



OZDISAN ELECTRONIC A.S.

3.5” 16 bit TFT Digital Driver Board Specification

TDDB-SSD-3.5-54P-16B-V2

Doc.Version : 1.0



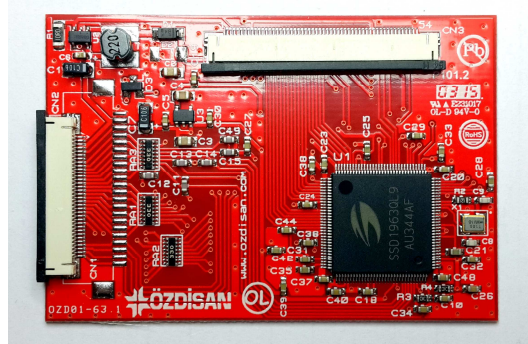
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Product Pictures



TDDB-SSD-3.5-54P-16B-V2

22 Pins 8Bit User MPU interface, 40 pins TFT connection, 20mA Backlight Driver

Main Parameters

Board supply voltage	3.3V
Backlight supply voltage	2.7V ~ 5.5V
Working current	< 1mA
Working temperature scope	-20°C ~ +60°C
Storage temperature scope	-40°C ~ +70°C

Controller Information

Built-in SSD1963

SSD1963 is a display controller of 1215K byte frame buffer to support up to 864x480x24bit graphics content. It also equips parallel MCU interfaces in a different bus width to receive graphics data and commands from MCU. Its display interface supports common RAM-less LCD driver of color depth up to 24 bit-per pixel.

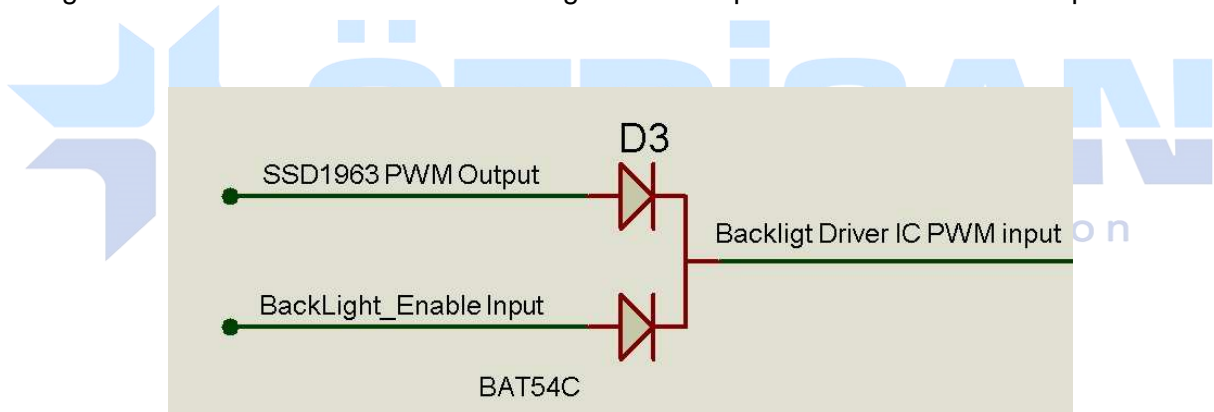


Data Format

Interface	Cycle	D[23]	D[22]	D[21]	D[20]	D[19]	D[18]	D[17]	D[16]	D[15]	D[14]	D[13]	D[12]	D[11]	D[10]	D[9]	D[8]	D[7]	D[6]	D[5]	D[4]	D[3]	D[2]	D[1]	D[0]
24 bits	1 st	R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0
18 bits	1 st							R5	R4	R3	R2	R1	R0	G5	G4	G3	G2	G1	G0	B5	B4	B3	B2	B1	B0
16 bits (565 format)	1 st									R5	R4	R3	R2	R1	G5	G4	G3	G2	G1	G0	B5	B4	B3	B2	B1
16 bits	1 st									R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0
	2 nd									B7	B6	B5	B4	B3	B2	B1	B0	R7	R6	R5	R4	R3	R2	R1	R0
	3 rd									G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0
12 bits	1 st													R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4
	2 nd											G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0		
9 bits	1 st																R5	R4	R3	R2	R1	R0	G5	G4	G3
	2 nd															G2	G1	G0	B5	B4	B3	B2	B1	B0	
8 bits	1 st																	R7	R6	R5	R4	R3	R2	R1	R0
	2 nd																	G7	G6	G5	G4	G3	G2	G1	G0
	3 rd																	B7	B6	B5	B4	B3	B2	B1	B0

Backlight

The driver board has 20mA constant current Backlight Driver circuit with maximum 24V output. The backlight can be controlled from MCU Backlight Enable input or SSD1963 PWM output.



