ÖZDİSAN ELECTRONIC A.S.

TDDB-SSD-4.3-5.0-16B-V3 Specification

TDDB-SSD-4.3-5.0-16B-V3

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OLAB

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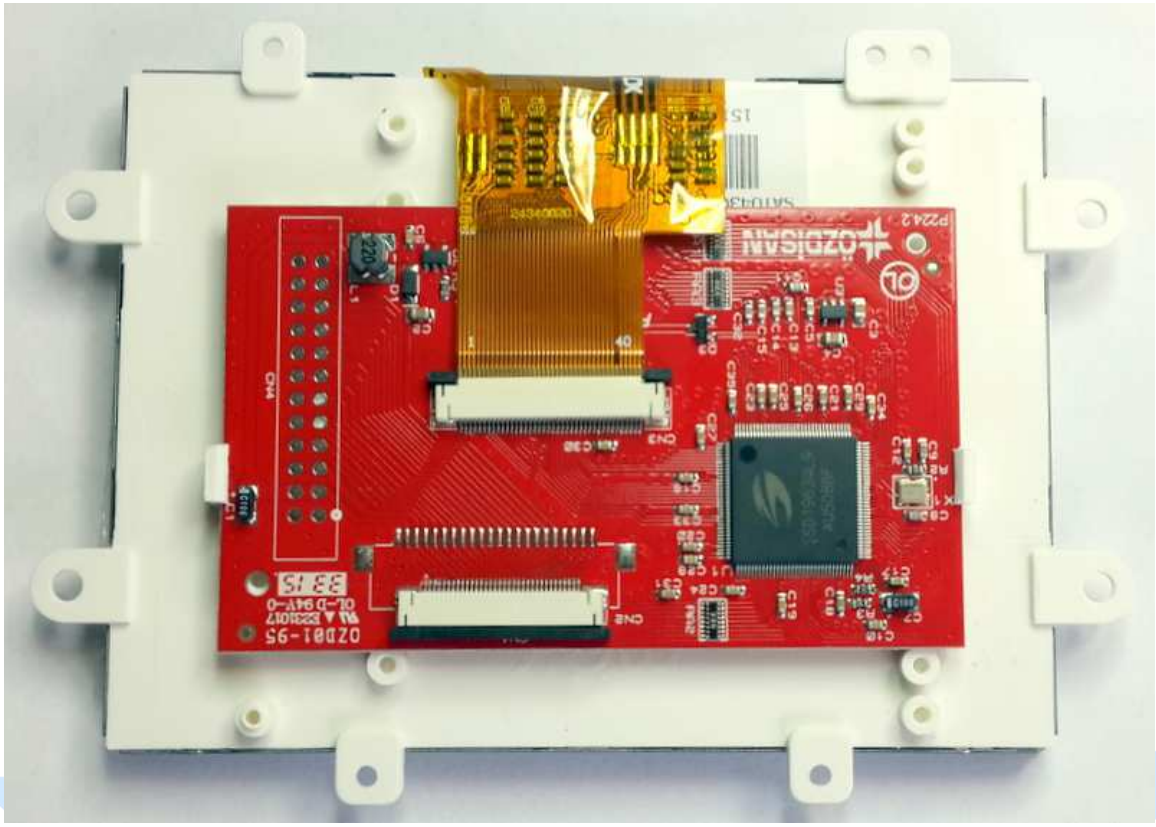
Product Pictures



TDDB-SSD-4.3-5.0-16B-V3

34 Pins 16 Bit User MPU interface, 40 pins TFT connection, 40mA 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

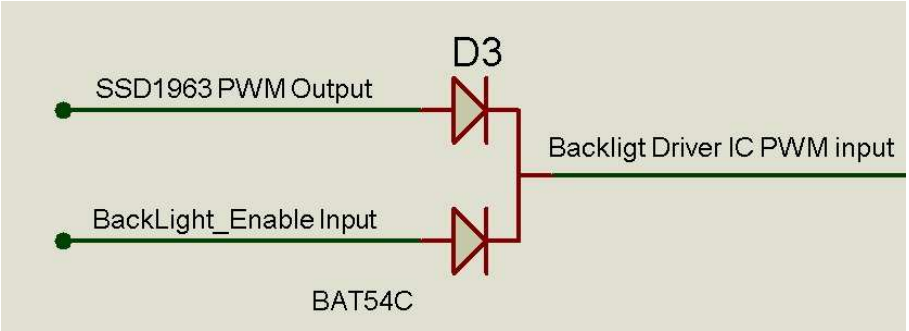
SSD1963 is a display controller of 1215K byte frame buffer to support up to 864x480x24bit graphics content. It also equips parallel MCU interfaces in a different bus width to receive graphics data and commands from MCU. Its display interface supports common RAM-less LCD driver of color depth up to 24 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	1st	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	1st							R5	R4	R3	R2	R1	R0	G5	G4	G3	G2	G1	G0	B5	B4	B3	B2	B1	B0
16 bits (565 format)	1st									R5	R4	R3	R2	R1	G5	G4	G3	G2	G1	G0	B5	B4	B3	B2	B1
16 bits	1st									R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0
	2nd									B7	B6	B5	B4	B3	B2	B1	B0	R7	R6	R5	R4	R3	R2	R1	R0
	3rd									G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0
12 bits	1st													R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4
	2nd													G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0
9 bits	1st																R5	R4	R3	R2	R1	R0	G5	G4	G3
	2nd																G2	G1	G0	B5	B4	B3	B2	B1	B0
8 bits	1st																	R7	R6	R5	R4	R3	R2	R1	R0
	2nd																	G7	G6	G5	G4	G3	G2	G1	G0
	3rd																	B7	B6	B5	B4	B3	B2	B1	B0

