TFT DISPLAY SPECIFICATION

WINSTAR Display Co.,Ltd.
華凌光電股份有限公司

Winstar Display Co., LTD
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SPECIFICATION

CUSTOMER :

MODULE NO.: WF43WSWAENN0#

APPROVED BY: (FOR CUSTOMER USE ONLY)	**PCB VERSION:** **DATA:**

SALES BY	APPROVED BY	CHECKED BY	PREPARED BY
			葉虹蘭
ISSUED DATE: 2025/02/03			

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

	MODLE NO：
RECORDS OF REVISION	DOC. FIRST ISSUE

VERSION	DATE	REVISED PAGE NO.	SUMMARY
0	2024/12/19		First issue
A	2025/01/03		Modify Reliability
B	2025/02/03		TFT FPC changed to direct out

Contents

1.Module Classification Information

W	F	43	W	S	W	A	E	S	N	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 S→LED, High Light White	T→LED, White Z→Nichia LED, White
⑥	LCD Polarize Type/ Temperature range/ Gray Scale Inversion Direction	A→Transmissive, N.T, IPS TFT C→Transmissive, N. T, 6:00 ; F→Transmissive, N.T,12:00 ; I→Transmissive, W. T, 6:00 K→Transflective, W.T,12:00 L→Transmissive, W.T,12:00 N→Transmissive, Super W.T, 6:00	Q→Transmissive, Super W.T, 12:00 R→Transmissive, Super W.T, O-TFT V→Transmissive, Super W.T, VA TFT W→Transmissive, Super W.T, IPS TFT X→Transmissive, W.T, VA TFT Y→Transmissive, W.T, IPS TFT Z→Transmissive, W.T, O-TFT
⑦	A：TFT LCD B：TFT+SCREW HOLES+CONTROL BOARD C：TFT+ SCREW HOLES +A/D BOARD D：TFT+ SCREW HOLES +A/D BOARD+CONTROL BOARD E：TFT+ SCREW HOLES +POWER BOARD		F：TFT+CONTROL BOARD G：TFT+ SCREW HOLES H：TFT+D/V BOARD I：TFT+ SCREW HOLES +D/V 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 IPS 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 industrial 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	105.5(W) x 67.2(H) x 2.95(D)	mm
Active area	95.04 x 53.856	mm
Pixel pitch	0.198 x 0.198	mm
LCD type	TFT, Normally Black, Transmissive	
Viewing Angle	80/80/80/80	
Aspect Ratio	16:9	
TFT Driver IC	NV3041A-01 or equivalent	
TFT Interface	4 Line data QSPI	
Backlight Type	LED,Normally White	
With /Without TP	Without TP	
Surface	Glare	

*Color tone slight changed by temperature and driving voltage.

4.Absolute Maximum Ratings

Item	Symbol	Min	Typ	Max	Unit
Operating Temperature	TOP	-30	—	+80	℃
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:

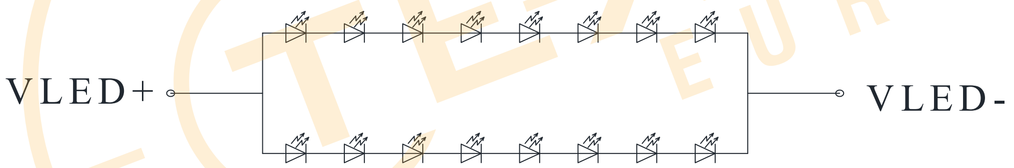
Item	Symbol	Min	Typ	Max	Unit	Remark
Power supply for analog circuit	VCI	3.0	3.3	3.6	V	
Power supply for logic circuit	IOVCC	1.65	1.8	3.3	V	VCI= 3.3V
Current for Driver	I_{VCI}	-	30	45	mA	VCI= 3.3V
	I_{IOVCC}	-	20	30	mA	IOVCC=1.8V

Note 1 : This value is test for VCI=3.3V , Ta=25 ℃ only, to avoid power supply noise, please avoid using driving conditions close to min, or max value

5.2. LED driving conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
LED current	-	-	40	-	mA	-
Power Consumption	-	864	1024	1088	mW	-
LED voltage	VLED+	21.6	25.6	27.2	V	Note 1
LED Life Time	-	50,000	-	-	Hr	Note 2,3,4

Note 1 : There are 1 Groups LED



CIRCUIT DIAGRAM(8*2)

Note 2 : Ta = 25 ℃
Note 3 : Brightness to be decreased to 50% of the initial value
Note 4 : The single LED lamp case

6.AC Characteristics

6.1. Display Serial Interface (Quad-SPI)

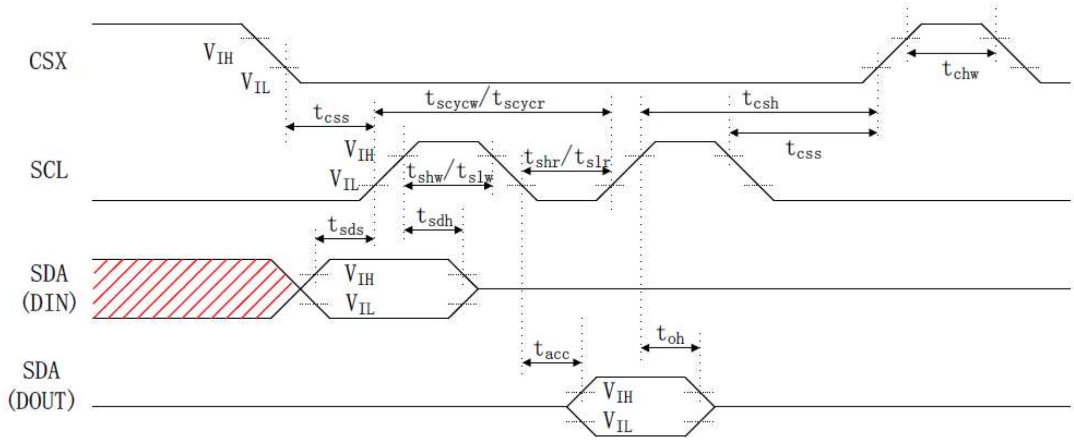


Figure 1

Signal	Symbol	Parameter	MIN	MAX	UNIT	Description
CSX	T_{CSS}	Chip Select Setup Time	10		ns	
	T_{CSH}	Chip Select Hold Time	30		ns	
	T_{CHW}	Chip Select "H" Pulse Width	30		ns	
SCL	T_{SCYCW}	Serial Clock Cycle(Write)	12.5		ns	QSPI 4 lane format (5-6-5): T_{SCYCW} >25ns (see "6.4.12.") QSPI 4 lane format (6-6-6): T_{SCYCW} >16ns(see "6.4.13") Other Format T_{SCYCW} >12.5ns
	T_{SHW}	S"L" "H" Pulse Width(Write)	T_{SCYCW} /2		ns	
	T_{SLW}	S"L" "L" Pulse Width(Write)	T_{SCYCW} /2		ns	
	T_{SCYCR}	Serial Clock Cycle(Read)	150		ns	
	T_{SHR}	S"L" "H" Pulse Width(Read)	T_{SCYCR} /2		ns	
	T_{SLR}	S"L" "L" Pulse Width(Read)	T_{SCYCR} /2		ns	
SDA(DIN) /(DOUT)	T_{SDS}	Data Setup Time	5		ns	
	T_{SDH}	Data Hold Time	5		ns	
	T_{ACC}	Access Time	5		ns	CLmax=30pF CLmin=8pF
	T_{OH}	Output Disable Time	10		ns	

Table 1: Serial Interface Characteristics

Note 1: IOVCC=1.8 V, VCI= 3.3V, GND=0V. Ta= 25 ℃

Note 2: The input signal rise time and fall time(Tr, Tf) is specified at 15 ns or less. Logic high and low levels are specified as 10% and 90% of IOVCC for Input signals.

