

# **P43401**

## **176x3x176 Full Color Application Notes (For 8080 8bits Interface)**

## Revision History

Version	Content
X01	First release(For 8080 8bits Interface)

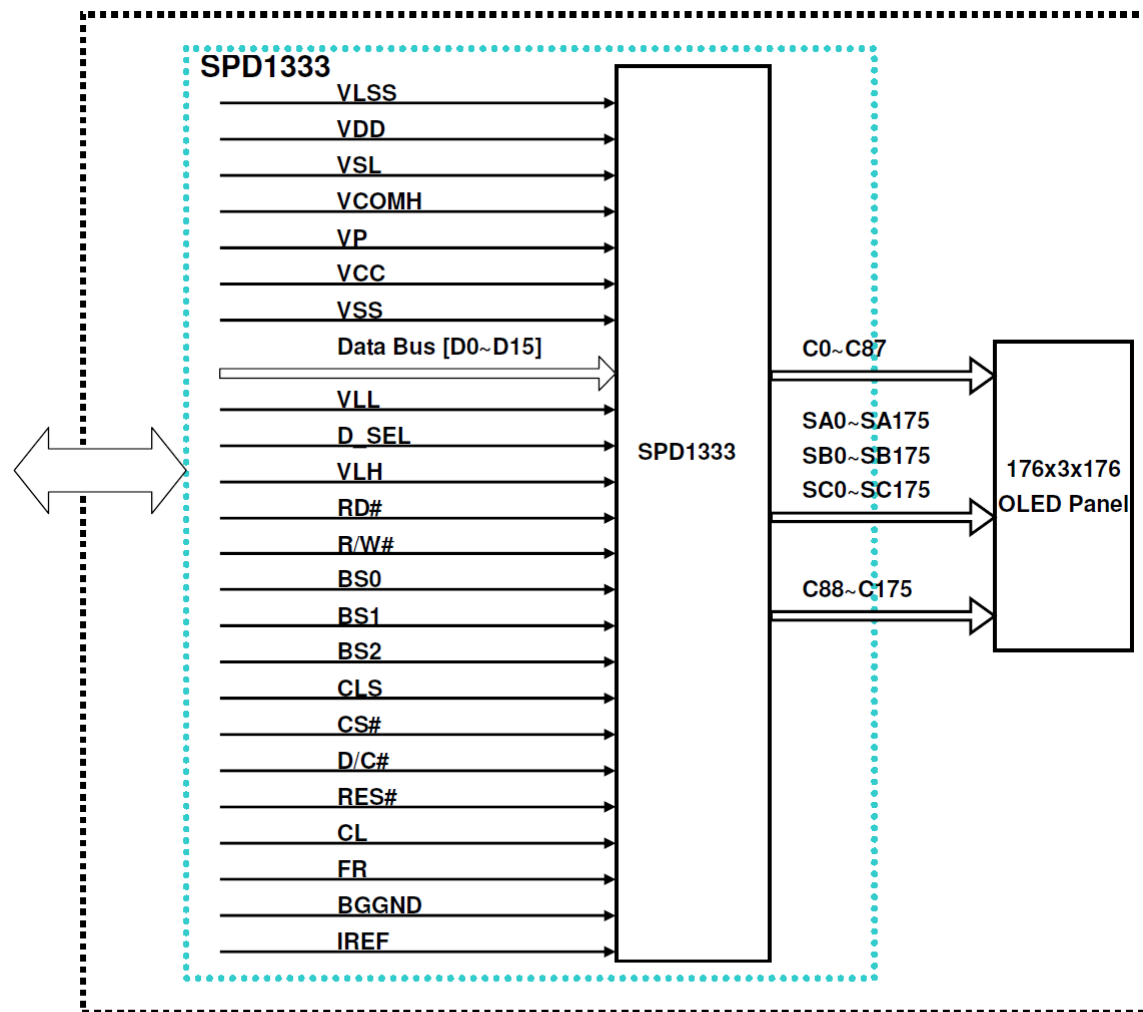
**DESCRIPTION**

P43401 is a 176x3x176 full color passive OLED module with controller for many compact portable applications.

