer

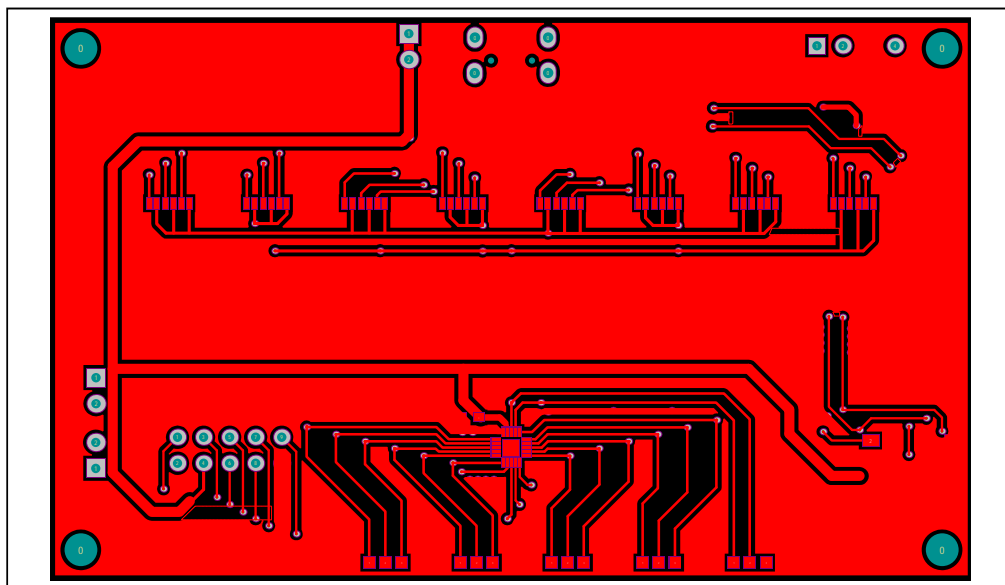


Figure 5: Board PCB Layout - Top Layer

12-CHANNEL LED DRIVER EVALUATION BOARD GUIDE

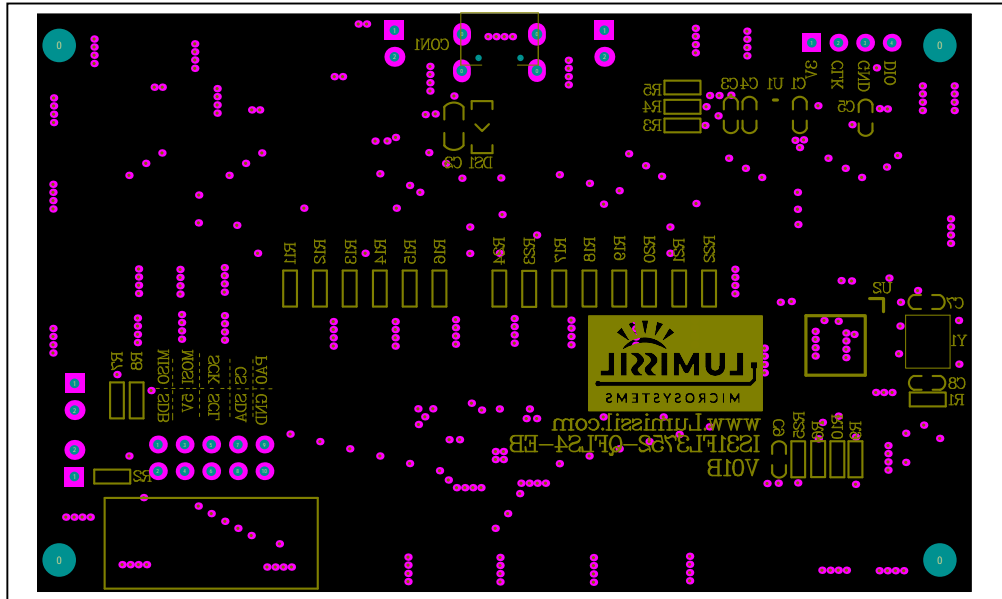


Figure 6: Board Component Placement Guide - Bottom Layer

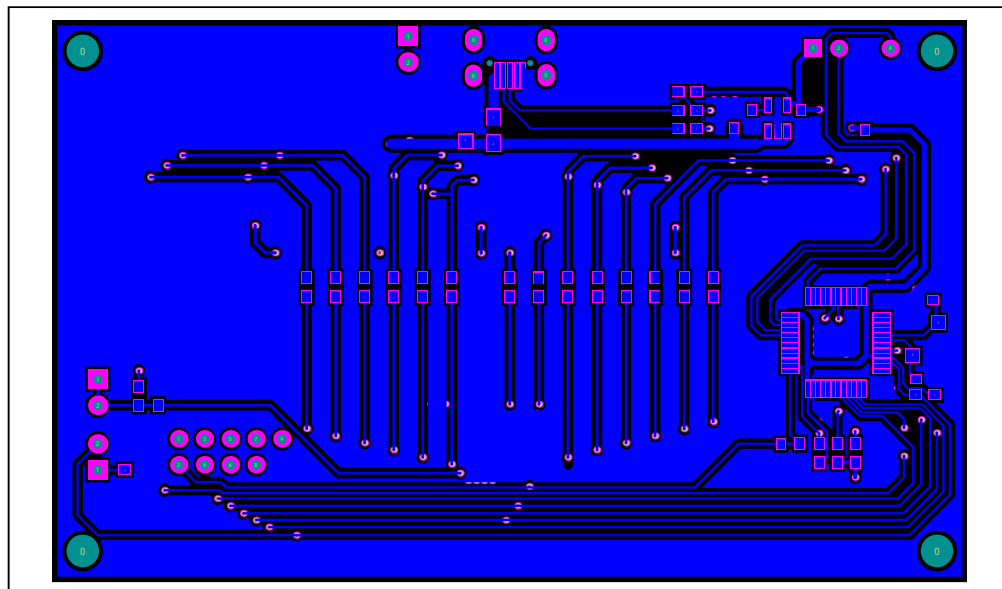


Figure 7: Board PCB Layout - Bottom Layer

Copyright © 2021 Lumissil Microsystems. All rights reserved. Lumissil Microsystems reserves the right to make changes to this specification and its products at any time without notice. Lumissil Microsystems assumes no liability arising out of the application or use of any information, products or services described herein. Customers are advised to obtain the latest version of this device specification before relying on any published information and before placing orders for products.

Lumissil Microsystems does not recommend the use of any of its products in life support applications where the failure or malfunction of the product can reasonably be expected to cause failure of the life support system or to significantly affect its safety or effectiveness. Products are not authorized for use in such applications unless Lumissil Microsystems receives written assurance to its satisfaction, that:

- 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

12-CHANNEL LED DRIVER EVALUATION BOARD GUIDE

REVISION HISTORY

Revision	Detail Information	Date
A	Initial release	2021.05.25

12-CHANNEL LED DRIVER EVALUATION BOARD GUIDE

APPENDIX I : IS31FL3752 Arduino Test Code V01A

```

#include<Wire.h>
#include<avr/pgmspace.h>
#define Addr_GND 0x88

int PWM_Gama64[128]=
{
    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,

    0xff,0xfe,0xfa,0xf6,0xf1,0xed,0xe9,0xe1,
    0xd6,0xcf,0xcb,0xc6,0xbf,0xb9,0xb0,0xac,
    0xa7,0xa0,0x9a,0x94,0x8d,0x88,0x80,0x7d,
    0x77,0x72,0x6d,0x69,0x64,0x5f,0x5a,0x55,
    0x4f,0x4b,0x48,0x44,0x40,0x3c,0x38,0x34,
    0x2e,0x28,0x25,0x22,0x1f,0x1d,0x1c,0x1a,
    0x16,0x13,0x11,0x0f,0x0d,0x0b,0x09,0x08,