Signal	Symbol	Parameter	MIN	MAX	UNIT	Description
CSX	T_{CSS}	Chip Select Setup Time	10		ns	
	T_{CSH}	Chip Select Hold Time	30		ns	
	T_{CHW}	Chip Select "H" Pulse Width	30		ns	
SCL	T_{SCYCW}	Serial Clock Cycle(Write)	12.5		ns	
	T_{SHW}	S "L" "H" Pulse Width(Write)	T_{SCYCW} /2		ns	
	T_{SLW}	S "L" "L" Pulse Width(Write)	T_{SCYCW} /2		ns	
	T_{SCYCR}	Serial Clock Cycle(Read)	150		ns	
	T_{SHR}	S "L" "H" "Pulse Width(Read)	T_{SCYCR} /2		ns	
	T_{SLR}	S"L" "L" Pulse Width(Read)	T_{SCYCR} /2		ns	
D/CX	T_{DCS}	D/CX Setup Time	5		ns	
	T_{DCH}	D/CX Hold Time	5		ns	
SDA(DIN) (DOUT)	T_{SDS}	Data Setup Time	5		ns	
	T_{SDH}	Data Hold Time	5		ns	
	T_{ACC}	Access Time	5		ns	CLmax=30pF CLmin=8pF
	T_{OH}	Output Disable Time	10		ns	

Table 2: 4 wire Serial Interface Characteristics

Note 1: IOVCC=1.8 V, VCI= 3.3V, GND=0V. Ta= 25 ℃

Note 2: The input signal rise time and fall time (tr, tf) is specified at 15 ns or less. Logic high and low levels are specified as 10% and 90% of IOVCC for Input signals.

6.2. Display Date Writing Format

1.QSPI 4 lane RGB format(5-6-5)