**FEATURE**

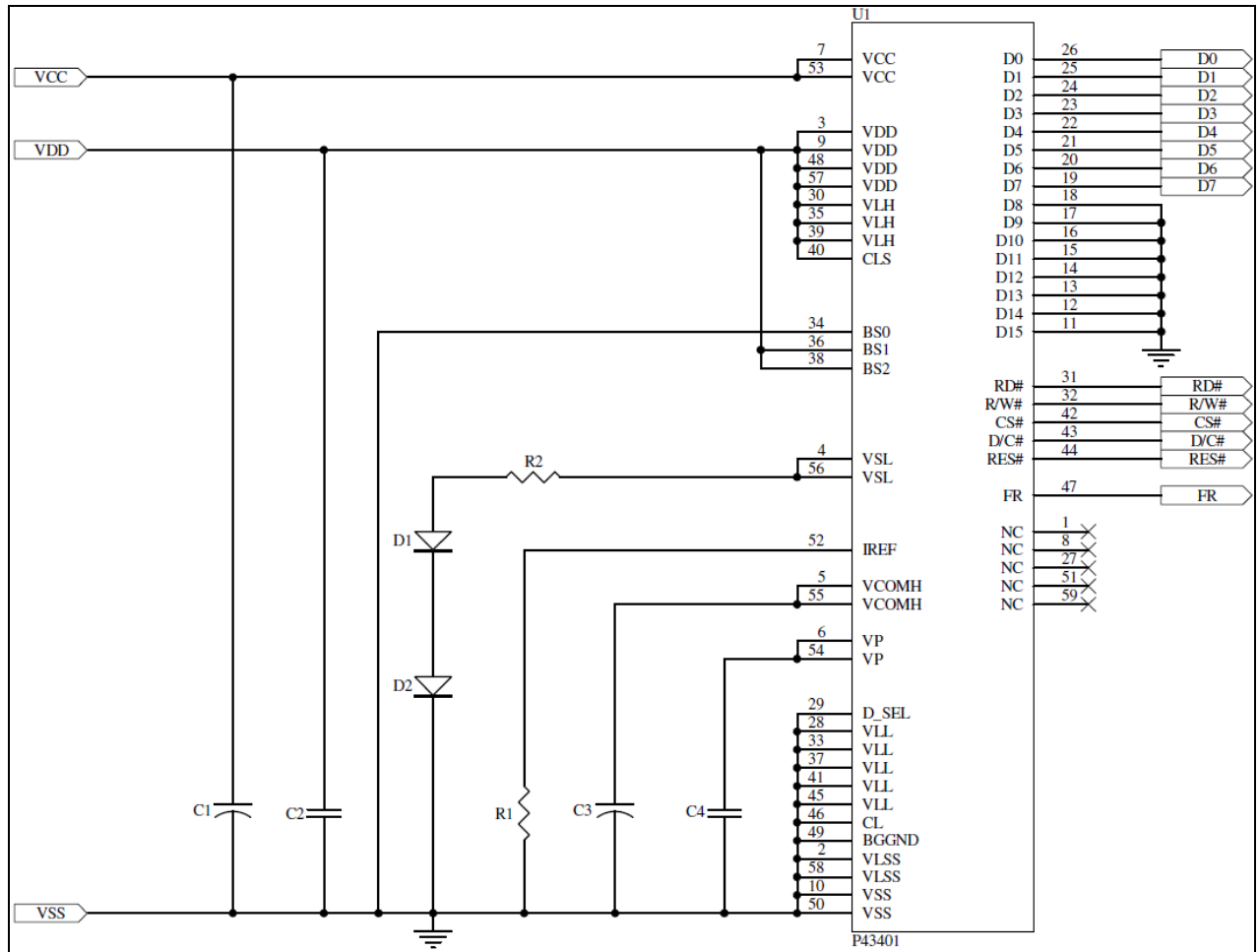
- 176x3x176 dot matrix full color OLED panel.
- Driver IC SPD1333.
- VCC = 17V
- VDD = 1.65V~3.5V
- 8/16 bits 6800/8080-series parallel Interface, 3/4 wire serial peripheral interface.
- Scrolling function.
- Row re-mapping and Column re-mapping.