    0x07,0x06,0x05,0x04,0x03,0x02,0x01,0x00
};

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_FL3752();
}

void loop() {
    // put your main code here, to run repeatedly:
    IS31FL3752_mode1();//8-bit mode
    //IS31FL3752_mode2();//12-bit mode
}

void IS_IIC_WriteByte(uint8_t Dev_Add,uint8_t Reg_Add,uint8_t Reg_Dat)
{
    Wire.beginTransmission(Dev_Add/2);

```


12-CHANNEL LED DRIVER EVALUATION BOARD GUIDE

```

Wire.write(Reg_Add); // sends regaddress
Wire.write(Reg_Dat); // sends regaddress
Wire.endTransmission(); // stop transmitting
}

void Init_FL3752(void)
{
  int i = 0;
  IS_IIC_WriteByte(Addr_GND,0x00,0x63);//Enable SSD 8-bit mode: 0x63 12-bit mode: 0x23
  IS_IIC_WriteByte(Addr_GND,0x01,0x80);//GCC
  IS_IIC_WriteByte(Addr_GND,0x61,0x00);//frequency select
  for(i=0x0E;i<=0x55;i++)
  {
    IS_IIC_WriteByte(Addr_GND,i,0x00);//PWM
  }
  for(i=0x02;i<=0x0D;i++)
  {
    IS_IIC_WriteByte(Addr_GND,i,0xFF);//SL
  }
}

void IS31FL3752_mode1(void)// 8-bit mode
{
  int i = 0;
  int j = 0;
  for (j=1;j<=127;j++)//all LED breath falling
  {
    for(i=0x0E;i<=0x55;i=i+2)
    {
      IS_IIC_WriteByte(Addr_GND,i,PWM_Gama64[j]);//set all PWM
    }
    delay(20);//20ms
  }
}

void IS31FL3752_mode2(void)// 12-bit mode
{
  int i, j, k, l;

  for(k=0;k<=0x0f;k++)//all LED breath rising
  {
    for(l=0x0F;l<=0x55;l=i+2)
    {
      IS_IIC_WriteByte(Addr_GND,l,k);//set all PWM
    }
  }
}

```

12-CHANNEL LED DRIVER EVALUATION BOARD GUIDE

```
for (j=0;j<=255;j++)//all LED breath falling
{
    for(i=0x0E;i<=0x54;i=i+2)
    {
        IS_IIC_WriteByte(Addr_GND,i,j);//set all PWM
    }
    delay(2);//2ms
}

for(k=0x0F;k>=0;k--)//all LED breath falling
{
    for(l=0x0F;l<=0x55;l=l+2)
    {
        IS_IIC_WriteByte(Addr_GND,l,k);//set all PWM
    }
    for (j=255;j>=0;j--)//all LED breath falling
    {
        for(i=0x0E;i<=0x54;i=i+2)
        {
            IS_IIC_WriteByte(Addr_GND,i,j);//set all PWM
        }
        delay(2);//2ms
    }
}
}
```