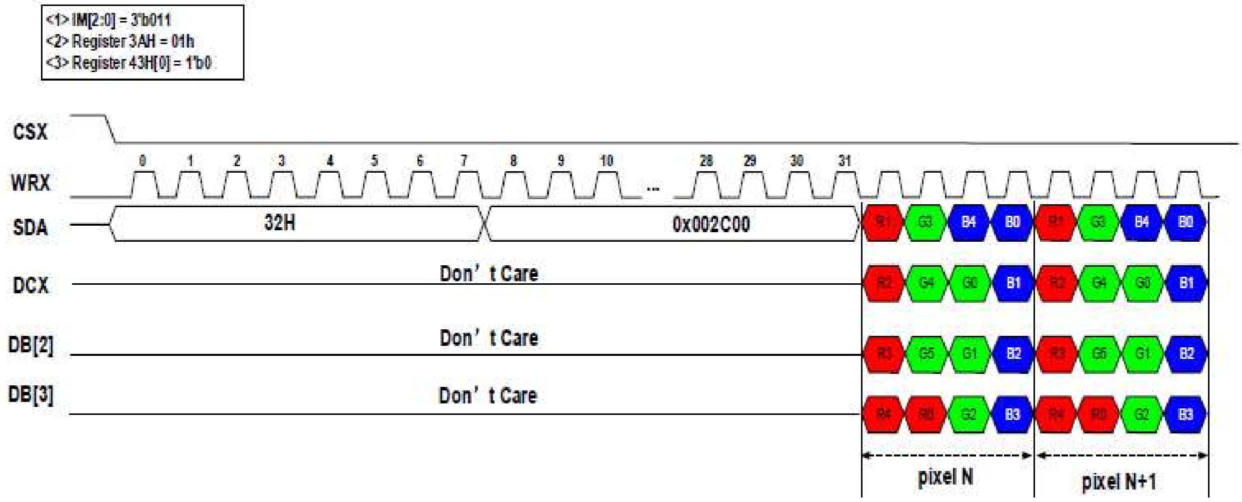


Figure 3

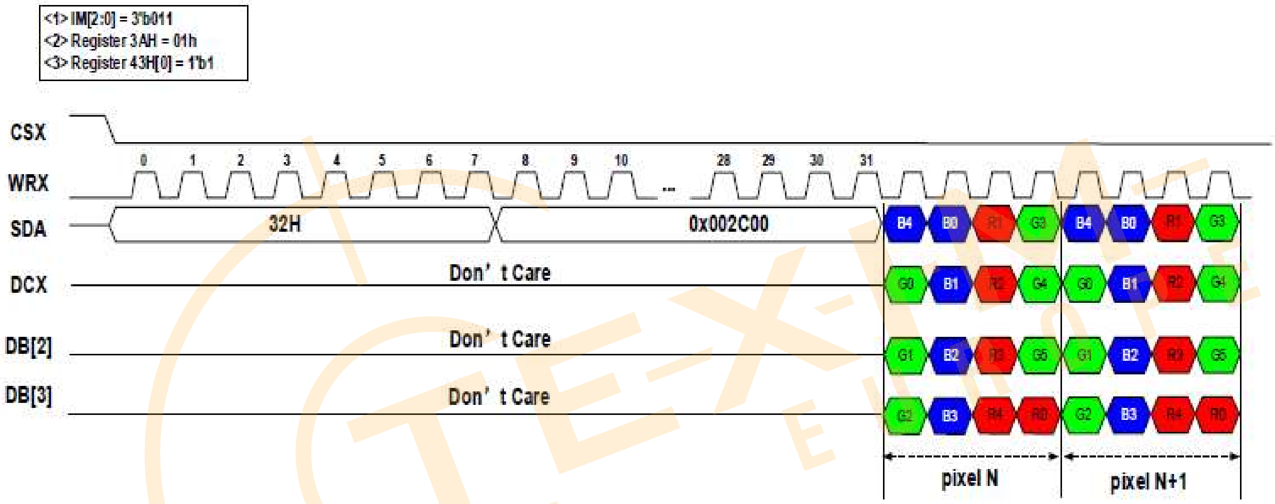


Figure 4

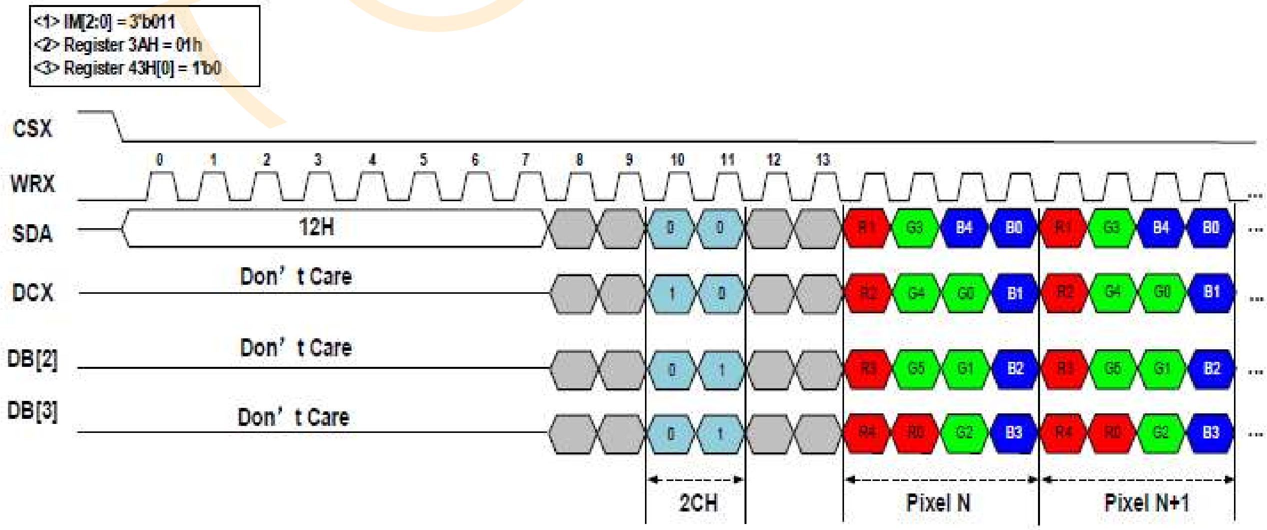


Figure 5

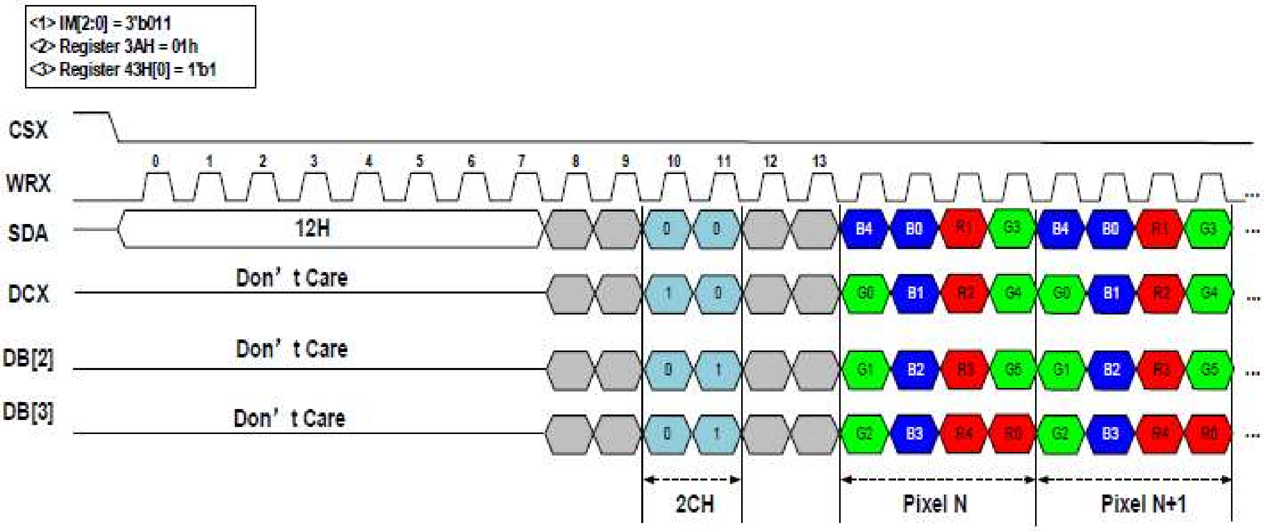

<1> IM[2:0] = 3'b011
<2> Register 3AH = 01h
<3> Register 43H[0] = 1'b1
CSX
WRX
SDA
DCX
DB[2]
DB[3]
12H
Don' t Care
Don' t Care
Don' t Care
2CH
Pixel N
Pixel N+1

Figure 6

2.QSPI 4 lane RGB format(6-6-6)

