9-CHANNEL LIGHT EFFECT LED DRIVER

DESCRIPTION

The IS31FL3299 is a 9-LED current sink LED driver programmed via 1MHz I2C compatible interface. Each LED can be dimmed individually with 4096 steps 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.

FEATURES

- 2.7V to 5.5V supply voltage
- Supply voltage range: 2.7V to 5.5V
- 9 current sinks, I_{OUT}=40mA (Max.)
- Ultra-low operational current (250μA Typ. 500μA Max. at V_{CC}=3.6V)
  - Shutdown mode: 1μA (Max.) with SDB low
  - Power-saving mode: 10μA (Typ.) with SDB high and all LEDs off
- Accurate color rendition
  - 12-bit PWM/channel
  - 8-bit correction/channel
  - 6-bit global current adjust
- SDB rising edge reset I2C module
- 1MHz I2C-compatible interface
- +-6% accuracy and mismatch @I_{OUT}=20mA and I_{OUT}=3mA
- Auto breath function:
  1), 3 patterns auto breath(12b@220Hz), for 3×3 channels. - Other channel can quit the pattern and control by SL&PWM
  2), Fade IN/ Fade OUT time length max value up to 5~8s.
  3), Single Pulse/Multi pulse/Manual control modes for auto breath.
  4), 3 color pre-configure registers for color breath
- 23kHz PWM frequency (8+4 PWM mode)
- QFN-20 (3mm×3mm) package

QUICK START

Figure 1: Photo of IS31FL3299 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 IS31FL3299 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 JP1 to connect by board MCU (default short).
2) Connect the 5VDC power to the connector (TP1&TP2) or plug in the USB power input to micro-USB (CON1).
3) Turn on the power supply/Plug in the Micro USB Pay attention to the supply current. If the current exceeds 1A, please check for circuit fault.

ORDERING INFORMATION

Part No.	Temperature Range	Package
IS31FL3299-QFLS4-EB	-40°C ~ +125°C (Industrial)	QFN-20, 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 IS31FL3299 evaluation board has five display modes. Press K1 to switch configurations.

1) RGB Mode
2) 3 Pattern Mode
3) Current Level Mode
4) PWM Mode

Note: IS31FL3299 solely controls the FxLED function on the evaluation board.

SOFTWARE CONTROL

J1 default setting is closed (short). If it is set to open, the MCU's SDB, SCL, SDA and CLK pin will be high impedance (open-drain) and external control is allowed.