**FUNCTION BLOCK DIAGRAM**



**RiTdisplay 176X3x176 OLED Module**

**APPLICATION CIRCUIT**



**Recommend components:**

C1 : 4.7uF/25V(0805)

C3 : 4.7uF/25V (Tantalum type) or VISHAY (572D475X0025A2T)

C2, C4 : 1uF/16V(0603)

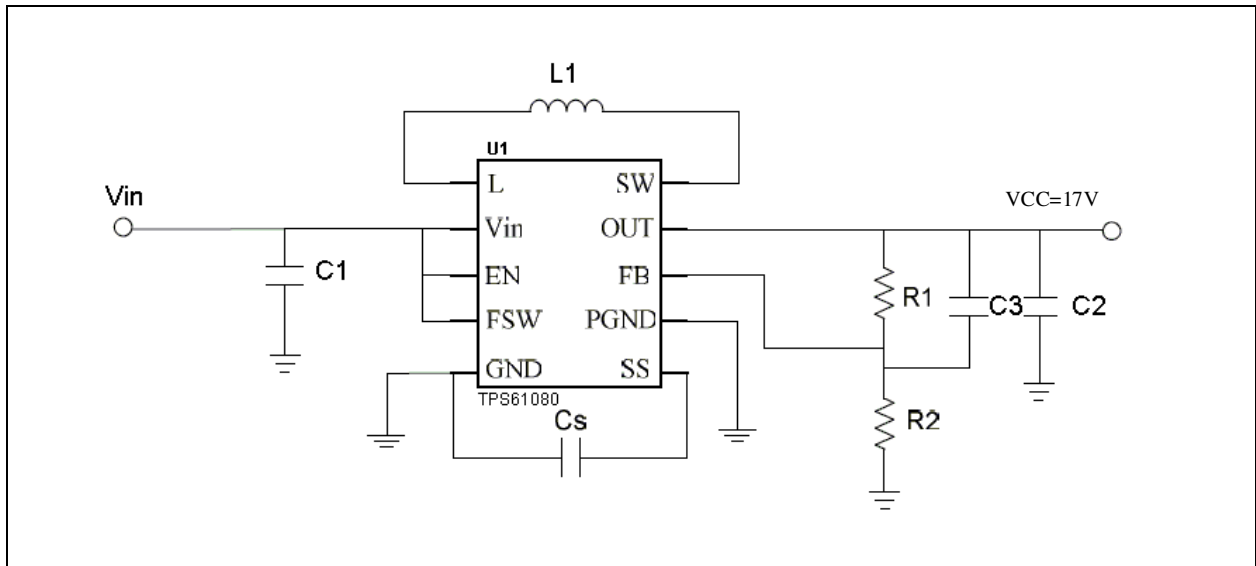
R1: 1M ohm (0603) 1%

R2: 49.9 ohm 1/4W

D1,D2: RB480K (ROHM)

**This circuit is for 8080 8bit interface.**

**DC-DC application circuit for OLED module**



**Recommend components:**

The C1: 4.7uF/6.3V.

The C2: 4.7 uF/25V Tantalum type capacitor.

The C3: 50pF/16V.

The Cs: 47nF/16V.

The R1: 1.2M ohm/ 1%.

The R2: 92K ohm/ 1%.

The L1: 4.7uH.

The U1: TPS61080

The R1, R2 and C3 value should be fine tune by customer.

**PIN ASSIGNMENTS**

Pin No.	Pin Name	Description	Setting at each interface		
			8080 16bit parallel	8080 8bit parallel	4 wire SPI
1	NC	No connection.			
2	VLSS	Analog system ground pin.			
3	VDD	Power supply pin for core logic operation.			
4	VSL	This is segment voltage reference pin.			
5	VCOMH	COM signal deselected voltage level. A capacitor should be connected between this pin and VSS.			
6	VP	This pin is the segment pre-charge voltage reference pin.			
7	VCC	Power supply for panel driving voltage.			
8	NC	No connection.			
9	VDD	Power supply pin for core logic operation.			
10	VSS	Ground pin.			
11	D15	These pins are bi-directional data bus connecting to the MCU data bus.  When serial interface mode is selected, D2, D1 should be tied together as the serial data input: SDIN, and D0 will be the serial clock input: SCLK.	D15	Tie LOW	Tie LOW
12	D14		D14	Tie LOW	Tie LOW
13	D13		D13	Tie LOW	Tie LOW
14	D12		D12	Tie LOW	Tie LOW
15	D11		D11	Tie LOW	Tie LOW
16	D10		D10	Tie LOW	Tie LOW
17	D9		D9	Tie LOW	Tie LOW
18	D8		D8	Tie LOW	Tie LOW
19	D7		D7	D7	Tie LOW
20	D6		D6	D6	Tie LOW
21	D5		D5	D5	Tie LOW
22	D4		D4	D4	Tie LOW
23	D3		D3	D3	Tie LOW
24	D2		D2	D2	SDIN
25	D1		D1	D1	SDIN