Backlight Enable Input	SSD1963 PWM Output	Backlight
0	Off	Off
0	On	Brightness Dimming
1	Off	%100
1	On	%100



Pin Description for CN1: 34Pin 16 bit input from User's

Pin No.	Symbol	Function Description
1	GND	GND
2	GND	GND
3	Vbl	Backlight Supply 2.7V-5.5V
4	Vbl	Backlight Supply 2.7V-5.5V
5	Vcc	Board and TFT Supply 3.3V
6	NC	
7	NC	
8	BLen	Backlight Enable
9	WR	Write Signal-Active Low
10	RD	Read Signal-Active Low
11	RS	Register select (Data Or command)
12	CS	Chip Select Signal- Active Low (Enables data or command sending)
13	TE	Tear Effect
14	RESET	Reset Signal- Active Low
15-30	D0-D15	16 Bit Bidirectional Data bus
31	TP_R	Touch Panel Right
32	TP_B	Touch Panel Bottom
33	TP_L	Touch Panel Left
34	TP_T	Touch Panel Top

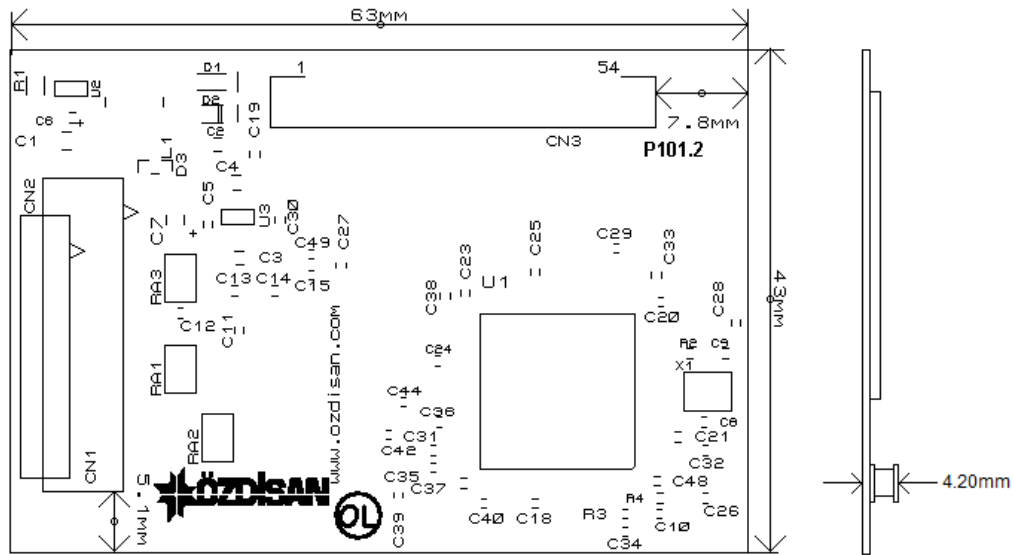
Pin Description for CN3: Pin Connections to TFT Panel

Pin No.	Symbol	Function Description
1	LED-	LED Cathode
2	LED-	LED Cathode
3	LED+	LED Anode
4	LED+	LED Anode
5-7	NC	
8	RESET	Reset
9	SPENA	Serial Port Data Enable Signal
10	SPCK	SPI Serial Clock
11	SPDA	SPI Serial Data Input
12-19	B0-B7	Blue Data 0-7
20-27	G0-G7	Green Data 0-7
28-35	R0-R7	Red Data 0-7
36	HSYNC	Horizontal Sync
37	VSYNC	Vertical Sync
38	DCLK	Data Clock
39-40	NC	
41-42	VDD	Power Supply (3.3V)
43-51	NC	
52	DEN	Data Enabling Signal
53-54	GND	Ground