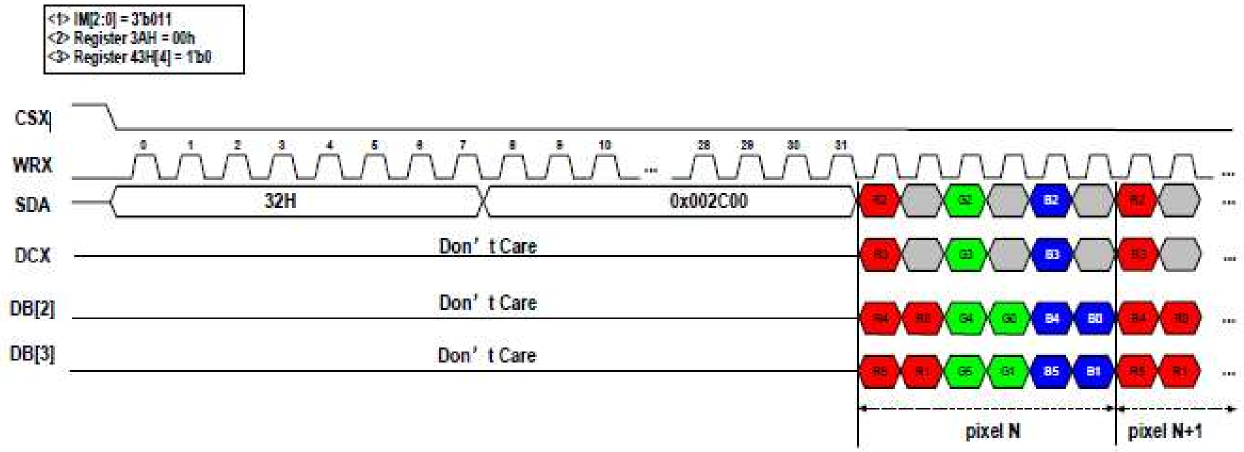


Figure 7

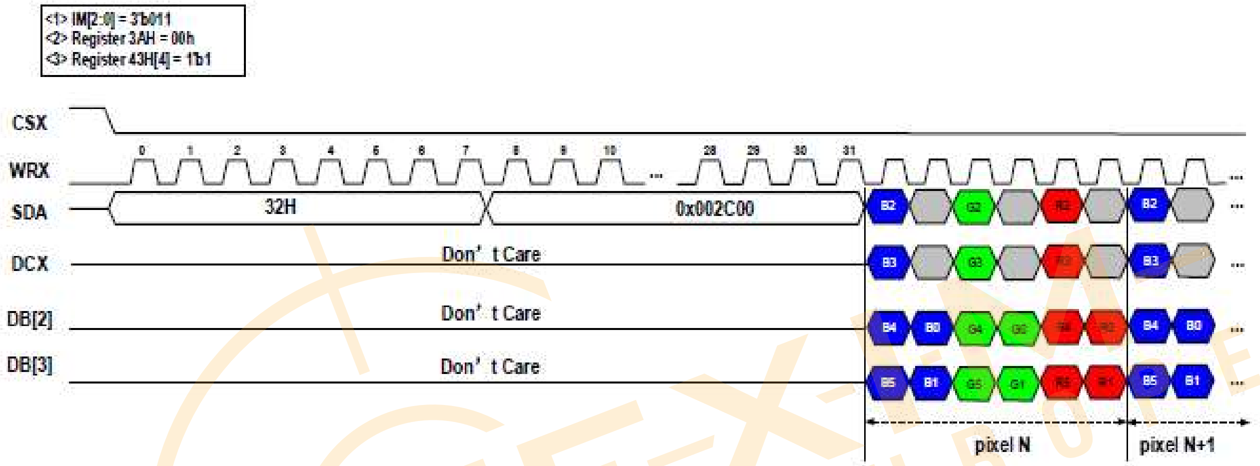


Figure 8

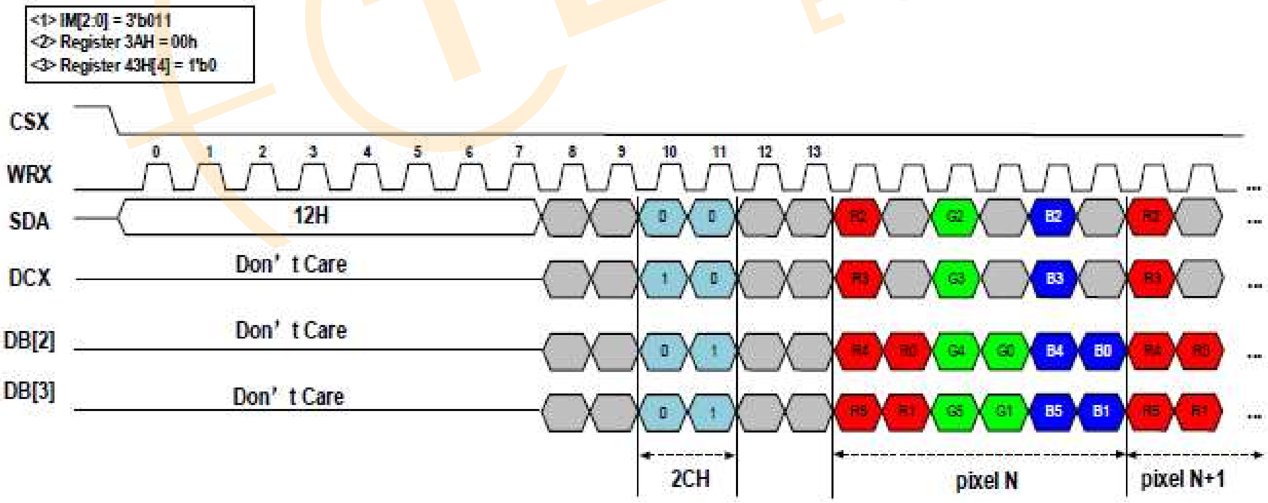


Figure 9

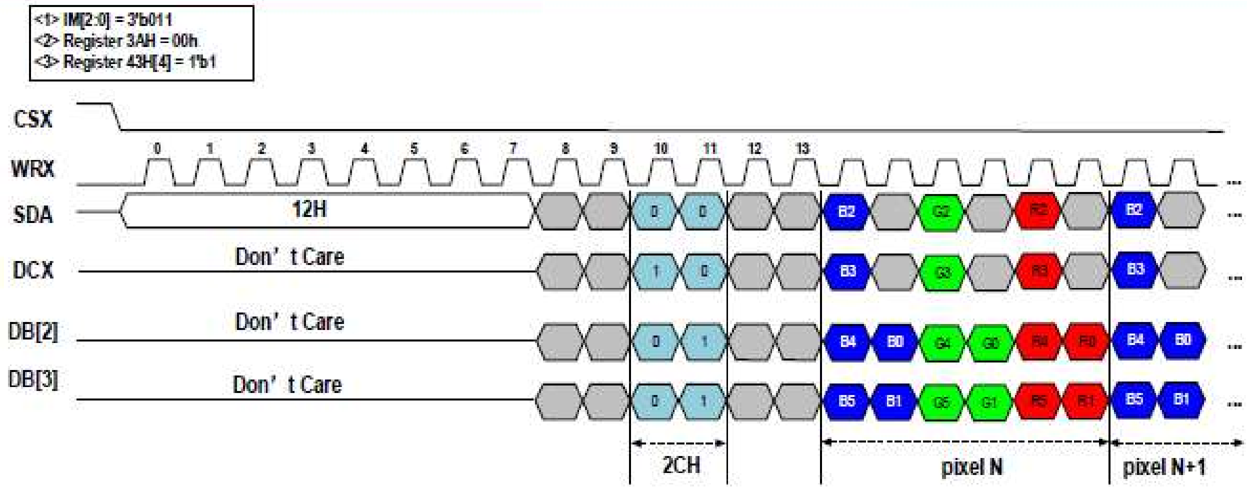

<1> IM[2:0] = 3'b011
<2> Register 3AH = 00h
<3> Register 43H[4] = 1'b1
CSX
WRX
SDA
DCX
DB[2]
DB[3]
12H
Don' t Care
Don' t Care
Don' t Care
2CH
pixel N
pixel N+1

Figure 10

7.Power sequence

7.1. Power On Sequence

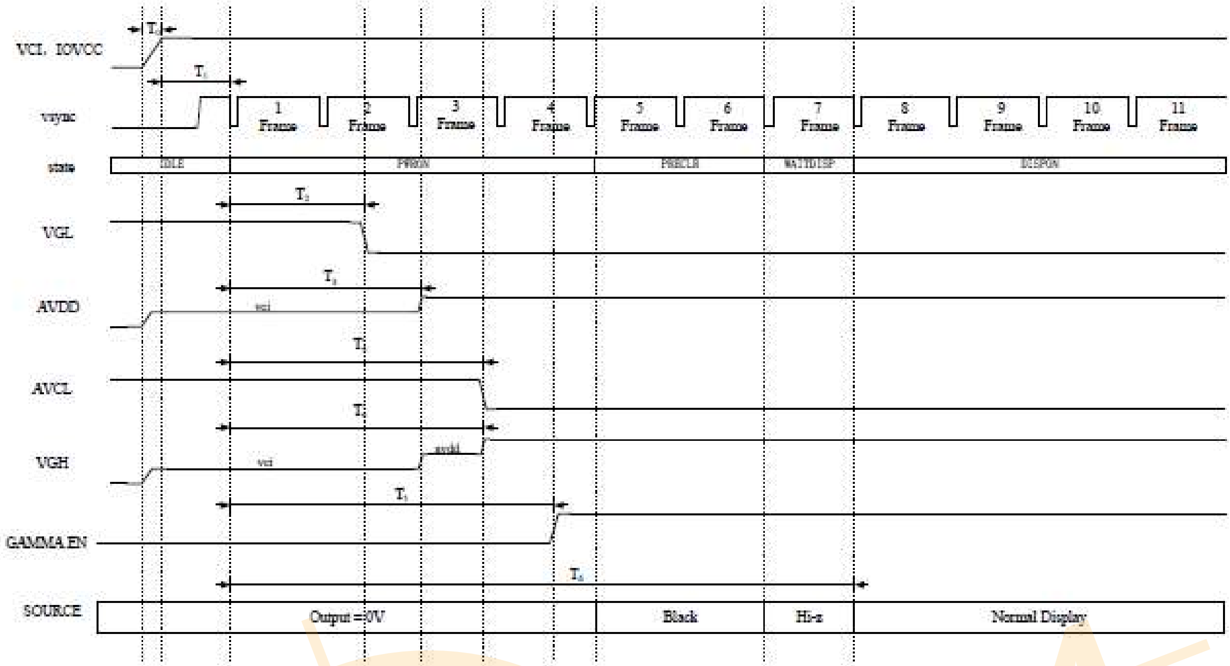


Figure 11

Symbol	Description	Min. Time	Unit
T_0	Determined by the external power	0[Note1]	ms
T_1	Time from stable VCI、IOVCC (reset finished) set-up to Command "11H"	Decide by 11H command	ms
T_2	Time from Command "11H" to VGL voltage stabilization	23	ms
T_3	Time from Command "11H" to AVDD voltage stabilization	30.7	ms
T_4	Time from Command "11H" to AVCL/VGH voltage stabilization	40.8	ms
T_5	Gamma output enable	55.3	ms
T_6	Source normal display	Decide by 29H command	ms

Table 3

Note1: Condition: AVDD and AVCL without stabilized capacitance

7.2. Power Off Sequence

When host sends "10H" command, State from WAIT_PD to PWRDOWN, in which power disabled sequentially.