26	D0		D0	D0	SCLK
27	NC	No connection.			
28	VLL	Logic low.			
29	D_SEL	Should be connected to VLL.			
30	VLH	Logic high.			
31	RD#	8080: data read enable pin; 6800:Read/Write enable pin.When serial interface is selected, this pin must be connected to VSS.	RD#	RD#	Tie LOW
32	R/W#	This pin is read / write control input pin connecting to the MCU interface. 8080: data write enable pin; 6800:Read/Write select pin.	R/W#	R/W#	Tie LOW
33	VLL	Logic low.			
34	BS0	MCU bus interface selection pins.	High	Low	Low
35	VLH	Logic high.			
36	BS1	MCU bus interface selection pins.	High	High	Low
37	VLL	Logic low.			
38	BS2	MCU bus interface selection pins.	High	High	Low
39	VLH	Logic high.			
40	CLS	This is internal clock enable pin.			
41	VLL	Logic low.			
42	CS#	This pin is the chip select input. Low active.	CS#	CS#	CS#
43	D/C#	This pin is Data/Command control pin	D/C#	D/C#	D/C#
44	RES#	This is a reset signal input. Low active.			
45	VLL	Logic low.			
46	CL	This is external clock input pin.			
47	FR	This pin outputs RAM write synchronization signal.			
48	VDD	Power supply pin for core logic operation.			
49	BGGND	It must be connected to VSS.			
50	VSS	Ground pin.			
51	NC	No connection.			
52	IREF	This is an internal voltage reference pin. A capacitor should be connected to this pin and VSS.			

53	VCC	Power supply for panel driving voltage.			
54	VP	This pin is the segment pre-charge voltage reference pin.			
55	VCOMH	COM signal deselected voltage level. A capacitor should be connected between this pin and VSS.			
56	VSL	This is segment voltage reference pin.			
57	VDD	Power supply pin for core logic operation.			
58	VLSS	Analog system ground pin.			
59	NC	No connection.			

**Note**

- (1) Low is connected to VSS
- (2) High is connected to VDD

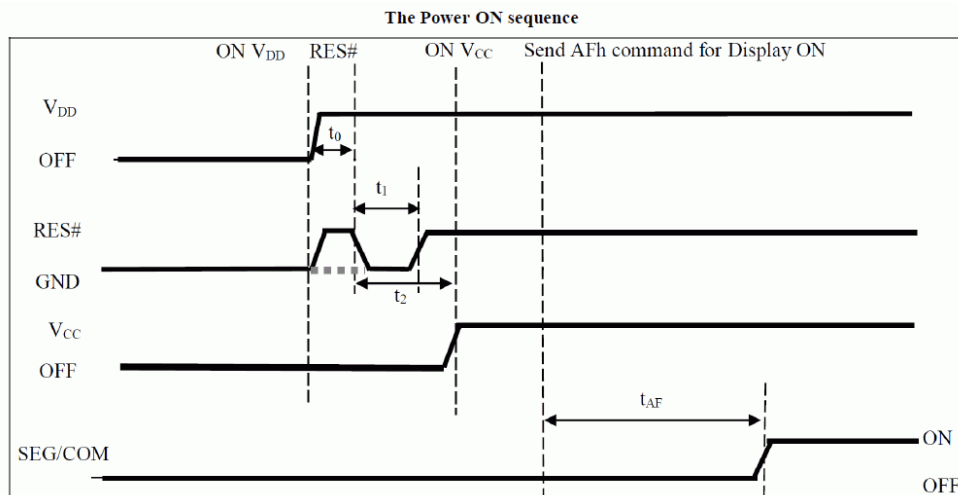


### Power ON / OFF Sequence

The following figures illustrate the recommended power ON and power OFF sequence of SSD1333.