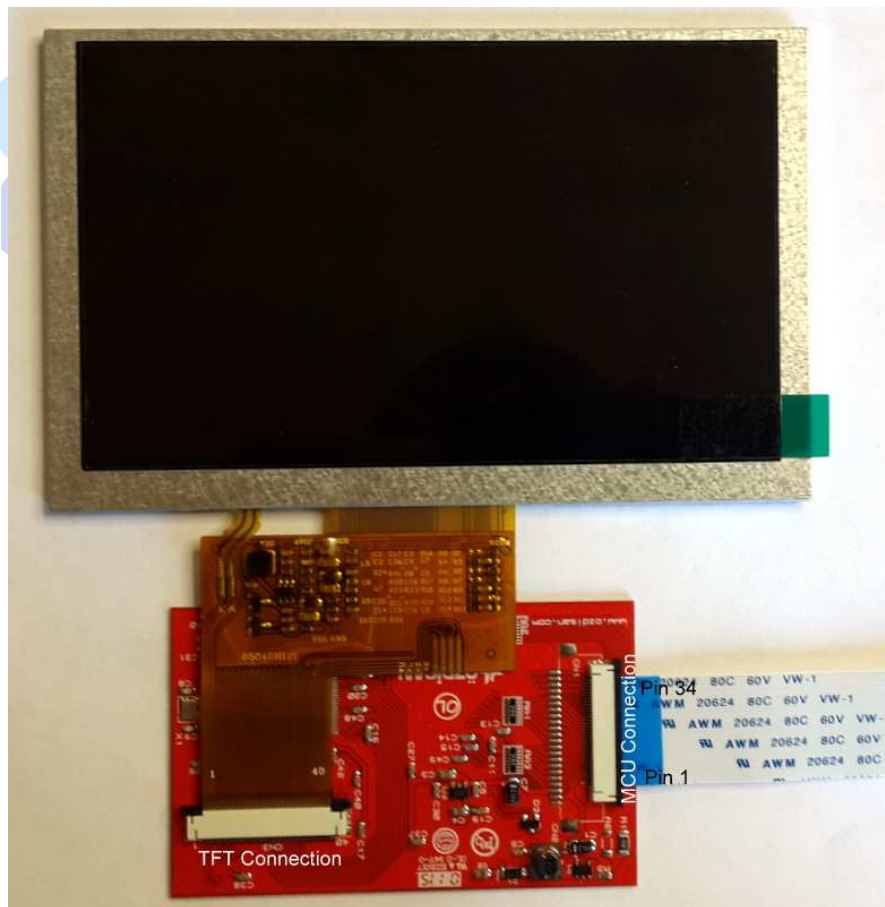
*SPI inputs are used just for TFT controller register settings