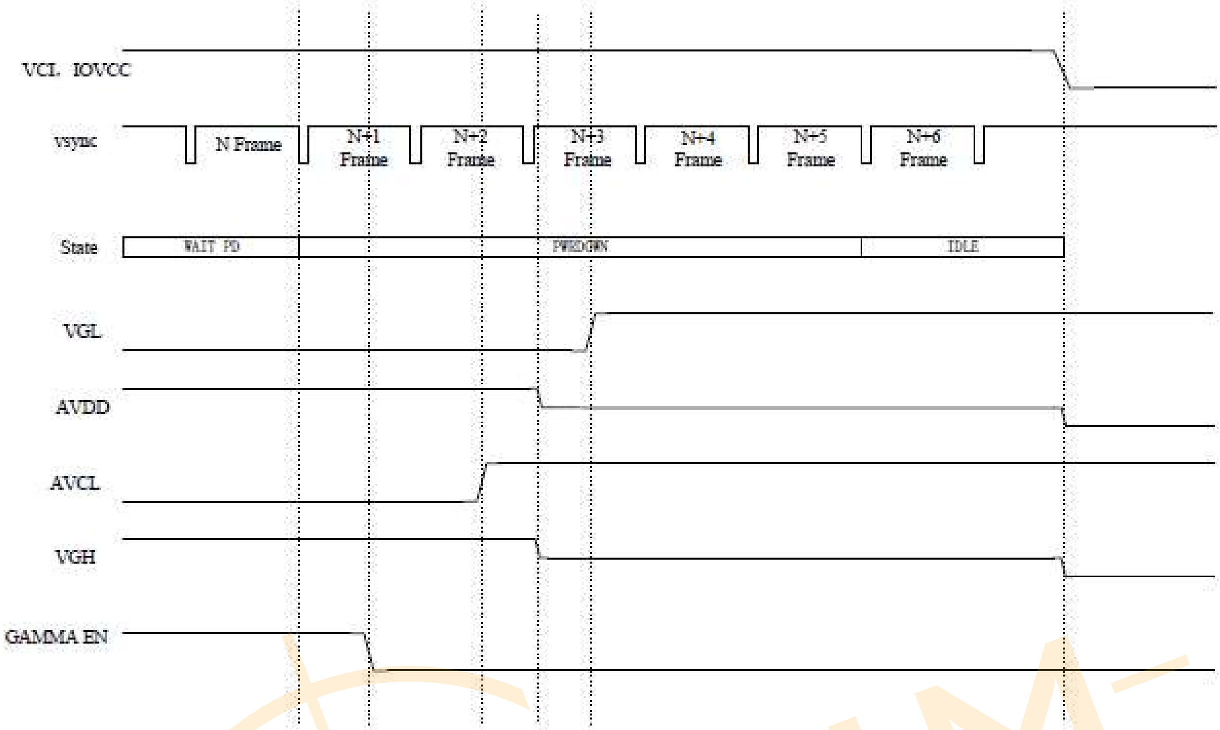


Figure 12

8.Optical Characteristics

Item		Symbol	Condition.	Min	Typ.	Max.	Unit	Remark
Response time		Tr+ Tf	θ=0°、Φ=0°	-	30	40	ms	Note 3
Contrast ratio		CR	At optimized viewing angle	640	800	-	-	Note 4
Color Chromaticity	White	Wx	θ=0°、Φ=0	0.27	0.32	0.37	-	Note 2,6,7
		Wy		0.295	0.345	0.395	-	
Viewing angle	Hor.	ΘR	CR≧10	70	80	-	Deg.	Note 1
		ΘL		70	80	-		
	Ver.	ΦT		70	80	-		
		ΦB		70	80	-		
Brightness		-	-	850	1000	-	cd/m2	Center of display
Uniformity		(U)	-	75	-	-	%	Note 5

Ta=25±2℃, IL=40mA

Note 1: Definition of viewing angle range

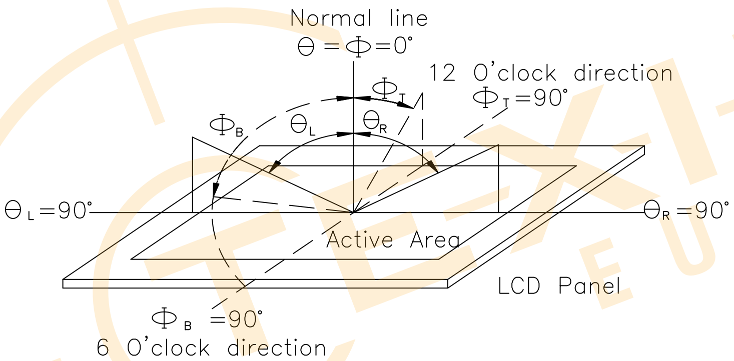


Fig. 8.1. Definition of viewing angle

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-7orBM-5 luminance meter 1.0° field of view at a distance of 50cm and normal direction.

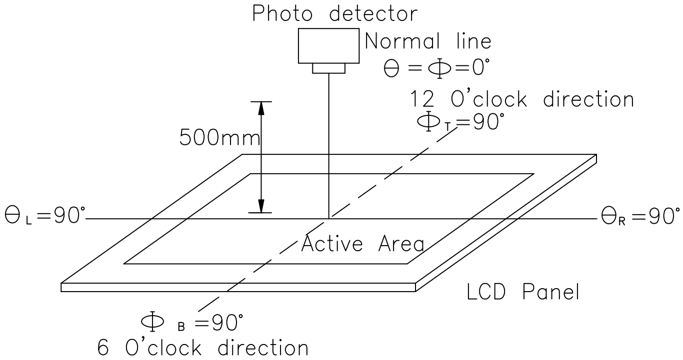
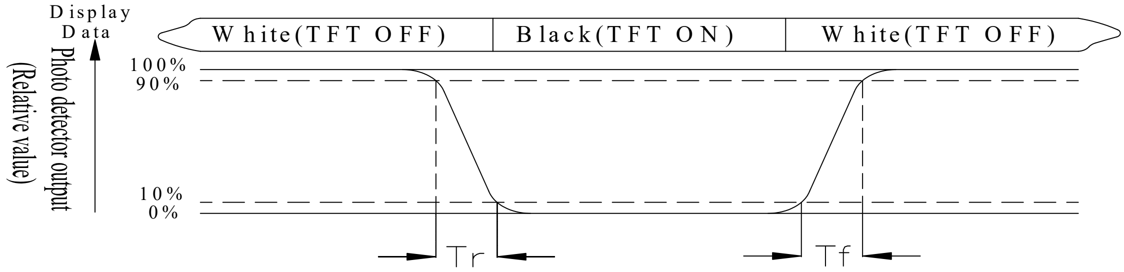


Fig. 8.2. Optical measurement system setup

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: Definition of Luminance Uniformity
Active area is divided into 9 measuring areas (reference the picture in below). Every measuring point is placed at the center of each measuring area.
Luminance Uniformity (U) = Lmin/Lmax x100%
L = Active area length
W = Active area width

