WINSTAR

WINSTAR Display Co.,Ltd.

華凌光電股份有限公司

SPECIFICATION

CUSTOMER :

MODULE NO.: **WF43QTIBEDBN0#**

| APPROVED BY:

(FOR CUSTOMER USE ONLY)	
	PCB VERSION: DATA:

SALES BY	APPROVED BY	CHECKED BY	PREPARED BY
			葉虹蘭
ISSUED DATE: 2017/02/23			

TFT Display Inspection Specification: https://www.winstar.com.tw/technology/download.html

Precaution in use of TFT module: https://www.winstar.com.tw/technology/download/declaration.html

RECORDS OF REVISION			DOC. FIRST ISSUE

VERSION	DATE	REVISED PAGE NO.	SUMMARY
0	2013/02/19		First issue
A	2013/08/29		A version modify 5.Electrical Characteristics 7.1.1 8080 Mode 7.1.2 8080 Mode Write Cycle 13. PACKAGE SPECIFICATION 14. Initial Code For Reference
B	2013/11/27		Modify the brightness specifications.
C	2013/12/11		Correct VDD.
D	2014/03/05		Modify Package Specification.
E	2014/08/07		Correct AA.
F	2014/09/09		Modify Pixel Data Format & Block Diagram& Static electricity test.
G	2015/04/27		Modify Reliability.
H	2016/01/21		Modify Static electricity test
I	2016/08/10		Modify Vibration test.

| J | 2016/10/04 | Modify Summary. |
| K | 2017/02/23 | Modify tape. |

Contents

1.Module Classification Information

W	F	43	Q	T	I	B	E	D	B	N	0	#
①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	⑫	⑬

①	Brand：WINSTAR DISPLAY CORPORATION		
②	Display Type：F→TFT Type, J→Custom TFT		
③	Display Size：4.3" TFT		
④	Model serials no.		
⑤	Backlight Type：	F→CCFL, White	T→LED, White
		S→LED, High Light White	Z→Nichia LED, White
⑥	LCD Polarize Type/ Temperature range/ Gray Scale Inversion Direction	A→Transmissive, N.T, IPS TFT	Q→Transmissive, Super W.T, 12:00
		C→Transmissive, N. T, 6:00 ;	R→Transmissive, Super W.T, O-TFT
		F→Transmissive, N.T,12:00 ;	V→Transmissive, Super W.T, VA TFT
		I→Transmissive, W. T, 6:00	W→Transmissive, Super W.T, IPS TFT
		K→Transflective, W.T,12:00	X→Transmissive, W.T, VA TFT
		L→Transmissive, W.T,12:00	Y→Transmissive, W.T, IPS TFT
		N→Transmissive, Super W.T, 6:00	Z→Transmissive, W.T, O-TFT
⑦	A：TFT LCD		F：TFT+CONTROL　BOARD
	B：TFT+SCREW HOLES+CONTROL BOARD		G：TFT+ SCREW HOLES
	C：TFT+ SCREW HOLES +A/D BOARD		H：TFT+D/V　BOARD
	D：TFT+ SCREW HOLES +A/D BOARD+CONTROL BOARD		I：TFT+ SCREW HOLES +D/V BOARD
	E：TFT+ SCREW HOLES +POWER　BOARD		J：TFT+POWER BD

⑧	Resolution:											
	A	128160	B	320234	C	320240	D	480234	E	480272	F	640480
	G	800480	H	1024600	I	320480	J	240320	K	800600	L	240400
	M	1024768	N	128128	P	1280800	Q	480800	R	640320	S	480128
	T	800320	U	8001280	V	176220	W	1280398	X	1024250	Y	1920720
	Z	800200	2	1024324	3	7201280	4	19201200	5	1366768	6	1280320

⑨	D: Digital L：LVDS M:MIPI							
⑩	Interface:							
	N	Without control board	A	8Bit	B	16Bit	H	HDMI
	I	I2C Interface	R	RS232	S	SPI Interface	U	USB

⑪	TS:				
	N	Without TS	T	Resistive touch panel	C	Capacitive touch panel (G-F-F)
	G	Capacitive touch panel (G-G)		C1	Capacitive touch panel (G-F-F)+OCA
	C2	Capacitive touch panel (G-F-F)+OCR		G1	Capacitive touch panel (G-G)+OCA
	G2	Capacitive touch panel (G-G)+OCR		B	CTP+GG+USB

⑫	Version: X:Raspberry pi	
⑬	Special Code	#:Fit in with ROHS directive regulations

2.Summary

TFT 4.3" is a TN transmissive type color active matrix TFT liquid crystal display that use amorphous silicon TFT as switching devices. This module is a composed of a TFT_LCD module, It is usually designed for indusrial application and this module follows RoHs,

3.General Specifications

Item	Dimension	Unit
Size	4.3	inch
Dot Matrix	480 x RGBx272(TFT)	dots
Module dimension	106.7 x 83.98 x 7.1	mm
Active area	95.04 x 53.856	mm
Dot pitch	0.066 x 0.198	mm
LCD type	TFT, Normally White, Transmissive	
View Direction	12 o'clock	
Gray Scale Inversion Direction	6 o'clock	
Aspect Ratio	16:9	
Backlight Type	LED, Normally White	
Controller IC	SSD1963	
Interface	Digital 8080 family MPU 8bit/16bit	
With /Without TP	Without TP	
Surface	Anti-Glare	

*Color tone slight changed by temperature and driving voltage.