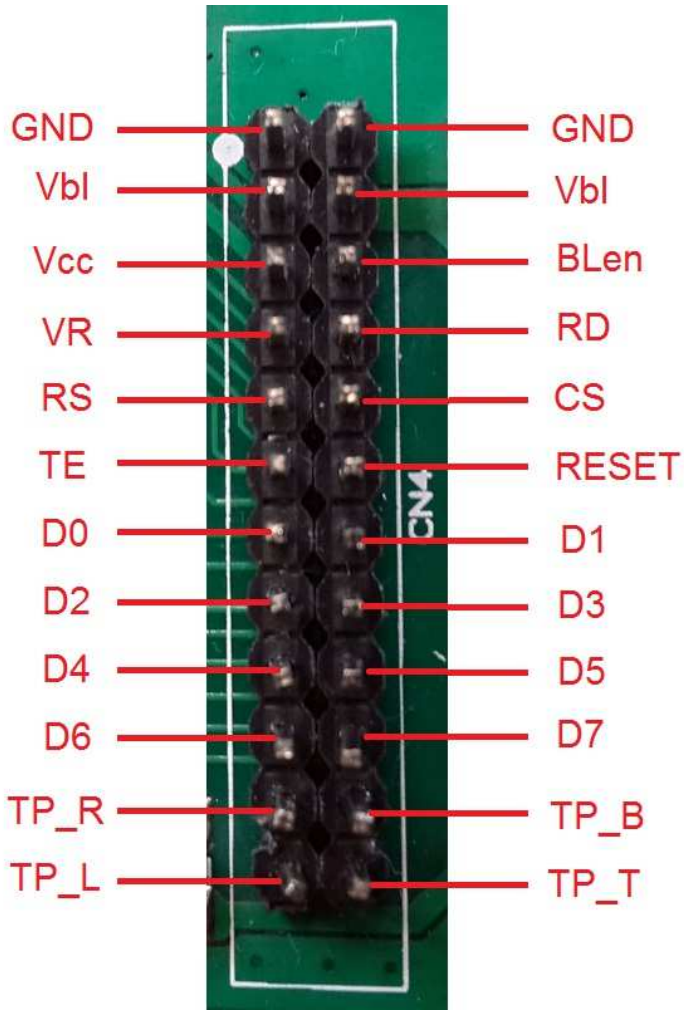
Backlight

The driver board has 40mA 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 CN4: 24 Pin header 8 bit input from User’s MCU

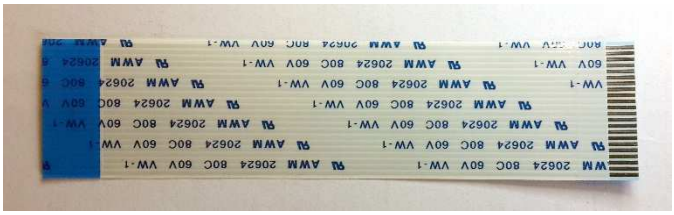


Pin Description for CN3: Pin Connections to TFT Panel

Pin No.	Symbol	Function Description
1	LED-	LED Cathode
2	LED+	LED Anode
3	GND	Power Ground
4	VDD	Power Voltage(3.3V)
5-12	R0-R7	Red Data 0-7
13-20	G0-G7	Green Data 0-7
21-28	B0-B7	Blue Data 0-7
29	GND	Power Ground
30	DCLK	Pixel clock
31	DISP	Display on/off
32	HSYNC	Horizontal sync signal
33	VSYNC	Vertical sync signal
34	DE	Data enable
35	NC	No connection
36	GND	Power Ground
37	X_R	Right electrode
38	Y_B	Bottom electrode
39	X_L	Left electrode
40	Y_T	Top electrode