Outline Dimensions



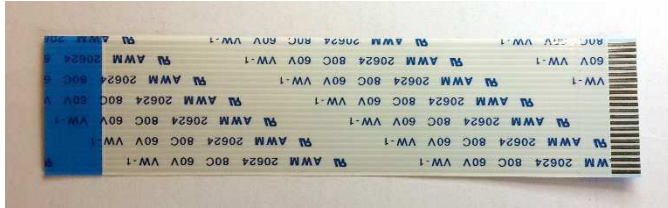
Board Connections





Other Tools used with the boards

DS1057-03-1E22W5L10E1B: Flat cable with 22 pins 10cm



FPC3AMR6-22TNBT-U: Connector with 22 pins



3.5" TFT Panel

SAT035TM54DMR1-A0-01

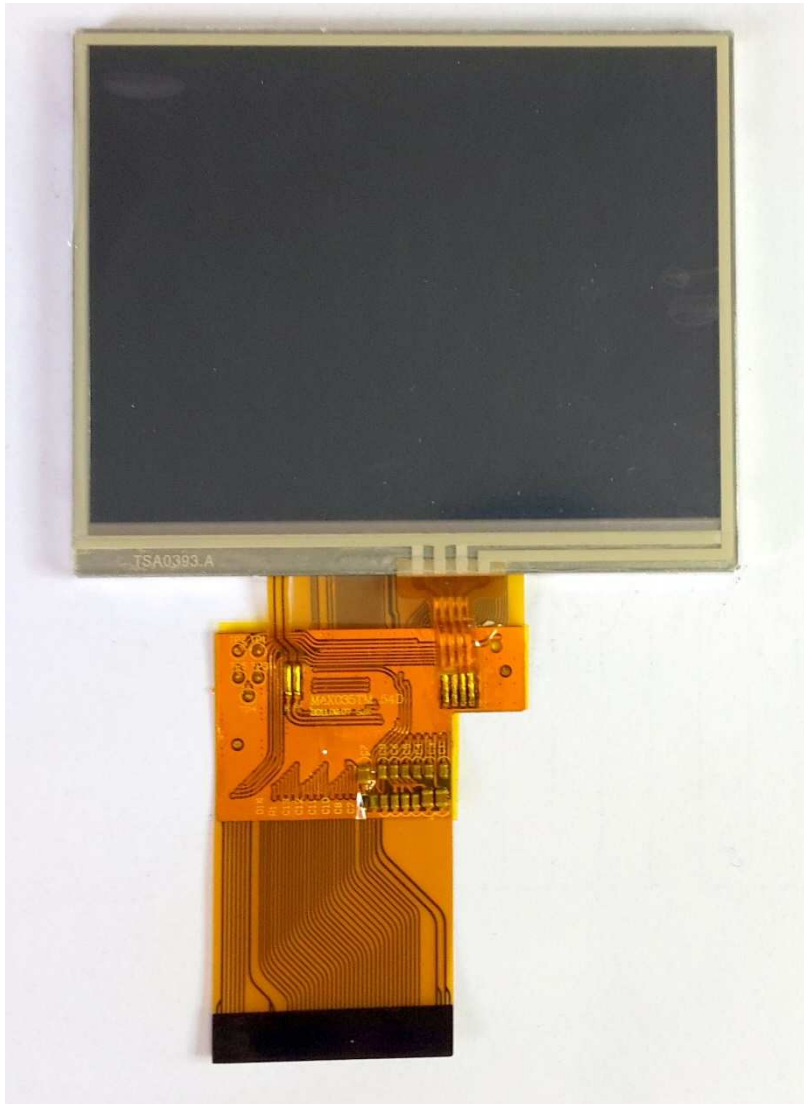


DISAN
Way of Distribution



3.5" TFT Panel with Touch Panel

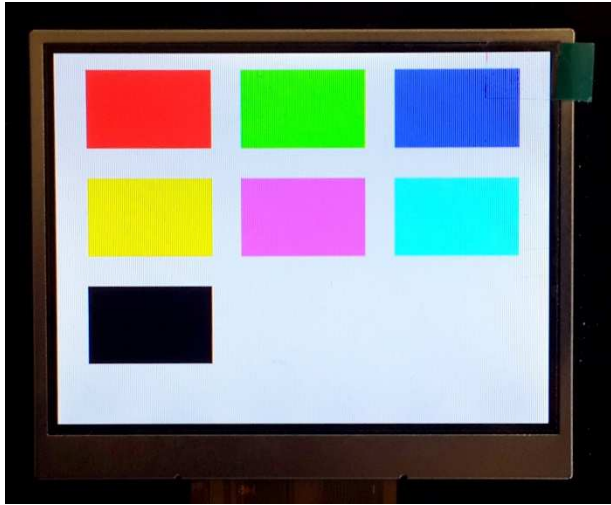
SAT035TM54DMR1-A0-01-TP



SAN
Distribution



Code Sample



TFT screen which is working with this software

```
//pin defines for STM32 in mikroc compiler
unsigned int TFT_DataPort at GPIOE_ODR;
sbit TFT_RST at GPIOB_ODR.B1;
sbit TFT_RS at GPIOC_ODR.B4;
sbit TFT_CS at GPIOC_ODR.B5;
sbit TFT_RD at GPIOA_ODR.B7;
sbit TFT_WR at GPIOA_ODR.B6;
sbit TFT_BLED at GPIOA_ODR.B5;
```

```
void Send_TFT_Command(char index)
{
    TFT_CS = 0;
    TFT_RS = 0;
    TFT_DataPort = index;
    TFT_WR = 0;
    asm nop;
    TFT_WR = 1;
    TFT_CS = 1;
}
```

```
void Send_TFT_Data_8(unsigned char index)
{
```




```
TFT_CS = 0;
TFT_RS = 1;
TFT_DataPort = index;
TFT_WR = 0;
asm nop;
TFT_WR = 1;
TFT_CS = 1;
}
```

```
void Send_TFT_Data_16(int index)
```

```
{
    TFT_CS = 0;
    TFT_RS = 1;
    TFT_DataPort = index;
    /*
    if data port has 8 bit output
    TFT_DataH = index>>8;
    TFT_DataL = index&0x00FF;
    */
    TFT_WR = 0;
    asm nop;
    TFT_WR = 1;
    TFT_CS = 1;
}
```

```
void init_SSD1963(void)
```

```
{
    TFT_RST = 0; // Hold in reset
    TFT_RS = 1; // Enable data access
    TFT_CS = 1; // Disable LCD
    TFT_RD = 1;
    TFT_WR = 1;

    // Release from reset
    Delay_ms(100);
    TFT_RST = 1;
```



```

Delay_ms(100);

Send_TFT_Command(0x01); //Software Reset
Send_TFT_Command(0x01); //Software Reset
Send_TFT_Command(0x01); //Software Reset
Delay_ms(100);
Send_TFT_Command(0xE2); //SET PLL freq=110MHz
Send_TFT_Data_8(0x21); //N=33, 33X10=330Mhz
Send_TFT_Data_8(0x02); //M=3 330/3=110Mhz
Send_TFT_Data_8(0x54);
Delay_ms(100);
Send_TFT_Command(0xE0); //PLL settings
Send_TFT_Data_8(0x01); //START PLL
delay_ms(1); // Wait to let the PLL stable
Send_TFT_Command(0xE0); //PLL settings