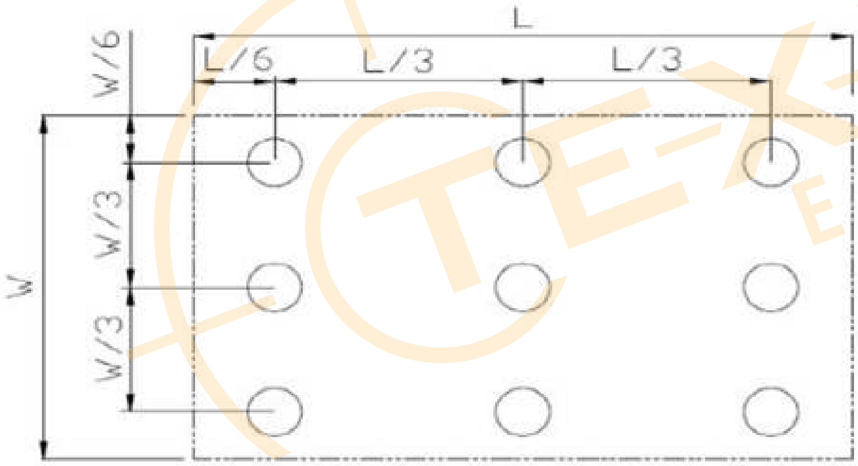


Fig 8.3. Definition of uniformity

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

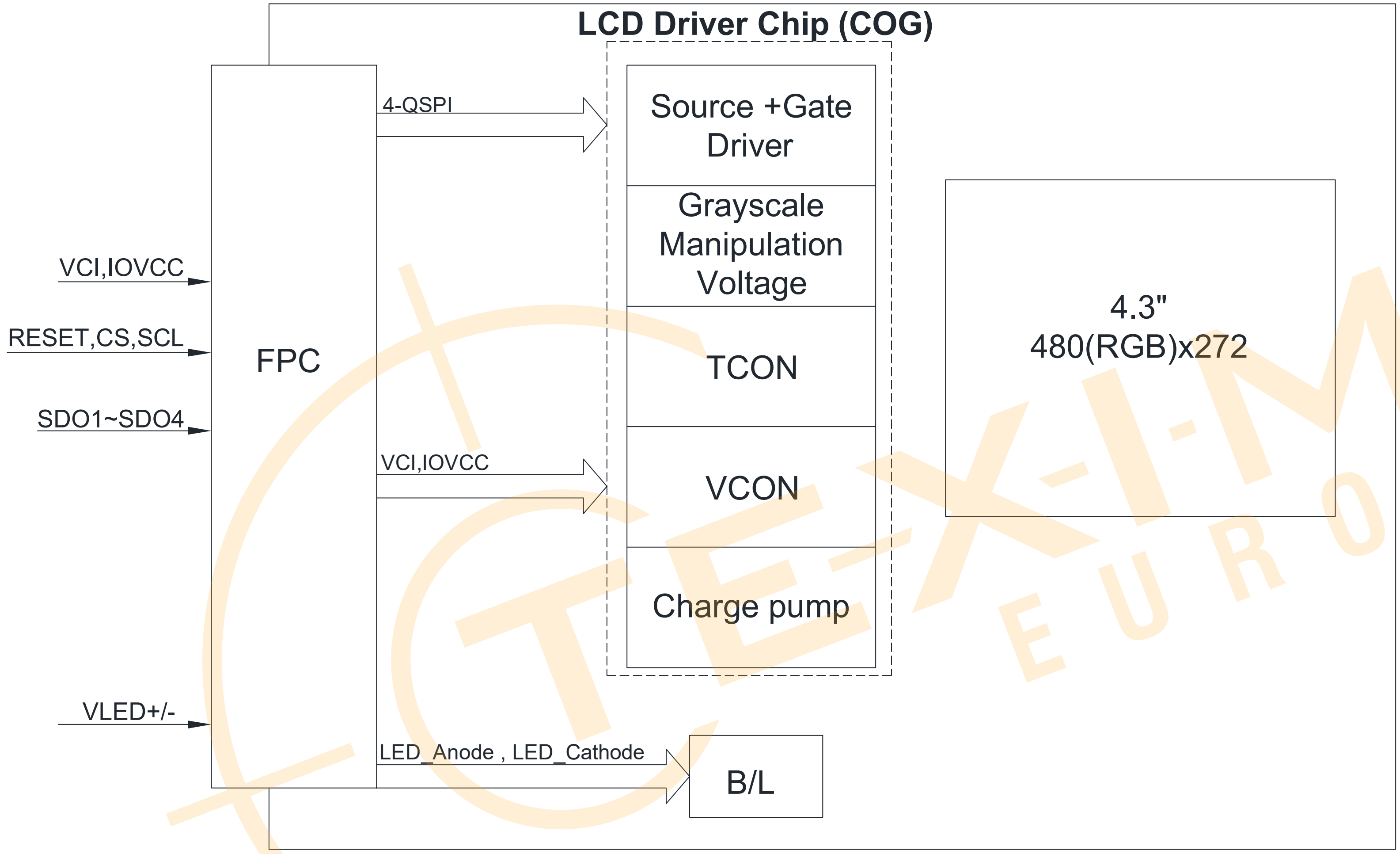
Note 7: Measured at the center area of the panel when all the input terminals of LCD panel are electrically opened.

9.Interface

9.1. LCM PIN Definition

Pin	Symbol	Function	Remark
1	VLED-	Power for LED backlight cathode	
2	VLED+	Power for LED backlight anode	
3	NC	No connection	
4	VCI	Power supply for analog circuit	
5	IOVCC	Power supply for digital interface I/O pins	
6	GND	Ground	
7	RESET	Reset.	
8	GND	Ground	
9	CS	Chip select, internal pull high. (CSX)	
10	SCL	This pin is used serial interface clock	
11	GND	Ground	
12	SDO1	SPI bi-direction data pin (SDA)	
13	SDO2	Std-SPI(4 wire): command or parameter select. Quard-SPI: the second data pin (DCX)	
14	SDO3	The third pin of Quard-SPI (DB[2])	
15	SDO4	The fourth pin of Quard-SPI (DB[3])	
16	GND	Ground	
17	TE	Tearing effect output pin is used to synchronize MCU frame writing, activated by S/W command. When this pin is not activated (TE function OFF), this pin is GND level.	
18	GND	Ground	

10.Block Diagram



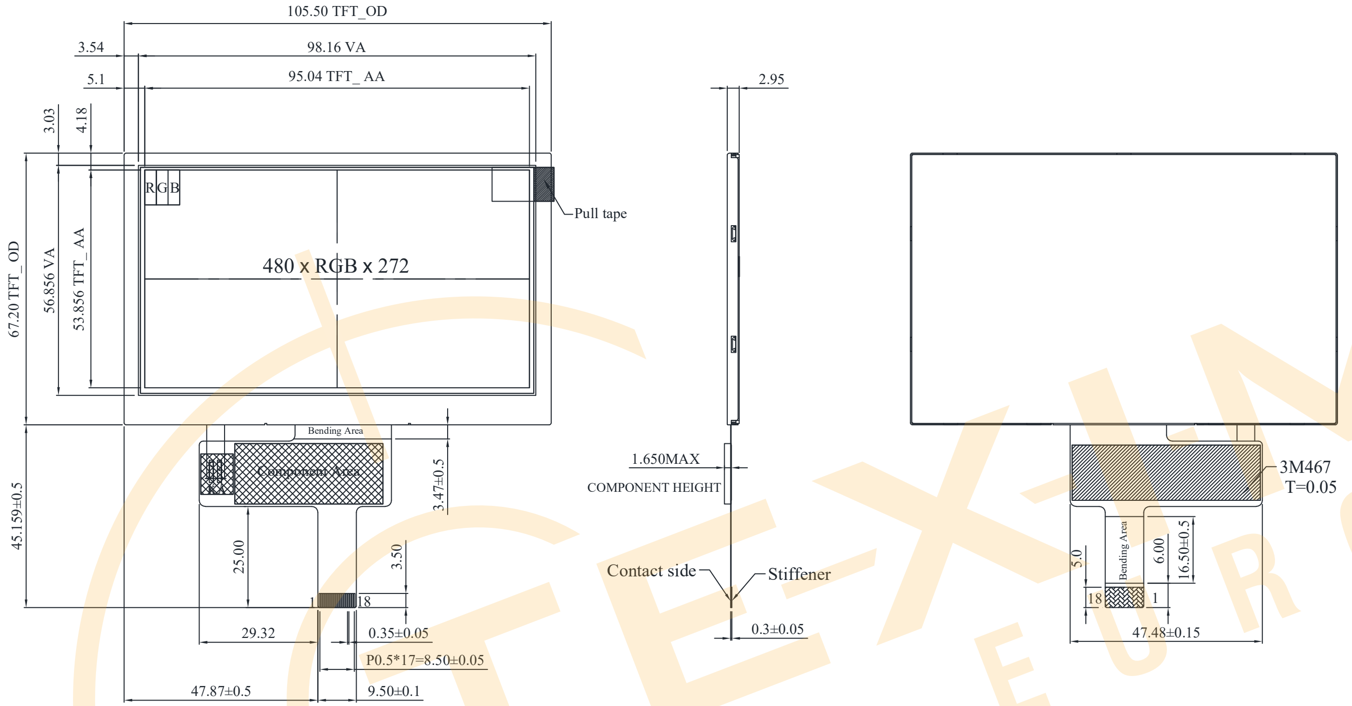
11.Reliability

Content of Reliability Test (Wide temperature, -30℃~80℃)