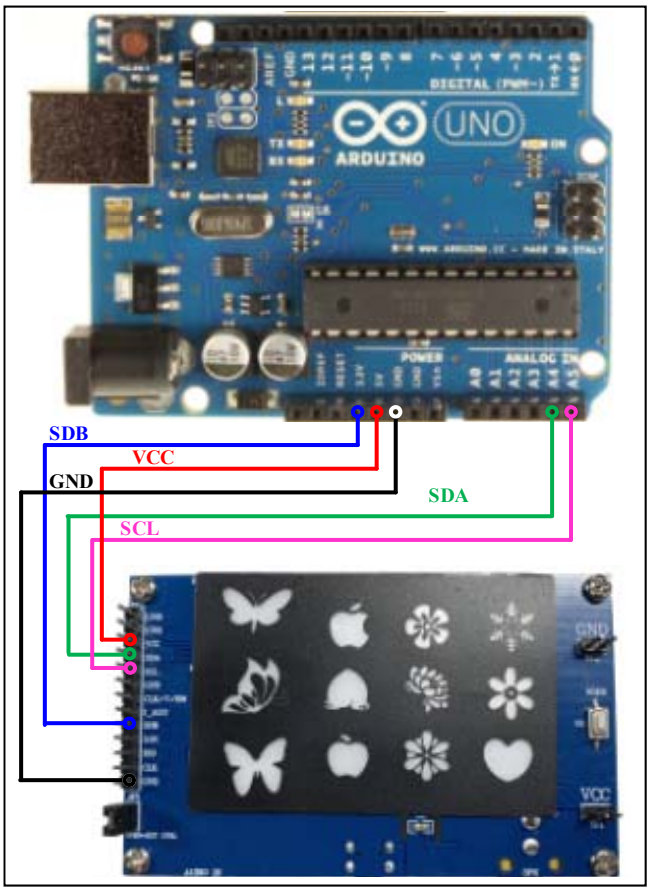

Figure 2: Photo of Arduino UNO connected to Evaluation Board

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 IS31FL3299 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 IS31FL3299 EVB:
   a) Arduino 5V pin to IS31FL3299 EVB VCC.
   b) Arduino GND to IS31FL3299 EVB GND.
   c) Arduino SDA (A4) to IS31FL3299 EVB SDA.
   d) Arduino SCL (A5) to IS31FL3299 EVB SCL.
   e) If Arduino use 3.3V MCU VCC, connect 3.3V to IS31FL3299 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.
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 STM32F103C8T6 is disabled. (Some early board we provided is still controlling the white 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 IS31FL3299.