4.Absolute Maximum Ratings

Item	Symbol	Min	Typ	Max	Unit
Operating Temperature	TOP	-20	—	+70	℃
Storage Temperature	TST	-30	—	+80	℃

Note: Device is subject to be damaged permanently if stresses beyond those absolute maximum ratings listed above
1. Temp. ≦60℃, 90% RH MAX. Temp.＞60℃, Absolute humidity shall be less than 90% RH at 60℃

5.Electrical Characteristics

5.1. Operating conditions: (CON3.Pin1=GND, Pin2=VDD)

Item	Symbol	Condition	Min	Typ	Max	Unit	Remark
Supply Voltage For LCM	VDD	—	3.0	3.1	3.3	V	-
Supply Current For LCM	IDD	—	—	200	300	mA	Note1

Note 1 : This value is test for VDD =3.3V , Ta=25℃ only

5.2. Backlight driving conditions　(CON3.Pin33,34=VLED-, Pin35,36=VLED+)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
Operation Current For LED Driver	VLED+=3.3V	270	-	405	mA	Note 1,2
Power Consumption	VLED+=3.3V	891	-	1337	mW	Note 1,2
Supply Voltage For LED Driver	VLED+	3.3	-	5	V	Note 1,2
LED Life Time		-	50,000	-	Hr	Note 2,3,4

Note 1 : Base on VLED= 3.3V for the back light driver IC specification
Note 2 : Ta = 25 ℃
Note 3 : Brightness to be decreased to 50% of the initial value
Note 4 : The single LED lamp case

6.DC CHARATERISTICS

| Parameter	Symbol	Rating			Unit	Condition
		Min	Typ	Max		
Low level input voltage	V_{IL}	0	-	0.3VDD	V	
High level input voltage	V_{IH}	0.7VDD	-	VDD	V	

7.Interface timing

7.1. 8080 Mode 8bit/16bit

The 8080 mode MCU interface consist of CS#, D/C#, RD#, WR#, Data Bus signals. This interface use WR# to define a write cycle and RD# for read cycle. If the WR# goes low when the CS# signal is low, the data or command will be latched into the system at the rising edge of WR#. Similarly, the read cycle will start when RD# goes low and end at the rising edge of RD#.

7.2. 8080 Mode Write Cycle

Symbol	Parameter		Min	Typ	Max	Unit
fMCLK	System Clock Frequency		1	-	110	MHz
tMCLK	System Clock Period		1/ fMCLK	-	-	ns
tPWCSH	Control Pulse High Width	Write	13	1.5* tMCLK	-	ns
		Read	30	3.5* tMCLK		
tPWCSL	Control Pulse Low Width	Write (next write cycle)	13	1.5* tMCLK	-	ns
		Write (next read cycle)	80	9* tMCLK		
		Read	80	9* tMCLK		
tAS	Address Setup Time		1	-	-	ns
tAH	Address Hold Time		2	-	-	ns
tDSW	Write Data Setup Time		4			ns
tDHW	Write Data Hold Time		1	-	-	ns
tPWLW	Write Low Time		12			ns
tDHR	Read Data Hold Time		1	-	-	ns
tACC	Access Time		32			ns
tPWLR	Read Low Time		36	-	-	ns
tR	Rise Time		-		0.5	ns
tF	Fall Time		-	-	0.5	ns
tCS	Chip select setup time		2		-	ns
tCSH	Chip select hold time to read signal		3	-	-	ns