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.	80℃ 200hrs	2
Low Temperature Operation	Endurance test applying the electric stress under low temperature for a long time.	-30℃ 200hrs	1,2
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 -30℃ 25℃ 80℃ 30min 5min 30min 1 cycle	-30℃/80℃ 10 cycles	2
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=±6KV(contact), ±8KV(air), RS=330Ω CS=150pF 10 times	4

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.
Note4: Endurance test applying the electric stress to the finished product housing

12.Contour Drawing



PIN NO.	SYMBOL
1	VLED-
2	VLED+
3	NC
4	VCI
5	IOVCC
6	GND
7	RESET
8	GND
9	CS
10	SCL
11	GND
12	SDO1
13	SDO2
14	SDO3
15	SDO4
16	GND
17	TE
18	GND

Note.
380nm transmittance(UV Cut at 380nm)<1.0%

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

13.Initial Code For Reference

```
void LCD_43W_Init(void)
{
	qspi_simulation_res = 1;
	delay_ms(80);
	qspi_simulation_res = 0;
	delay_ms(80);
	qspi_simulation_res = 1;
	delay_ms(150);

	//---------Start Initial Code ------//
	qspi_simulation_write_cmd(0xff);
	qspi_simulation_write_data(0xa5);
	qspi_simulation_write_cmd(0xE7); // TE_output_en
	qspi_simulation_write_data(0x10);
	qspi_simulation_write_cmd(0x35); // TE_ interface_en
	qspi_simulation_write_data(0x01);
	qspi_simulation_write_cmd(0x3A);
	qspi_simulation_write_data(0x01); // 00---666//01--565
	qspi_simulation_write_cmd(0x40);
	qspi_simulation_write_data(0x01); // 01:IPS/00:TN
	qspi_simulation_write_cmd(0x41);
	qspi_simulation_write_data(0x03); // 01--8bit//03--16bit
	qspi_simulation_write_cmd(0x55);
	qspi_simulation_write_data(0x01);
	qspi_simulation_write_cmd(0x44);    // VBP
	qspi_simulation_write_data(0x15); // 21
	qspi_simulation_write_cmd(0x45);    // VFP
	qspi_simulation_write_data(0x15); // 21
	qspi_simulation_write_cmd(0x7d);    // vdds_trim[2:0]
	qspi_simulation_write_data(0x03); // 2.07V

	qspi_simulation_write_cmd(0xc1);    // avdd_clp_en avdd_clp[1:0] avcl_clp_en
avcl_clp[1:0]
	qspi_simulation_write_data(0xab); // 6.74V/-5.16V
	qspi_simulation_write_cmd(0xc2);    // vgh_clp_en vgl_clp[2:0]
	qspi_simulation_write_data(0x17);
	qspi_simulation_write_cmd(0xc3);    // vgl_clp_en vgl_clp[2:0]
	qspi_simulation_write_data(0x10); //-10.951
	qspi_simulation_write_cmd(0xc6);    // avdd_ratio_sel avcl_ratio_sel vgh_ratio_sel[1:0]
vgl_ratio_sel[1:0]
	qspi_simulation_write_data(0x3a); // 35

	qspi_simulation_write_cmd(0xc7);    // mv_clk_sel[1:0] avdd_clk_sel[1:0] avcl_clk_sel[1:0]
	qspi_simulation_write_data(0x25); // 2e
	qspi_simulation_write_cmd(0xc8);    // VGL_CLK_sel
	qspi_simulation_write_data(0x00);

	qspi_simulation_write_cmd(0x7a);    // user_vgsp
```

```
qspi_simulation_write_data(0x67); // 5f
qspi_simulation_write_cmd(0x6f);   // user_gvdd
qspi_simulation_write_data(0x3f); // 3f
qspi_simulation_write_cmd(0x78);   // user_gvcl
qspi_simulation_write_data(0x37); // 4a

qspi_simulation_write_cmd(0x73); // osc
qspi_simulation_write_data(0x08);
qspi_simulation_write_cmd(0x74);
qspi_simulation_write_data(0x12);
qspi_simulation_write_cmd(0xc9);
qspi_simulation_write_data(0x00);
qspi_simulation_write_cmd(0x67);
qspi_simulation_write_data(0x11);
// gate_ed
qspi_simulation_write_cmd(0x51); // gate_st_o[7:0]
// qspi_simulation_write_data(0x4b);
qspi_simulation_write_data(0x20);
qspi_simulation_write_cmd(0x52); // gate_ed_o[7:0]
qspi_simulation_write_data(0x7c);
qspi_simulation_write_cmd(0x53); // gate_st_e[7:0]
// qspi_simulation_write_data(0x45);
qspi_simulation_write_data(0x1c);
qspi_simulation_write_cmd(0x54); // gate_ed_e[7:0]
qspi_simulation_write_data(0x77);

qspi_simulation_write_cmd(0x46); // fsm_hbp_o[5:0]
qspi_simulation_write_data(0x0a);
qspi_simulation_write_cmd(0x47); // fsm_hfp_o[5:0]
qspi_simulation_write_data(0x2a);
qspi_simulation_write_cmd(0x48); // fsm_hbp_e[5:0]
qspi_simulation_write_data(0x0a);
qspi_simulation_write_cmd(0x49); // fsm_hfp_e[5:0]
qspi_simulation_write_data(0x1a);
qspi_simulation_write_cmd(0x56); // src_ld_wd[1:0] src_ld_st[5:0]
qspi_simulation_write_data(0x43);

qspi_simulation_write_cmd(0x57); // pn_cs_en src_cs_st[5:0]
qspi_simulation_write_data(0x42);
qspi_simulation_write_cmd(0x58); // src_cs_p_wd[6:0]
qspi_simulation_write_data(0x3c);
qspi_simulation_write_cmd(0x59); // src_cs_n_wd[6:0]
qspi_simulation_write_data(0x64);
qspi_simulation_write_cmd(0x5a); // src_pchg_st_o[6:0]
qspi_simulation_write_data(0x41);
qspi_simulation_write_cmd(0x5b); // src_pchg_wd_o[6:0]
qspi_simulation_write_data(0x3c);
qspi_simulation_write_cmd(0x5c); // src_pchg_st_e[6:0]
qspi_simulation_write_data(0x02);
qspi_simulation_write_cmd(0x5d); // src_pchg_wd_e[6:0]
qspi_simulation_write_data(0x3c);
```

```
qspi_simulation_write_cmd(0x5e); // src_pol_sw[7:0]
qspi_simulation_write_data(0x1f);
qspi_simulation_write_cmd(0x60); // src_op_st_o[7:0]
qspi_simulation_write_data(0x80);
qspi_simulation_write_cmd(0x61); // src_op_st_e[7:0]
qspi_simulation_write_data(0x3f);
qspi_simulation_write_cmd(0x62); // src_op_ed_o[9:8] src_op_ed_e[9:8]
qspi_simulation_write_data(0x21);
qspi_simulation_write_cmd(0x63); // src_op_ed_o[7:0]
qspi_simulation_write_data(0x07);
qspi_simulation_write_cmd(0x64); // src_op_ed_e[7:0]
qspi_simulation_write_data(0xe0);
qspi_simulation_write_cmd(0x65);    // chopper
qspi_simulation_write_data(0x01); // 01-A2,02--A1
qspi_simulation_write_cmd(0xca);    // avdd_mux_st_o[7:0]
qspi_simulation_write_data(0x20);
qspi_simulation_write_cmd(0xcb); // avdd_mux_ed_o[7:0]
qspi_simulation_write_data(0x52);
qspi_simulation_write_cmd(0xcc); // avdd_mux_st_e[7:0]
qspi_simulation_write_data(0x10);
qspi_simulation_write_cmd(0xcD); // avdd_mux_ed_e[7:0]
qspi_simulation_write_data(0x42);
qspi_simulation_write_cmd(0xD0); // avcl_mux_st_o[7:0]

qspi_simulation_write_data(0x20);
qspi_simulation_write_cmd(0xD1); // avcl_mux_ed_o[7:0]
qspi_simulation_write_data(0x52);
qspi_simulation_write_cmd(0xD2); // avcl_mux_st_e[7:0]
qspi_simulation_write_data(0x10);
qspi_simulation_write_cmd(0xD3); // avcl_mux_ed_e[7:0]
qspi_simulation_write_data(0x42);
qspi_simulation_write_cmd(0xD4); // vgh_mux_st[7:0]
qspi_simulation_write_data(0x0a);
qspi_simulation_write_cmd(0xD5); // vgh_mux_ed[7:0]
qspi_simulation_write_data(0x32);
qspi_simulation_write_cmd(0xe5);    // DVDD_TRIM
qspi_simulation_write_data(0x06); // 1.65 05
qspi_simulation_write_cmd(0xe6);    // ESD_CTRL
qspi_simulation_write_data(0x00);
qspi_simulation_write_cmd(0x6e); // LVD_en
qspi_simulation_write_data(0x14);
// gammma 01      20240416
qspi_simulation_write_cmd(0x80); // gam_vrp0 63
qspi_simulation_write_data(0x08);
qspi_simulation_write_cmd(0xA0); // gam_VRN0 63
qspi_simulation_write_data(0x08);
qspi_simulation_write_cmd(0x81); // gam_vrp1 62
qspi_simulation_write_data(0x09);
qspi_simulation_write_cmd(0xA1); // gam_VRN1 62-
qspi_simulation_write_data(0x08);
qspi_simulation_write_cmd(0x82); // gam_vrp2 61
```

```
qspi_simulation_write_data(0x07);
qspi_simulation_write_cmd(0xA2); // gam_VRN2 61-
qspi_simulation_write_data(0x06);
qspi_simulation_write_cmd(0x83); // gam_vrp3 2
qspi_simulation_write_data(0x37);
qspi_simulation_write_cmd(0xA3); // gam_VRN3 2-
qspi_simulation_write_data(0x37);
qspi_simulation_write_cmd(0x84); // gam_vrp4 1
qspi_simulation_write_data(0x38);
qspi_simulation_write_cmd(0xA4); // gam_VRN4 1-
qspi_simulation_write_data(0x38);
qspi_simulation_write_cmd(0x85);   // gam_vrp5 0
qspi_simulation_write_data(0x3f); // 2a~39-0.43
qspi_simulation_write_cmd(0xA5);   // gam_VRN5 0-
qspi_simulation_write_data(0x3f);

qspi_simulation_write_cmd(0x86);   // gam_prp0 50
qspi_simulation_write_data(0x27); // 33
qspi_simulation_write_cmd(0xA6);   // gam_PRN0 50-
qspi_simulation_write_data(0x28); // 2a

qspi_simulation_write_cmd(0x87);   // gam_prp1 14
qspi_simulation_write_data(0x3b); // 2d
qspi_simulation_write_cmd(0xA7);   // gam_PRN1 14-
qspi_simulation_write_data(0x3b); // 2d
qspi_simulation_write_cmd(0x88);   // gam_pkp0 59
qspi_simulation_write_data(0x07); // 0b
qspi_simulation_write_cmd(0xA8);   // gam_PKN0 59-
qspi_simulation_write_data(0x07); // 0b
qspi_simulation_write_cmd(0x89);   // gam_pkp1 57
qspi_simulation_write_data(0x0e); // 14
qspi_simulation_write_cmd(0xA9);   // gam_PKN1 57-
qspi_simulation_write_data(0x0e); // 14
qspi_simulation_write_cmd(0x8a);   // gam_pkp2 54
qspi_simulation_write_data(0x16); // 1a
qspi_simulation_write_cmd(0xAa);   // gam_PKN2 54-
qspi_simulation_write_data(0x17); // 1a
qspi_simulation_write_cmd(0x8b);   // gam_PKP3 44
qspi_simulation_write_data(0x0f);
qspi_simulation_write_cmd(0xAb); // gam_PKN3 44-
qspi_simulation_write_data(0x0e);
qspi_simulation_write_cmd(0x8c); // gam_PKP4 38
qspi_simulation_write_data(0x14);
qspi_simulation_write_cmd(0xAc); // gam_PKN4 38-
qspi_simulation_write_data(0x14);
qspi_simulation_write_cmd(0x8d); // gam_PKP5 32
qspi_simulation_write_data(0x12);
qspi_simulation_write_cmd(0xAd); // gam_PKN5 32-
qspi_simulation_write_data(0x12);
qspi_simulation_write_cmd(0x8e);   // gam_PKP6 26
qspi_simulation_write_data(0x10); // 16
```

```
    qspi_simulation_write_cmd(0xAe);    // gam_PKN6 26-
    qspi_simulation_write_data(0x10); // 13
    qspi_simulation_write_cmd(0x8f);    // gam_PKP7 20
    qspi_simulation_write_data(0x13); // 1c
    qspi_simulation_write_cmd(0xAf);    // gam_PKN7 20-
    qspi_simulation_write_data(0x12); // 0a
    qspi_simulation_write_cmd(0x90);    // gam_PKP8 10
    qspi_simulation_write_data(0x05);
    qspi_simulation_write_cmd(0xB0); // gam_PKN8 10-
    qspi_simulation_write_data(0x04);
    qspi_simulation_write_cmd(0x91);    // gam_PKP9 6
    qspi_simulation_write_data(0x0e); // 0e
    qspi_simulation_write_cmd(0xB1);    // gam_PKN9 6-
    qspi_simulation_write_data(0x0e); // 0e
    qspi_simulation_write_cmd(0x92);    // gam_PKP10 4
    qspi_simulation_write_data(0x14);
    qspi_simulation_write_cmd(0xB2); // gam_PKN10 4-
    qspi_simulation_write_data(0x14);

    qspi_simulation_write_cmd(0x11); // exit sleep
    qspi_simulation_write_data(0x00);
    delay_ms(200);
    qspi_simulation_write_cmd(0x29); // display on
    qspi_simulation_write_data(0x00);
    delay_ms(120);
}
```