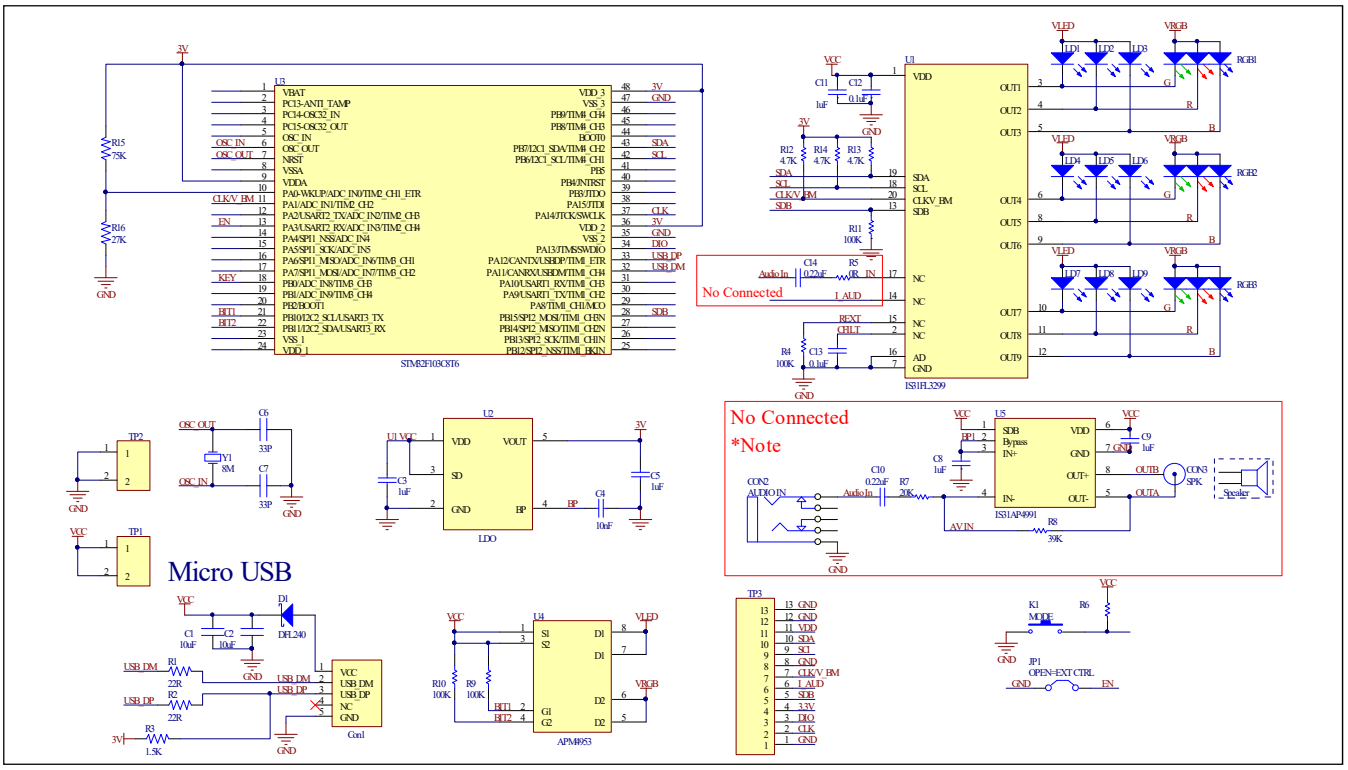

Figure 3: IS31FL3299 Application Schematic

BILL OF MATERIALS

Name	Symbol	Description	Qty	Supplier	Part No.
LED Driver	U1	Matrix LED Driver	1	Lumissil	IS31FL3299
LDO	U2	3.0V LDO	1	SGMICRO	SGM2019-3.0YN5G
MCU	U3	Microcontroller	1	STM	STM32F103C8T6
PMOS	U4	PMOS	1	ANPEC	APM4953
LED	LD1~LD9	Blue LED, SMD	9	Everlight	19-217/BHC-ZL1M2RY/3T
LED	RGB1~ RGB3	RGB LED, SMD	3	Everlight	99-235/RSGBB7C-A22/2D or 99-235/RGBC/TR8
Diode	D1	Diode, SMD	1	Diodes	DFLS240
Crystal	Y1	Crystal, 8MHz	1	HLX	HC-49S
Resistor	R1,R2	RES,22R,1/16W,±5%,SMD	2	Yageo	RC0603JR-0722RL
Resistor	R3	RES,1.5k,1/16W,±5%,SMD	1	Yageo	RC0603JR-071K5L
Resistor	R4,R6,R9, R10,R11	RES,100k,1/16W,±5%,SMD	5	Yageo	RC0603JR-07100KL
Resistor	R12,R13, R14	RES,4.7k,1/16W,±5%,SMD	3	Yageo	RC0603JR-0704K7L
Resistor	R15	RES,75k,1/16W,±5%,SMD	1	Yageo	RC0603JR-0775KL
Resistor	R16	RES,27k,1/16W,±5%,SMD	1	Yageo	RC0603JR-0727KL
Capacitor	C1,C2	CAP,10μF,16V,±20%,SMD	2	Yageo	CC0603KKX7R9BB106
Capacitor	C3,C5,C11	CAP,1μF,16V,±20%,SMD	3	Yageo	CC0603KKX7R9BB105
Capacitor	C4	CAP,10nF,16V,±20%,SMD	1	Yageo	CC0603KKX7R9BB103
Capacitor	C6,C7	CAP,33pF,16V,±20%,SMD	2	Yageo	CC0603KKX7R9BB330
Capacitor	C12,C13	CAP,0.1μF,16V,±20%,SMD	2	Yageo	CC0603KKX7R9BB104
Button	K1	Button SMD	1		
AMP	U5	No Connected (Note)	1		
Phone Jack	CON2	No Connected	1		
Speaker	CON3	No Connected	1		
Resistor	R5,R7,R8	No Connected	3		
Capacitor	C8,C9, C10,C14	No Connected	4		

Bill of Materials, refer to Figure 3 above.

Note: IS31FL3299 Evaluation Board is compatible with IS31FL3199, some components reserve for the audio function on IS31FL3199. These components don't need to connected on IS31FL3299 Evaluation Board.