7.3. Parallel 8080-series Interface Timing Diagram(Write Cycle)
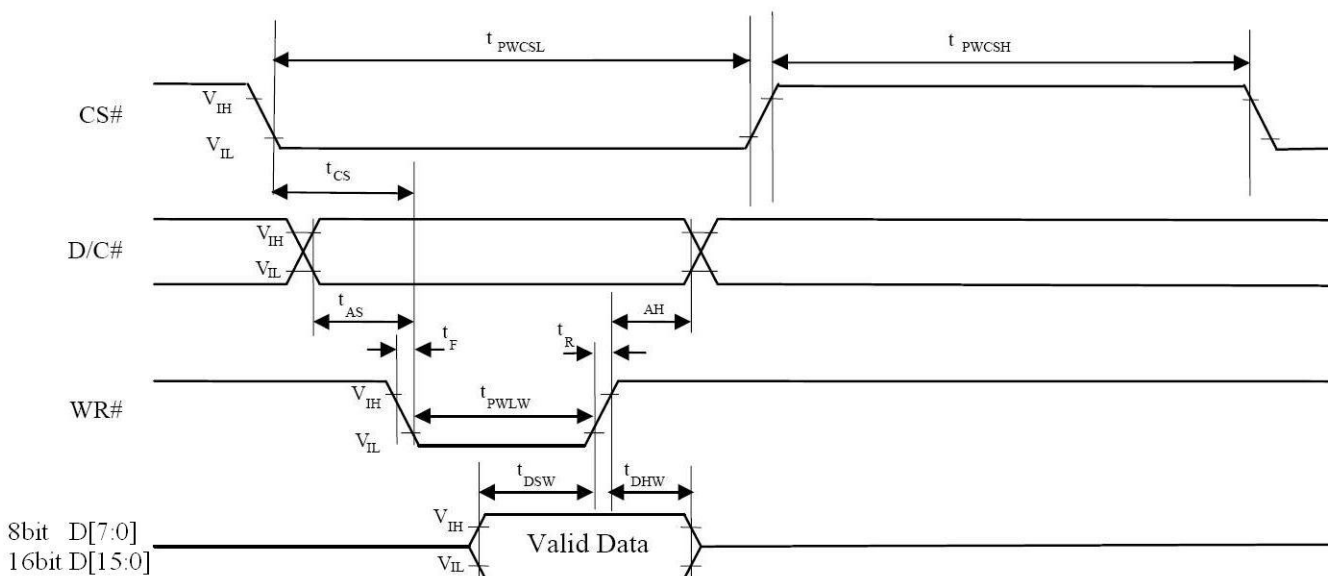
7.4. Parallel 8080-series Interface Timing Diagram(Read Cycle)
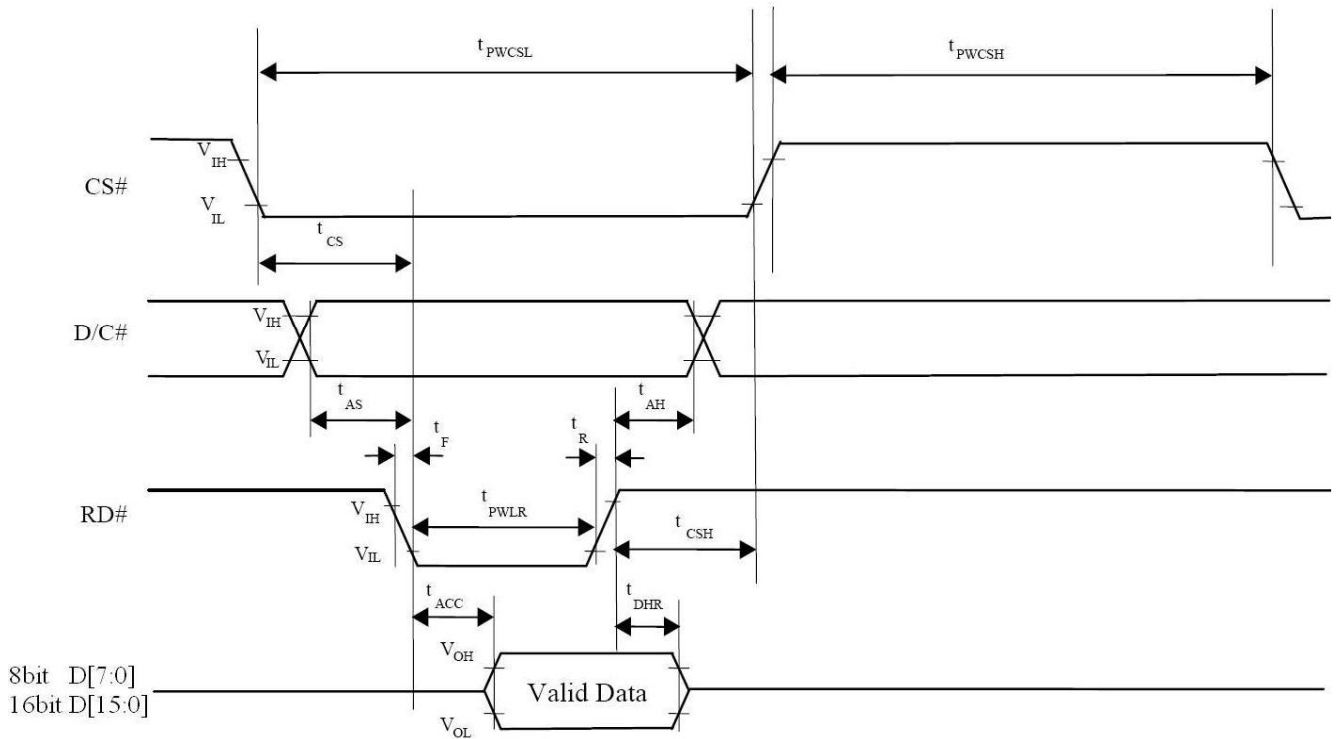
7.5. Pixel Data Format