Send_TFT_Data_8(0x03); //LOCK PLL
delay_ms(1);

Send_TFT_Command(0xB0); //LCD MODE Settings
Send_TFT_Data_8(0x20); //TFT panel data width 24bit, FRC, dithering disable
Send_TFT_Data_8(0x00); //hsync+Vsync+DEN
Send_TFT_Data_8(0x01); //horizontal panel size(horizontal lines) HightByte
Send_TFT_Data_8(0x3F); //LowByte
Send_TFT_Data_8(0x00); //vertical panel size(vertical lines) HightByte
Send_TFT_Data_8(0xEF); //SET vertical size LowByte
Send_TFT_Data_8(0x00); //available if serial RGB mode is selected.
delay_ms(1);

Send_TFT_Command(0xF0);
Send_TFT_Data_8(0x03); //SSD1963 data input format data 16 bit
delay_ms(1);

Send_TFT_Command(0x3A); //Pixel format
Send_TFT_Data_8(0x60);
delay_ms(1);

delay_ms(1);

```



```

Send_TFT_Command(0xE6); //SET PCLK freq=10MHz = 110MHz * LCDC_FPR / 2^20
Send_TFT_Data_8(0x01);
Send_TFT_Data_8(0x45);
Send_TFT_Data_8(0x47);
//////////
delay_ms(1);
//////////3.5"//////////
Send_TFT_Command(0xB4);
Send_TFT_Data_8(0x01); //horizontal total period (display + non-display)-1 highbyte
Send_TFT_Data_8(0x97); //low byte
Send_TFT_Data_8(0x00); //Horizontal Pulse Width + Horizontal Back Porch highbyte
Send_TFT_Data_8(0x46); //low byte
Send_TFT_Data_8(0x00); //Horizontal Sync Pulse Width
Send_TFT_Data_8(0x00); //Hsync pulse start position
Send_TFT_Data_8(0x00); //lowbyte
Send_TFT_Data_8(0x00); //for serial RGB mode
delay_ms(1);

Send_TFT_Command(0xB6);
Send_TFT_Data_8(0x01); //vertical total period (display + non-display)-1 highbyte
Send_TFT_Data_8(0x06); //low byte
Send_TFT_Data_8(0x00); //vertical Pulse Width + vertical Back Porch highbyte
Send_TFT_Data_8(0x0D); //low byte
Send_TFT_Data_8(0x00); //vertical Sync Pulse Width
Send_TFT_Data_8(0x00); //Vsync pulse start position
Send_TFT_Data_8(0x00); //lowbyte
delay_ms(1);
//////////

Send_TFT_Command(0x36); // Address Mode
Send_TFT_Data_8(0x00);
delay_ms(1);
Send_TFT_Command(0x29); //SET display on

//backlight PWM setting.
Send_TFT_Command(0xBE);
Send_TFT_Data_8(0x01); //PLL clock / (256 * (PWMF[7:0] + 1)) / 256
Send_TFT_Data_8(0x64); //PWM duty cycle
Send_TFT_Data_8(0x01); //PWM, DBC enable/disable setting.