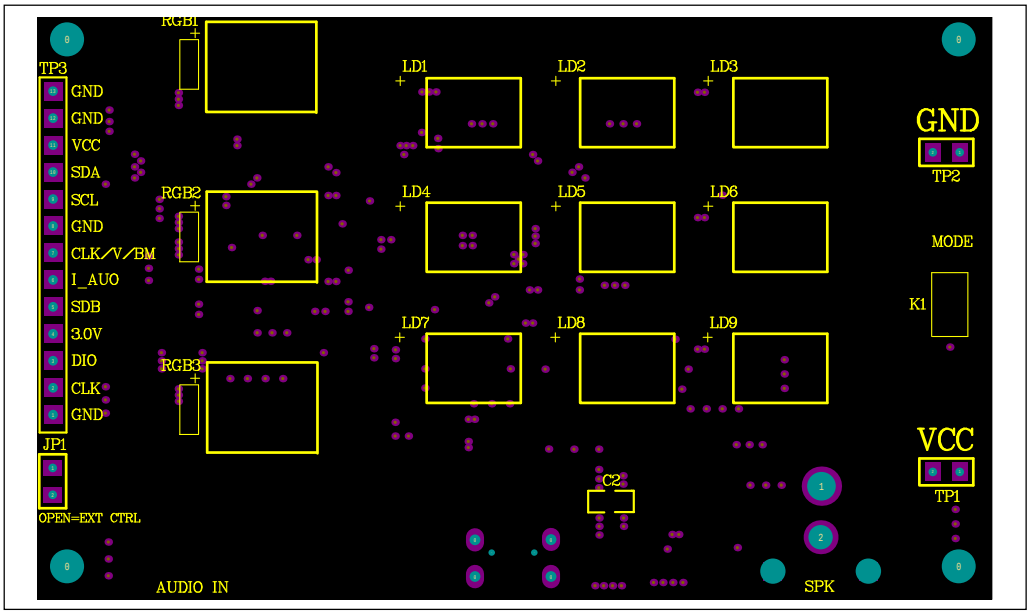

Figure 4: Board Component Placement Guide - Top Layer

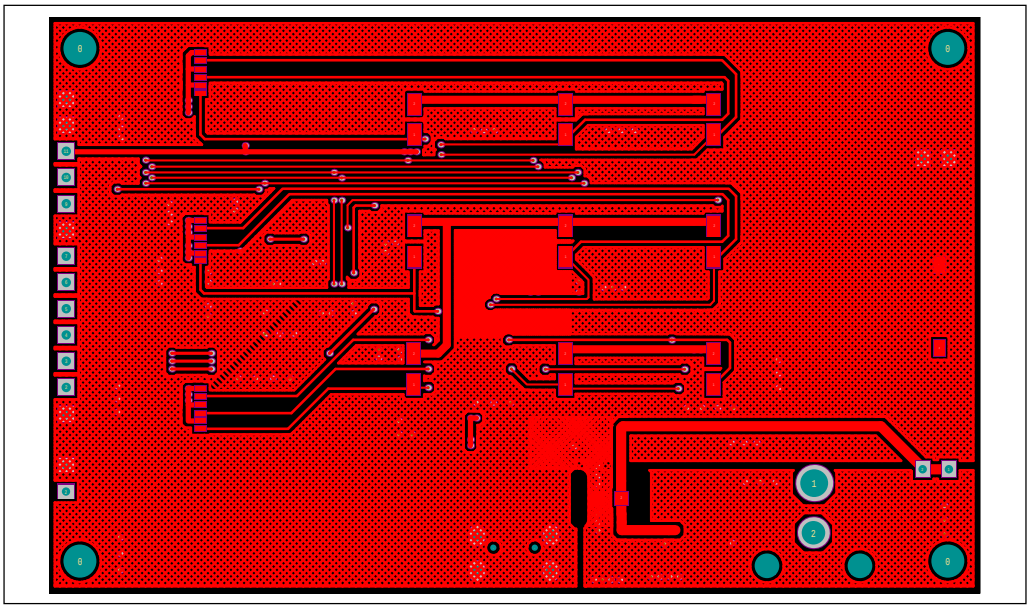

Figure 5: Board PCB Layout - Top Layer

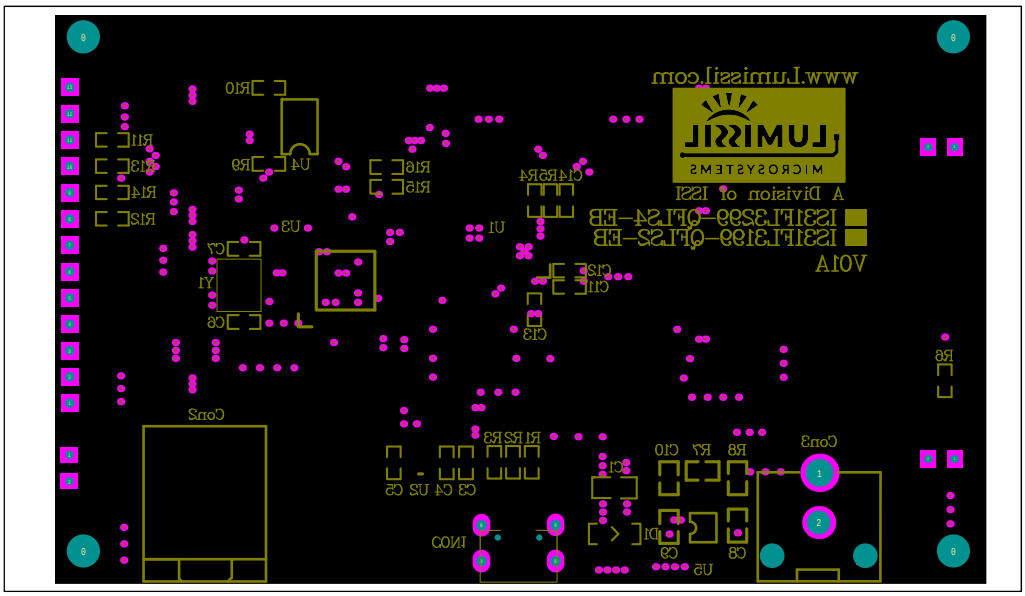