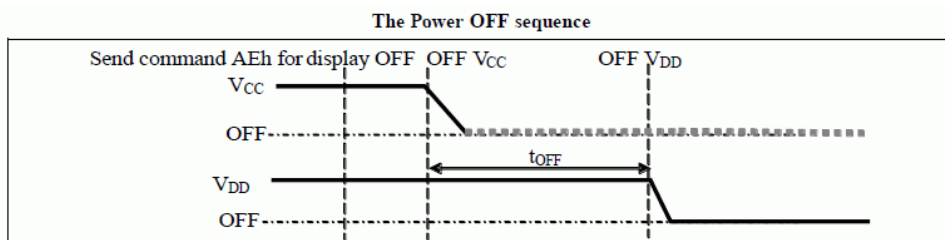
*Power ON sequence:*

1. Power ON VDD
2. After VDD become stable, wait at least 20ms ( $t_0$ ), set RES# pin LOW (logic low) for at least 3us ( $t_1$ )<sup>(4)</sup> and then HIGH (logic high).
3. After set RES# pin LOW (logic low), wait for at least 3us ( $t_2$ ). Then Power ON VCC.<sup>(1)</sup>
4. After VCC become stable, send command AFh for display ON. SEG/COM will be ON after 100ms( $t_{AF}$ ).



*Power OFF sequence:*

1. Send command AEh for display OFF.
2. Power OFF VCC.<sup>(1), (2)</sup>
3. Power OFF VDD after  $t_{OFF}$ .<sup>(4)</sup> (where Minimum  $t_{OFF}$ =80ms, typical  $t_{OFF}$ =100ms)



**Note:**

- (1) VCC should be kept float (i.e. disable) when it is OFF.
- (2) Power Pins (VDD, VCC) can never be pulled to ground under any circumstance.
- (3) The register values are reset after  $t_1$ .
- (4) VDD should not be Power OFF before VCC Power OFF.

### Graphic Display Data RAM Address Map

The GDDRAM is a bit mapped static RAM holding the pattern to be displayed. The RAM size is 176 x 176 x16bits. For mechanical flexibility, re-mapping on both Segment and Common outputs can be selected by software. Each pixel has 16-bit data. Sub-pixels for color A, C have 5 bits and B have 6 bits. The arrangement of data pixel in graphic display data RAM is shown below figures.

**65k Color Depth Graphic Display Data RAM Structure**

Segment Address	Normal	0			1			2	.....	.....	174	175			
	Remapped	175			174			173	.....	.....	1	0			
Color		A	B	C	A	B	C	A	.....	.....	C	A	B	C	
Common Address	Data format		B5	C4	B5	C4	C4	A4	.....	.....	C4	A4	B4	C4	
			A4	B4	C4	A4	B4	C4	A4	.....	.....	C4	A4	B4	C4
			A3	B3	C3	A3	B3	C3	A3	.....	.....	C3	A3	B3	C3
			A2	B2	C2	A2	B2	C2	A2	.....	.....	C2	A2	B2	C2
			A1	B1	C1	A1	B1	C1	A1	.....	.....	C1	A1	B1	C1
		A0	B0	C0	A0	B0	C0	A0	.....	.....	C0	A0	B0	C0	
Normal															
Remapped															
0	175	5	6	5	5	6	5	5	.....	.....	5	5	6	5	
1	174	5	6	5	5	6	5	5	.....	.....	5	5	6	5	
2	173	5	6	5	5	6	5	5	.....	.....	5	5	6	5	
3	172	5	6	5	5	6	5	5	.....	.....	5	5	6	5	
4	171	5	6	5	5	6	5	5	.....	.....	5	5	6	5	
5	170	5	6	5	5	6	5	5	.....	.....	5	5	6	5	
6	169	5	6	5	5	6	5	5	.....	.....	5	5	6	5	
7	168	5	6	no. of bits in this cell			5	5	.....	.....	5	5	6	5	
:	:	:	:	:	:	:	:	:	.....	.....	:	:	:	:	
:	:	:	:	:	:	:	:	:	.....	.....	:	:	:	:	
:	:	:	:	:	:	:	:	:	.....	.....	:	:	:	:	
:	:	:	:	:	:	:	:	:	.....	.....	:	:	:	:	
171	4	5	6	5	5	6	5	5	.....	.....	5	5	6	5	
172	3	5	6	5	5	6	5	5	.....	.....	5	5	6	5	
173	2	5	6	5	5	6	5	5	.....	.....	5	5	6	5	
174	1	5	6	5	5	6	5	5	.....	.....	5	5	6	5	
175	0	5	6	5	5	6	5	5	.....	.....	5	5	6	5	