```



```
Send_TFT_Data_8(0x00); //DBC manual brightness
Send_TFT_Data_8(0x00); //DBC minimum brightness
Send_TFT_Data_8(0x00); //Brightness prescaler
```

```
}
```

```
void draw_rectagle(unsigned int X1,unsigned int X2,unsigned int Y1,unsigned int Y2,unsigned int red,unsigned int green,unsigned int blue)
```

```
{
```

```
unsigned char X_point_1_1;
unsigned char X_point_1_2;
unsigned char X_point_2_1;
unsigned char X_point_2_2;
unsigned char Y_point_1_1;
unsigned char Y_point_1_2;
unsigned char Y_point_2_1;
unsigned char Y_point_2_2;
```

```
unsigned long temp1;
unsigned long temp2;
unsigned long frame_pixel;
unsigned long pixel_CNT;
```

```
unsigned int color;
```

```
red=red<<11;
```

```
green=green<<5;
```

```
color=blue|green|red;
```

```
temp1= X2-X1+1;
```

```
temp2= Y2-Y1+1;
```

```
frame_pixel=temp1*temp2;
```

```
X_point_1_1=X1>>8;
```

```
X_point_1_2=X1&0x00FF;
```

```
X_point_2_1=X2>>8;
```

```
X_point_2_2=X2&0x00FF;
```





```
Y_point_1_1=Y1>>8;
```

```
Y_point_1_2=Y1&0x00FF;
```

```
Y_point_2_1=Y2>>8;
```

```
Y_point_2_2=Y2&0x00FF;
```

```
Send_TFT_Command(0x2A);//Setup the frame buffer vertical addressing range
```

```
Send_TFT_Data_8(X_point_1_1);
```

```
Send_TFT_Data_8(X_point_1_2);
```

```
Send_TFT_Data_8(X_point_2_1);
```

```
Send_TFT_Data_8(X_point_2_2);
```

```
Send_TFT_Command(0x2B);// Setup the frame buffer horizontal address range
```

```
Send_TFT_Data_8(Y_point_1_1);
```

```
Send_TFT_Data_8(Y_point_1_2);
```

```
Send_TFT_Data_8(Y_point_2_1);
```

```
Send_TFT_Data_8(Y_point_2_2);
```

```
Send_TFT_Command(0x2C);
```

```
pixel_CNT=0;
```

```
while(pixel_CNT<=frame_pixel)
```

```
{
```

```
Send_TFT_Data_16(color);
```

```
pixel_CNT++;
```

```
}
```

```
}
```

```
void main()
```

```
{
```

```
///pin configurations for STM32 in Mikroc compiler
```

```
GPIO_Digital_Output(&GPIOA_BASE, _GPIO_PINMASK_ALL); // Set PORTB as digital output
```

```
GPIO_Digital_Output(&GPIOB_BASE, _GPIO_PINMASK_ALL); // Set PORTB as digital output
```

```
GPIO_Digital_Output(&GPIOC_BASE, _GPIO_PINMASK_ALL); // Set PORTB as digital output
```

```
GPIO_Digital_Output(&GPIOD_BASE, _GPIO_PINMASK_ALL); // Set PORTB as digital output
```

```
GPIO_Digital_Output(&GPIOE_BASE, _GPIO_PINMASK_ALL); // Set PORTB as digital output
```

```
GPIOA_ODR = 0;
```



```

GPIOB_ODR = 0;
GPIOC_ODR = 0;
GPIOD_ODR = 0;
GPIOE_ODR = 0;
GPIOA_OSPEEDR=0xFFFFFFFF;
GPIOB_OSPEEDR=0xFFFFFFFF;
GPIOC_OSPEEDR=0xFFFFFFFF;
GPIOD_OSPEEDR=0xFFFFFFFF;
GPIOE_OSPEEDR=0xFFFFFFFF;

```

```
TFT_BLED=1;
```

```
/*
```

```
TFT_BLED=1 -> backlight % 100
```

```
TFT_BLED=0 and SSD1963 PWM on-> backlight=PWM
```

```
TFT_BLED=0 and SSD1963 PWM off-> backlight=off
```

```
*/
```

```
init_SSD1963();
```

```
//color depth in 16 bit mode
```

```
//red 0-31
```

```
//green 0-63
```

```
//blue 0-31
```

```
draw_rectagle(0,319,0,239,31,63,31);
```

```
while(1)
```

```
{
```

```
draw_rectagle(20,100,10,60,31,0,0);
```

```
draw_rectagle(120,200,10,60,0,63,0);
```

```
draw_rectagle(220,300,10,60,0,0,31);
```

```
draw_rectagle(20,100,80,130,31,63,0);
```

```
draw_rectagle(120,200,80,130,31,0,31);
```

```
draw_rectagle(220,300,80,130,0,63,31);
```

```
draw_rectagle(20,100,150,200,0,0,0);
```

```
}
```

```
}
```