Figure 6: Board Component Placement Guide - Bottom Layer

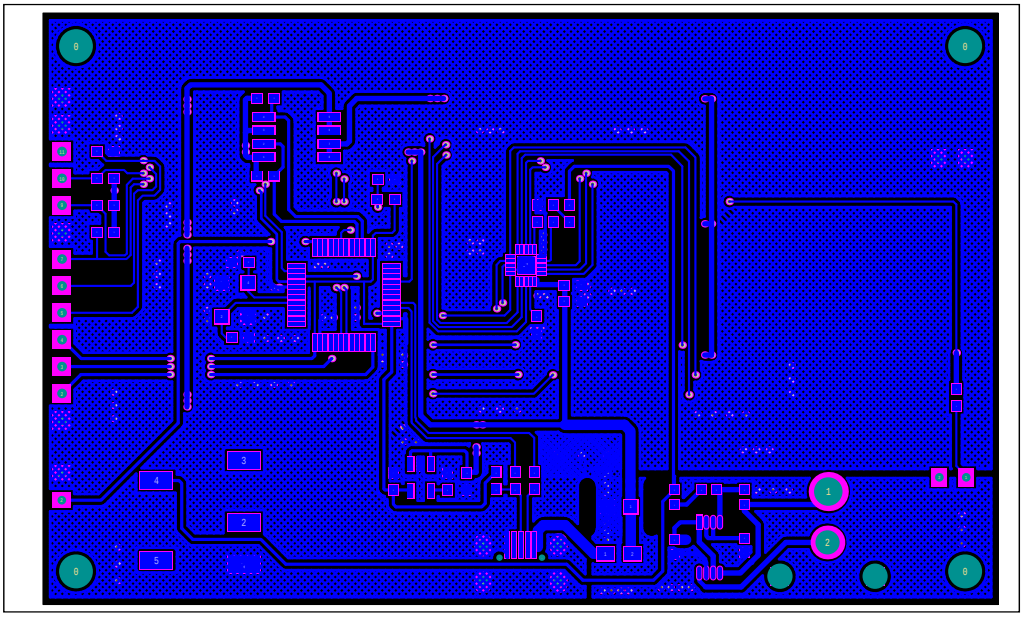

Figure 7: Board PCB Layout - Bottom Layer

REVISION HISTORY

Revision	Detail Information	Data
A	Initial release	2022.05.24
B	Update the Bill of Materials	2022.07.18