winstar

LCM Sample Estimate Feedback Sheet

Module Number： ____________________

1、Panel Specification：

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 □ Pass □ NG ,____________________
7. Storage Temperature： □ Pass □ NG ,____________________
8. Others：____

2、Mechanical

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 □ Pass □ NG ,____________________
9. Height of Module： □ Pass □ NG ,____________________
10. Others： □ Pass □ NG ,____________________

3、Relative Hole Size：

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、Backlight Specification：

1. B/L Type： □ Pass □ NG ,____________________
2. B/L Color： □ Pass □ NG ,____________________
3. B/L Driving Voltage (Reference for LED □ 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：** ____/____/____

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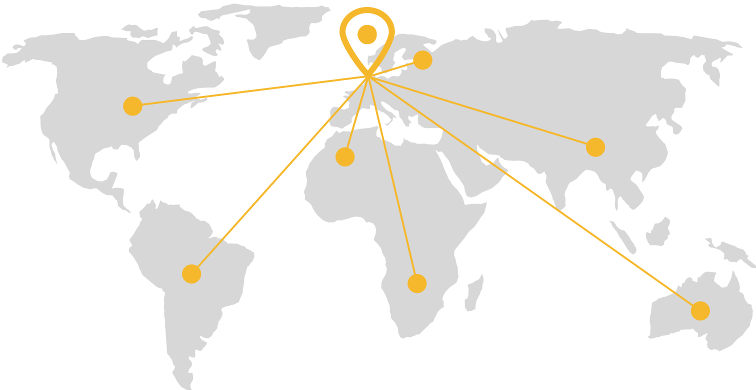

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