Interface	Cycle	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]
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
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

8.Optical Characteristics

Item		Symbol	Condition.	Min	Typ.	Max.	Unit	Remark
Response time		Tr	θ=0°、Φ=0°	-	10	20	ms	Note 3,5
		Tf		-	15	30	ms	
Contrast ratio		CR	At optimized viewing angle	400	500	-	-	Note 4,5
Color Chromaticity	White	Wx	θ=0°、Φ=0	0.26	0.31	0.36		Note 2,6,7
		Wy		0.28	0.33	0.38		
Viewing angle (Gray Scale Inversion Direction)	Hor.	ΘR	CR≧10	60	70	-	Deg.	Note 1
		ΘL		60	70	-		
	Ver.	ΦT		40	50	-		
		ΦB		60	70	-		
Brightness		-	-	400	500	-	cd/m^2	Center of display

Ta=25±2℃, VLED /ILED = 3.3V /270mA
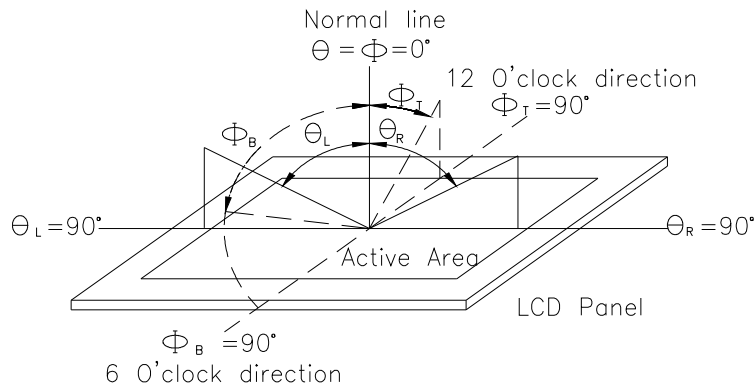
Note 1: Definition of viewing angle range

Fig. 8.1. Definition of viewing angle

Note 2: Test equipment setup:
After stabilizing and leaving the panel alone at a driven temperature for 10 minutes, the measurement should be executed. Measurement should be executed in a stable, windless, and dark room. Optical specifications are measured by Topcon BM-7 or BM-5 luminance meter 1.0° field of view at a distance of 50cm and normal direction.
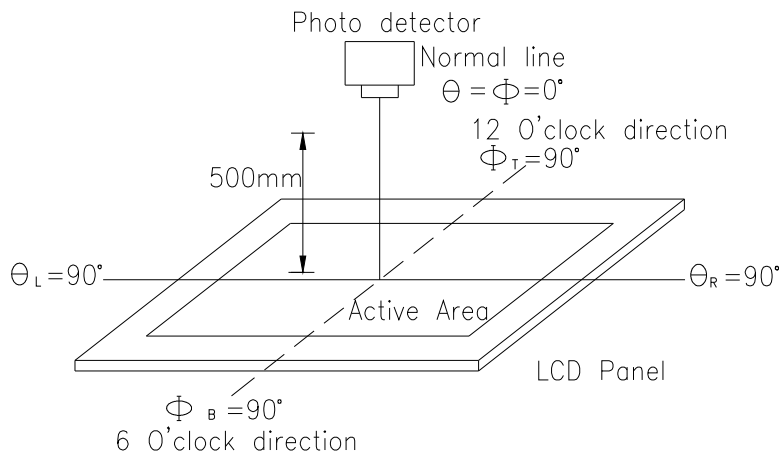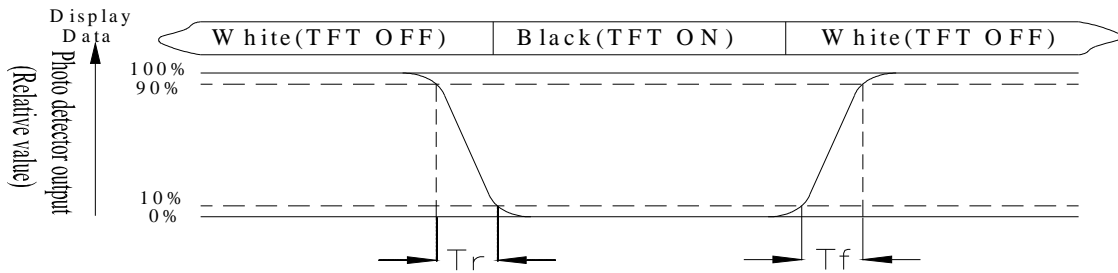