SEG output	SA0	SB0	SC0	SA1	SB1	SC1	SA2	.....	.....	SC174	SA175	SB175	SC175
------------	-----	-----	-----	-----	-----	-----	-----	-------	-------	-------	-------	-------	-------

Common output	COM0	COM1	COM2	COM3	COM4	COM5	COM6	COM7	:	:	:	:	COM172	COM173	COM174	COM175
---------------	------	------	------	------	------	------	------	------	---	---	---	---	--------	--------	--------	--------

### Application Initial Setting

```
/* 176x3x176 OLED driver program */
```

```
void initial(void)
```

```
{
```

```
comm_out(0xfd); //Set Command Lock
```

```
data_out(0x12);
```

```
comm_out(0xae); //Display off
```

```
comm_out(0xa0); //Set Re-map/Color Depth
```

```
data_out(0x64);
```

```
comm_out(0xa1); //Set Display Start Line
```

```
data_out(0x00);
```

```
comm_out(0xa2); //Set Display Offset
```

```
data_out(0x00);
```

```
comm_out(0xa6); //Reset to normal display
```

```
comm_out(0xb1); //Set Reset(Phase 1)/Pre-charge(Phase 2)period
```

```
data_out(0x24);
```

```
comm_out(0xb3); //Front Clock Divider(DivSet)/Oscillator Frequency
```

```
data_out(0x80);
```

```
comm_out(0xb6); //Set Second Precharge Period
```

```
data_out(0x0f);
```

```
comm_out(0xbb); //Set Pre-charge voltage
```

```
data_out(0x1f);
```

```
comm_out(0xbe); //Set VCOMH Voltage
```

```
data_out(0x05);
```

comm\_out(0xc1); //Set Contrast Current for Color A,B,C

data\_out(0x003c); // Luminance 80 nits

data\_out(0x0039);

data\_out(0x0043);

comm\_out(0xc7); //Master Contrast Current Control

data\_out(0x0f); //VCC=17V

comm\_out(0xca); //Set MUX Ratio

data\_out(0xaf);