Other Tools used with the boards

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



FPC3AMR6-22TNBT-U: Connector with 22 pins

4.3” TFT panel with bracket

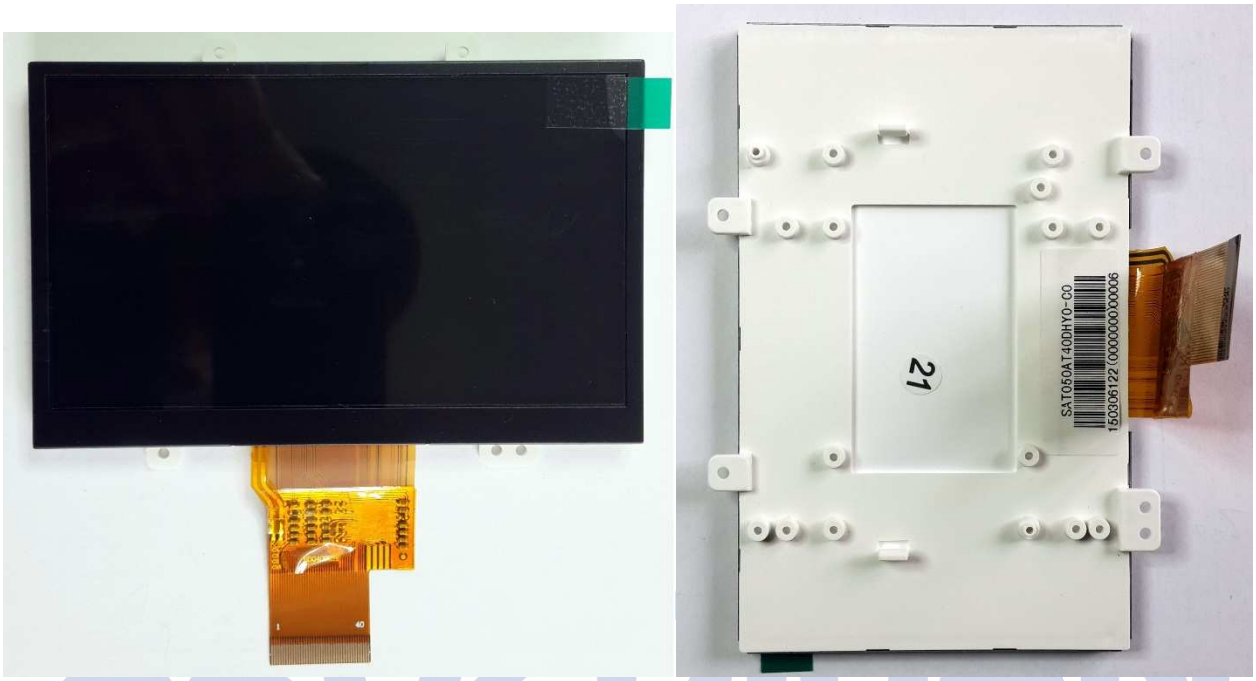
SAT043CM40DHY0-C01, SAT043HS40DMYO-C0-VSD

4.3” TFT panel with bracket and Touch Panel

SAT043CM40DHY0-C01-TP, SAT043HS40DHY0-C0-TP

5” TFT panel with bracket

SAT050AT40DHY0-C0 (480X272 pixel)



5” TFT panel with bracket and Touch Panel

SAT050AT40DHYO-C0-VSD-TP (480X272 pixel)

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(0xDF); //LowByte
Send_TFT_Data_8(0x01); //vertical panel size(vertical lines) HightByte
Send_TFT_Data_8(0x0F); //SET vertical size LowByte
Send_TFT_Data_8(0x00); //avaible 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);

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);
Send_TFT_Command(0xB4);
Send_TFT_Data_8(0x02); //horizontal total period (display + non-display)-1 highbyte
Send_TFT_Data_8(0x0C); //low byte
Send_TFT_Data_8(0x00); //Horizontal Pulse Width + Horizontal Back Porch highbyte
Send_TFT_Data_8(0x28); //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(0x21); //low byte
 Send_TFT_Data_8(0x00); //vertical Pulse Width + vertical Back Porch highbyte
 Send_TFT_Data_8(0x08); //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(0,479,0,271,31,63,31);

while(1)
{
  draw_rectagle(20,120,10,90,31,0,0);
  draw_rectagle(140,240,10,90,0,63,0);
  draw_rectagle(260,360,10,90,0,0,31);
  draw_rectagle(20,120,100,180,31,63,0);
  draw_rectagle(140,240,100,180,31,0,31);
  draw_rectagle(260,360,100,180,0,63,31);
  draw_rectagle(20,120,190,260,0,0,0);
 }
}
```