Fig. 8.2. Optical measurement system setup

Note 3: Definition of Response time:
The response time is defined as the LCD optical switching time interval between "White" state and "Black" state. Rise time, Tr, is the time between photo detector output intensity changed from 90%to

10%. And fall time, Tf, is the time between photo detector output intensity changed from 10%to 90%

Note 4: Definition of contrast ratio:
The contrast ratio is defined as the following expression.

$$\text{Contrast ratio (CR)} = \frac{\text{Luminance measured when LCD on the "White" state}}{\text{Luminance measured when LCD on the "Black" state}}$$

Note 5: White Vi = Vi50 ± 1.5V
Black Vi = Vi50 ± 2.0V
"±" means that the analog input signal swings in phase with VCOM signal.
"±" means that the analog input signal swings out of phase with VCOM signal.
The 100% transmission is defined as the transmission of LCD panel when all the input terminals of module are electrically opened.

Note 6: Definition of color chromaticity (CIE 1931)
Color coordinates measured at the center point of LCD

Note 7: Measured at the center area of the panel when all the input terminals of LCD panel are electrically opened.

9.Interface

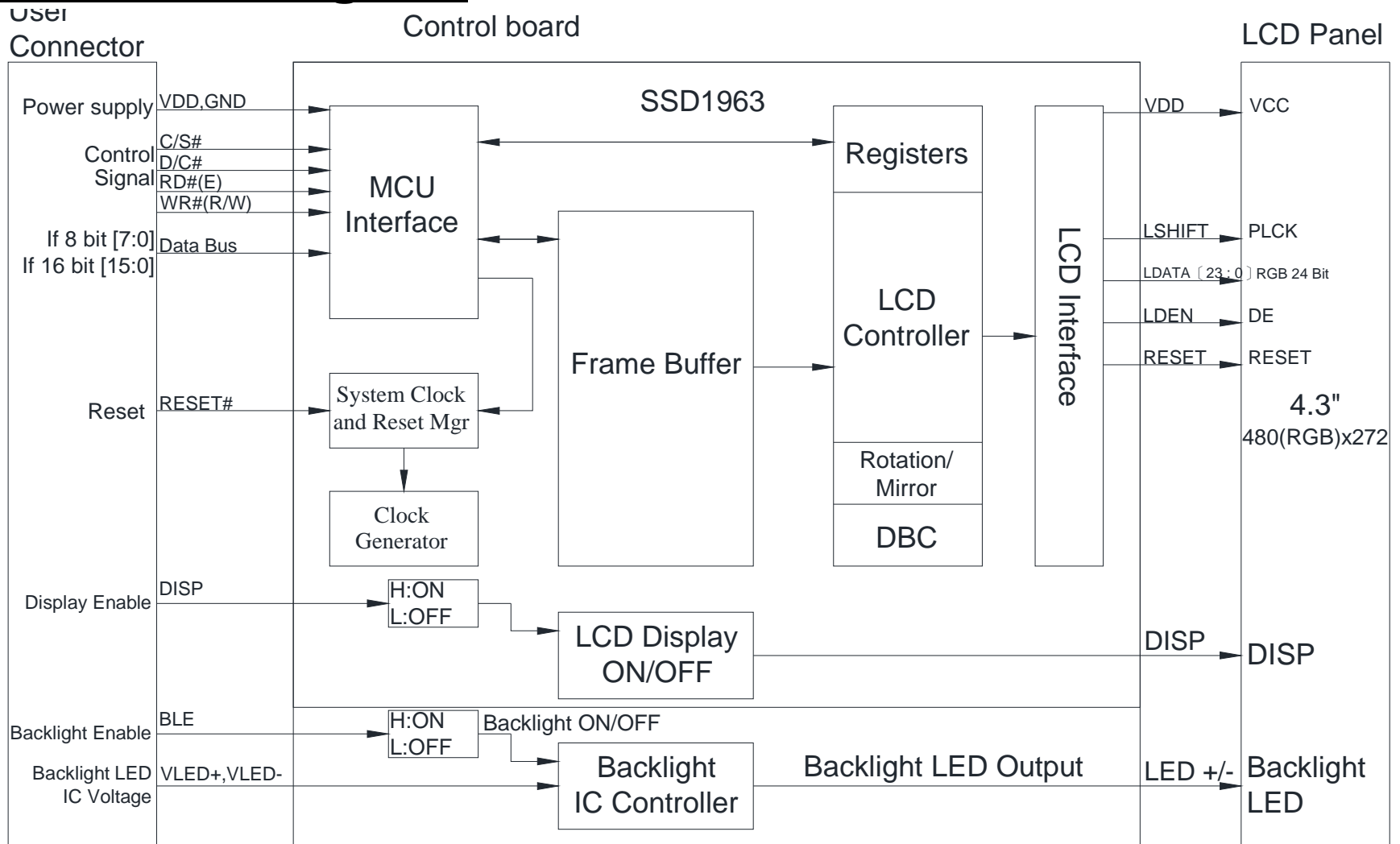## 9.1. LCM PIN Definition   (CON3)