APPENDIX I: IS31FL3299 Arduino Test Code V01A

```
#include<Wire.h>
#include<avr/pgmspace.h>
#define Addr_GND 0xE8

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_FL3299();
   IS31FL3299_mode1();//RGB MODE mode
}

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

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_FL3299(void)
{
   uint8_t i = 0;

   for(i=0x10;i<=0x18;i++)
   {
      IS_IIC_WriteByte(Addr_GND,i,0x40);//Color 1 Setting
   }
   for(i=0x20;i<=0x28;i++)
   {
      IS_IIC_WriteByte(Addr_GND,i,0x00);//Color 2 Setting
   }
   for(i=0x30;i<=0x38;i++)
   {
      IS_IIC_WriteByte(Addr_GND,i,0x00);//Color 3 Setting
   }

   for(i=0x40;i<=0x51;i++)
   {
      IS_IIC_WriteByte(Addr_GND,i,0x00);//PWM
   }

   IS_IIC_WriteByte(Addr_GND,0x52,0xC5);//Color Update
   IS_IIC_WriteByte(Addr_GND,0x53,0xC5);//PWM Update
   IS_IIC_WriteByte(Addr_GND,0x54,0xC5);//Pattern Update 1
   IS_IIC_WriteByte(Addr_GND,0x55,0xC5);//Pattern Update 2
   IS_IIC_WriteByte(Addr_GND,0x56,0xC5);//Pattern Update 3
}

void IS31FL3299_mode1(void)//white LED
{
```

```
  uint8_t i=0,j=0;
  IS_IIC_WriteByte(Addr_GND,0x04,0x40);//9 OUTPUT RGB MODE
  IS_IIC_WriteByte(Addr_GND,0x05,0x00);//
  IS_IIC_WriteByte(Addr_GND,0x06,0x00);//

    for(i=0x10;i<=0x18;i++)
  {
    IS_IIC_WriteByte(Addr_GND,i,0x20);//Color 1 Setting
  }
    for(i=0x20;i<=0x28;i++)
  {
    IS_IIC_WriteByte(Addr_GND,i,0x80);//Color 2 Setting
  }
    for(i=0x30;i<=0x38;i++)
  {
    IS_IIC_WriteByte(Addr_GND,i,0xFF);//Color 2 Setting
  }

  IS_IIC_WriteByte(Addr_GND,0x19,0x44);//Pattern TS &T1 Setting   0.51s
  IS_IIC_WriteByte(Addr_GND,0x1A,0x44);//Pattern T2 &T3 Setting   0.51s
  IS_IIC_WriteByte(Addr_GND,0x1B,0x44);//Pattern TP &T4 Setting   0.51s

  IS_IIC_WriteByte(Addr_GND,0x1C,0x07);//Pattern Color Enable
  IS_IIC_WriteByte(Addr_GND,0x1D,0x15);//Pattern Color Cycle
  IS_IIC_WriteByte(Addr_GND,0x1E,0x00);//Pattern
  IS_IIC_WriteByte(Addr_GND,0x1F,0x00);//Pattern Loop Times

  IS_IIC_WriteByte(Addr_GND,0x52,0xC5);//Color Update
  IS_IIC_WriteByte(Addr_GND,0x53,0xC5);//PWM Update
  IS_IIC_WriteByte(Addr_GND,0x54,0xC5);//Pattern TIME Update 1
  IS_IIC_WriteByte(Addr_GND,0x55,0xC5);//Pattern TIME Update 2
  IS_IIC_WriteByte(Addr_GND,0x56,0xC5);//Pattern TIME Update 3

}
```