comm\_out(0xb8); //gamma LUT

data\_out(0x00); //1

data\_out(0x02); //2

data\_out(0x04); //3

data\_out(0x06); //4

data\_out(0x07); //5

data\_out(0x08); //6

data\_out(0x09); //7

data\_out(0x0a); //8

data\_out(0x0b); //9

data\_out(0x0c); //10

data\_out(0x0d); //11

data\_out(0x0e); //12

data\_out(0x10); //13

data\_out(0x11); //14

data\_out(0x12); //15

data\_out(0x14); //16

data\_out(0x15); //17

data\_out(0x16); //18

data\_out(0x18); //19

data\_out(0x1a); //20

data\_out(0x1b); //21

data\_out(0x1d); //22

data\_out(0x1f); //23

data\_out(0x20); //24

data\_out(0x22); //25

data\_out(0x24); //26

data\_out(0x26);//27  
data\_out(0x27);//28  
data\_out(0x29);//29  
data\_out(0x2b);//30  
data\_out(0x2d);//31  
data\_out(0x2f);//32  
data\_out(0x31);//33  
data\_out(0x33);//34  
data\_out(0x35);//35  
data\_out(0x37);//36  
data\_out(0x39);//37  
data\_out(0x3b);//38  
data\_out(0x3d);//39  
data\_out(0x3f);//40  
data\_out(0x42);//41  
data\_out(0x44);//42  
data\_out(0x46);//43  
data\_out(0x48);//44  
data\_out(0x4b);//45  
data\_out(0x4d);//46  
data\_out(0x50);//47  
data\_out(0x52);//48  
data\_out(0x55);//49  
data\_out(0x57);//50  
data\_out(0x5a);//51  
data\_out(0x5b);//52  
data\_out(0x5f);//53  
data\_out(0x62);//54  
data\_out(0x65);//55  
data\_out(0x67);//56  
data\_out(0x6a);//57  
data\_out(0x6d);//58  
data\_out(0x70);//59  
data\_out(0x73);//60  
data\_out(0x76);//61  
data\_out(0x79);//62  
data\_out(0x7c);//63

```
cleanDDR();           //Clear the whole DDRAM
```

```
comm_out(0xaf); //Display on  
}
```

```
void cleanDDR(void)
```

```
{  
int i,j;  
comm_out(0x15);  
data_out(0x00);  
data_out(0xaf);  
comm_out(0x75);  
data_out(0x00);  
data_out(0xaf);
```

```
comm_out(0x5c);
```

```
for(i=0;i<176;i++)  
{  
for(j=0;j<176;j++)  
{  
data_out(0x00);  
data_out(0x00);  
}  
}  
}
```

```
write_red_data(void)
```

```
{  
int i;  
ram_address( );  
comm_out(0x5c);
```

```
for(i=0;i<176;i++)  
{  
for(j=0;j<176;j++)  
{  
data_out(0xf8);//RED  
data_out(0x00);  
}  
}  
}
```

```
write_green_data(void)
```

```
{  
int i;  
ram_address( );  
comm_out(0x5c);  
  
for(i=0;i<176;i++)  
{  
for(j=0;j<176;j++)  
{  
data_out(0x07);//GREEN  
data_out(0xe0);  
}  
}  
}
```

```
write_blue_data(void)
```

```
{  
int i;  
ram_address( );  
comm_out(0x5c);  
  
for(i=0;i<176;i++)  
{  
for(j=0;j<176;j++)  
{  
data_out(0x00);//BLUE  
data_out(0x1f);  
}  
}  
}
```

```
write_white_data(void)
```

```
{  
int i;  
ram_address( );  
comm_out(0x5c);
```



```
for(i=0;i<176;i++)  
{  
  for(j=0;j<176;j++)  
  {  
    data_out(0xff); //WHITE  
    data_out(0xff);  
  }  
}  
}
```

```
ram _address(void);  
{  
  comm_out(0x15);  
  data_out(0x00);  
  data_out(0xaf);  
  comm_out(0x75);  
  data_out(0x00);  
  data_out(0xaf);  
}
```

**For 80 cd/m<sup>2</sup> setting, user could follow the below setting.**

Brightness\_mode1 (void);

```
{  
comm_out(0xc7);//Master Contrast Current Control  
data_out(0x000f);  
comm_out(0xc1);//Set Contrast Current for Color A,B,C  
data_out(0x003c);  
data_out(0x0039);  
data_out(0x0043);  
}
```

**For 70 cd/m<sup>2</sup> setting, user could follow the below setting.**

Brightness\_mode1 (void);

```
{  
comm_out(0xc7);//Master Contrast Current Control  
data_out(0x000f);  
comm_out(0xc1);//Set Contrast Current for Color A,B,C  
data_out(0x0030);  
data_out(0x0028);  
data_out(0x0039);  
}
```

**For 50 cd/m<sup>2</sup> setting, user could follow the below setting.**

Brightness\_mode2 (void);

```
{  
comm_out(0xc7);//Master Contrast Current Control  
data_out(0x000f);  
comm_out(0xc1);//Set Contrast Current for Color A,B,C  
data_out(0x001c);  
data_out(0x001d);  
data_out(0x0029);  
}
```

**For 30 cd/m<sup>2</sup> setting, user could follow the below setting.**

Brightness\_mode3 (void);

```
{  
comm_out(0xc7);//Master Contrast Current Control  
data_out(0x000f);  
comm_out(0xc1);//Set Contrast Current for Color A,B,C
```

```
data_out(0x000f);  
data_out(0x0012);  
data_out(0x001b);  
}
```

**For 20 cd/m<sup>2</sup> setting, user could follow the below setting.**

Brightness\_mode4 (void);

```
{  
comm_out(0xc7);//Master Contrast Current Control  
data_out(0x000f);  
comm_out(0xc1);//Set Contrast Current for Color A,B,C  
data_out(0x0009);  
data_out(0x000e);  
data_out(0x0014);  
}
```

**Thank You**