Pin	Symbol	Function	Remark
1	GND	System round pin of the IC. Connect to system ground.	
2	VDD	Power Supply : +3.3V	
3	BL_E	Backlight control signal , H: On \ L: Off	
4	D/C	Data/Command select	
5	WR	Write strobe signal	
6	RD	Read strobe signal	
7	DB0	Data bus	
8	DB1	Data bus	
9	DB2	Data bus	
10	DB3	Data bus	
11	DB4	Data bus	
12	DB5	Data bus	
13	DB6	Data bus	
14	DB7	Data bus	
15	DB8	Data bus (When select 8bits mode, this pin is NC)	Note1
16	DB9	Data bus (When select 8bits mode, this pin is NC)	Note1
17	DB10	Data bus (When select 8bits mode, this pin is NC)	Note1
18	DB11	Data bus (When select 8bits mode, this pin is NC)	Note1
19	DB12	Data bus (When select 8bits mode, this pin is NC)	Note1
20	DB13	Data bus (When select 8bits mode, this pin is NC)	Note1
21	DB14	Data bus (When select 8bits mode, this pin is NC)	Note1
22	DB15	Data bus (When select 8bits mode, this pin is NC)	Note1
23	NC	No connection	
24	NC	No connection	
25	CS	Chip select	
26	RESET	Hardware reset	
27	DIP ON	Display control H: On \ L:Off	
28	NC	No connection	
29	NC	No connection	
30	NC	No connection	

31	NC	No connection	
32	NC	No connection	
33	VLED-	VLED- for B/L LED inverter (GND)	
34	VLED-	VLED- for B/L LED inverter (GND)	
35	VLED+	VLED+ for B/L LED inverter (+3.3V)	
36	VLED+	VLED+ for B/L LED inverter (+3.3V)	

Note1: When select 8bit mode, DB0~DB7 be used, DB8~DB15 no connect
　　　 When select 16bit mode, DB0~DB15 be used

10.Block Diagram

User Connector | Control board | LCD Panel

Control board — SSD1963

- Power supply — VDD,GND → MCU Interface
- Control Signal — C/S#, D/C#, RD#(E), WR#(R/W) → MCU Interface
- If 8 bit [7:0] / If 16 bit [15:0] — Data Bus → MCU Interface
- Reset — RESET# → System Clock and Reset Mgr → Clock Generator
- Display Enable — DISP → H:ON L:OFF → LCD Display ON/OFF
- Backlight Enable — BLE → H:ON L:OFF → Backlight ON/OFF → Backlight IC Controller
- Backlight LED IC Voltage — VLED+,VLED- → Backlight IC Controller

Registers — LCD Controller — Rotation/Mirror — DBC — Frame Buffer — LCD Interface

LCD Panel:
- VDD → VCC
- LSHIFT → PLCK
- LDATA〔23：0〕RGB 24 Bit
- LDEN → DE
- RESET → RESET
- 4.3" 480(RGB)x272
- DISP → DISP
- LED +/- → Backlight LED

Backlight LED Output

11.Reliability

Content of Reliability Test (Wide temperature, -20℃~70℃)

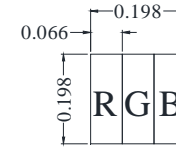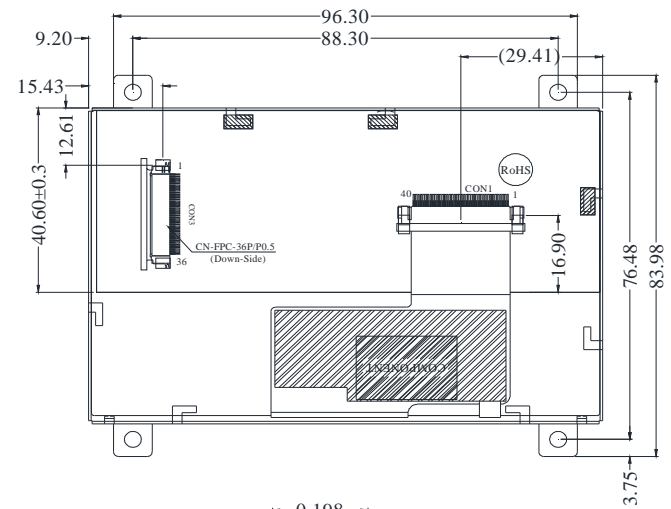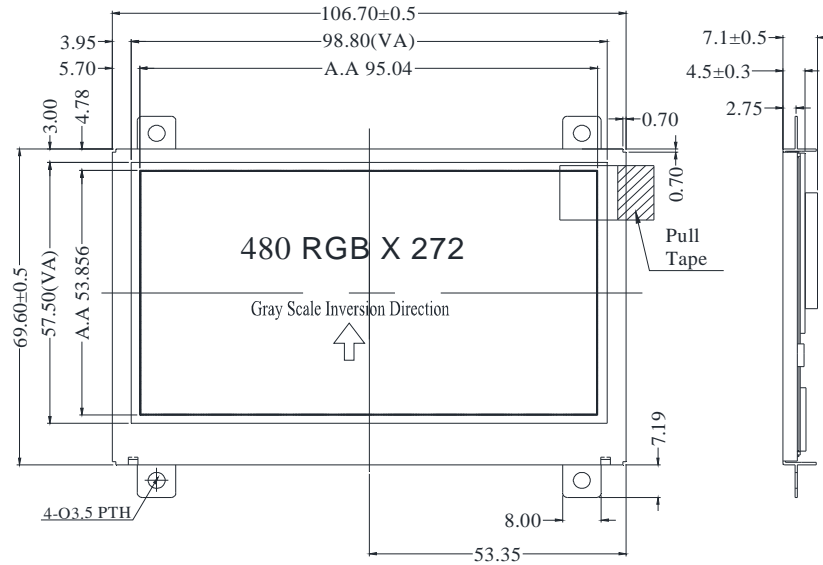| Environmental Test			
Test Item	**Content of Test**	**Test Condition**	**Note**
High Temperature storage	Endurance test applying the high storage temperature for a long time.	80℃ 200hrs	2
Low Temperature storage	Endurance test applying the low storage temperature for a long time.	-30℃ 200hrs	1,2
High Temperature Operation	Endurance test applying the electric stress (Voltage & Current) and the thermal stress to the element for a long time.	70℃ 200hrs	―――
Low Temperature Operation	Endurance test applying the electric stress under low temperature for a long time.	-20℃ 200hrs	1
High Temperature/ Humidity Operation	The module should be allowed to stand at 60℃,90%RH max	60℃,90%RH 96hrs	1,2
Thermal shock resistance	The sample should be allowed stand the following 10 cycles of operation 　-20℃　　25℃　　70℃ 　30min　　5min　　30min 　　　　1 cycle	-20℃/70℃ 10 cycles	―――
Vibration test	Endurance test applying the vibration during transportation and using.	Total fixed amplitude : 1.5mm Vibration Frequency : 10~55Hz One cycle 60 seconds to 3 directions of X,Y,Z for Each 15 minutes	3
Static electricity test	Endurance test applying the electric stress to the terminal.	VS=±600V(contact), ±800v(air), RS=330Ω CS=150pF 10 times	―――

Note1: No dew condensation to be observed.
Note2: The function test shall be conducted after 4 hours storage at the normal
　　　Temperature and humidity after remove from the test chamber.
Note3: The packing have to including into the vibration testing.

12.Contour Drawing

PIN NO.	SYMBOL
1	GND
2	VDD
3	BL_E
4	D/C
5	WR
6	RD
7	DB0
8	DB1
9	DB2
10	DB3
11	DB4
12	DB5
13	DB6
14	DB7
15	DB8
16	DB9
17	DB10
18	DB11
19	DB12
20	DB13
21	DB14
22	DB15
23	NC
24	NC
25	CS
26	RESET
27	DISP_ON
28	NC
29	NC
30	NC
31	NC
32	NC
33	VLED-
34	VLED-
35	VLED+
36	VLED+

480 RGB X 272

Gray Scale Inversion Direction

Pull Tape

106.70±0.5
98.80(VA)
A.A 95.04
3.95
5.70
3.00
4.78
0.70
0.70
69.60±0.5
57.50(VA)
A.A 53.856
7.19
4-O3.5 PTH
8.00
53.35

7.1±0.5
4.5±0.3
2.75

96.30
88.30
(29.41)
9.20
15.43
12.61
40.60±0.3
16.90
76.48
83.98
3.75

RoHS
CON1
40   1
1
CON3
36
CN-FPC-36P/P0.5
(Down-Side)

CON1N1

0.198
0.066
0.198

R G B

SCALE 1:100

The non-specified tolerance of dimension is ±0.3mm.

13.Initial Code For Reference

```
void Initial_code()
{
            Write_Command(0x01);
            Delay_ms(10);
            Write_Command(0xe0);
            Write_Parameter(0x01);
            Delay_ms(50);
            Write_Command(0xe0);
            Write_Parameter(0x03);
            Delay_ms(5);

            Write_Command(0xb0);
            Write_Parameter(0x20);
            Write_Parameter(0x80);
            Write_Parameter(0x01);
            Write_Parameter(0xdf);
            Write_Parameter(0x01);
            Write_Parameter(0x0f);
            Write_Parameter(0x00);

            Write_Command(0xf0);
            Write_Parameter(0x03); //0x03 is 16bit(565 format);0x00 is for 8-bit,pixel data format

            //Set the MN of PLL
            Write_Command(0xe2);
            Write_Parameter(0x1d);
            Write_Parameter(0x02);
            Write_Parameter(0x54);

            Write_Command(0xe6);
            Write_Parameter(0x01);
            Write_Parameter(0x99);
            Write_Parameter(0x9a);


            //Set front porch and back porch
            Write_Command(0xb4);
            Write_Parameter(0x02);
            Write_Parameter(0x0d);
            Write_Parameter(0x00);
            Write_Parameter(0x14);
            Write_Parameter(0x05);
            Write_Parameter(0x00);
            Write_Parameter(0x00);
            Write_Parameter(0x00);

            Write_Command(0xb6);
            Write_Parameter(0x01);
```

```
        Write_Parameter(0x24);
        Write_Parameter(0x00);
        Write_Parameter(0x0a);
        Write_Parameter(0x05);
        Write_Parameter(0x00);
        Write_Parameter(0x00);

        Write_Command(0x2a);
        Write_Parameter(0x00);
        Write_Parameter(0x00);
        Write_Parameter(0x01);
        Write_Parameter(0xdf);

        Write_Command(0x2b);
        Write_Parameter(0x00);
        Write_Parameter(0x00);
        Write_Parameter(0x01);
        Write_Parameter(0x0f);

        Write_Command(0x29);
        Write_Command(0x2c);
}
```

winstar   **<u>LCM Sample Estimate Feedback Sheet</u>**

Module Number： _____   **Page: 1**

1、<u>Panel Specification</u>：

  1. Panel Type：   □ Pass   □ NG , _____

  2. View Direction：   □ Pass   □ NG , _____

  3. Numbers of Dots：   □ Pass   □ NG , _____

  4. View Area：   □ Pass   □ NG , _____

  5. Active Area：   □ Pass   □ NG , _____

  6. Operating Temperature： □ Pass   □ NG , _____

  7. Storage Temperature： □ Pass   □ NG , _____

  8. Others： _____

2、<u>Mechanical Specification</u>：

  1. PCB Size：   □ Pass   □ NG , _____

  2. Frame Size：   □ Pass   □ NG , _____

  3. Material of Frame：   □ Pass   □ NG , _____

  4. Connector Position： □ Pass   □ NG , _____

  5. Fix Hole Position：   □ Pass   □ NG , _____

  6. Backlight Position：   □ Pass   □ NG , _____

  7. Thickness of PCB：   □ Pass   □ NG , _____

  8. Height of Frame to PCB：□ Pass   □ NG , _____

  9. Height of Module：   □ Pass   □ NG , _____

  10. Others：   □ Pass   □ NG , _____

3、<u>Relative Hole Size</u>：

  1. Pitch of Connector： □ Pass   □ NG , _____

  2. Hole size of Connector： □ Pass   □ NG , _____

  3. Mounting Hole size： □ Pass   □ NG , _____

  4. Mounting Hole Type： □ Pass   □ NG , _____

  5. Others：   □ Pass   □ NG , _____

4、<u>Backlight Specification</u>：

  1. B/L Type：   □ Pass   □ NG , _____

  2. B/L Color：   □ Pass   □ NG , _____

  3. B/L Driving Voltage (Reference for LED Type)：□ Pass   □ NG , _____

  4. B/L Driving Current： □ Pass   □ NG , _____

  5. Brightness of B/L：   □ Pass   □ NG , _____

  6. B/L Solder Method： □ Pass   □ NG , _____

  7. Others：   □ Pass   □ NG , _____

＞＞ **Go to page 2** ＜＜

5、**Electronic Characteristics of Module**：

1. Input Voltage： □ Pass □ NG , _____
2. Supply Current： □ Pass □ NG , _____
3. Driving Voltage for LCD： □ Pass □ NG , _____
4. Contrast for LCD： □ Pass □ NG , _____
5. B/L Driving Method： □ Pass □ NG , _____
6. Negative Voltage Output： □ Pass □ NG , _____
7. Interface Function： □ Pass □ NG , _____
8. LCD Uniformity： □ Pass □ NG , _____
9. ESD test： □ Pass □ NG , _____
10. Others： □ Pass □ NG , _____

6、**Summary**：

Sales signature： _____

Customer Signature： _____ **Date**： ____ / ____ / _____