

SPECIFICATION

[☒] Preliminary Specification

[☐] Final Specification

Description

12.1” 1280xRGBx800 TFT-LCD Module

Part Number

P1210WXF2MA00

Customer		Product Dept, PDBU Tianma Microelectronics Co., Ltd.	
Signatures		Date	
		Approved By Kevin Kim Reviewed By Longping Deng Prepared By Luca Chen	
Comments:			

* This cover page is for your Comments and Signatures back to TIANMA.

REVISION HISTORY

[illegible]

CONTENTS

1. SUMMARY.....	1
1.1 General Description.....	1
1.2 Features.....	1
2. GENERAL SPECIFICATIONS.....	2
3. INPUT / OUTPUT TERMINALS.....	3
3.1 CN1 Pin assignment (LCD Interface).....	3
3.2 CN2 Pin assignment (Back Light).....	4
3.3 CN3 Pin assignment (PCAP).....	错误!未定义书签。
4. ABSOLUTE MAXIMUM RATINGS	5
5. ELECTRICAL CHARACTERISTICS	6
5.1 DC Characteristics for Panel Driving.....	6
5.2 DC Characteristics for Backlight Driving.....	6
5.3 DC Characteristics For PCAP	错误!未定义书签。
5.4 Recommended Power ON/OFF Sequence.....	7
5.5 LCD Module Block Diagram	8
6. TIMING CHARACTERISTICS	9
6.1 AC characteristics.....	9
6.2 Data Input Timing Parameter Setting	10
6.3 SYNC Mode Timing Diagram.....	10
7. OPTICAL CHARACTERISTICS	11
8. RELIABILITY TEST.....	14
9. MECHANICAL DRAWING	15
10. PACKING INSTRUCTION.....	16
11. PRECAUTIONS FOR USE OF LCD MODULES.....	17
11.1 Handling Precautions.....	17
11.2 Storage precautions.....	17
11.3 Transportation Precautions	17
11.4 Screen saver Precautions.....	17
11.5 Safety Precautions	17

1. Summary

1.1 General Description

This is a 12.1-inch a-Si TFT-LCD module with Normal-Black technology. It is composed of a TFT-LCD panel, a PCB, and an LED backlight unit.

1.2 Features

- Ultra-wide viewing angle
- High luminance
- Long LED life time
- Wide temperature range
- LCM Interface: LVDS
- Readable with polarized sunglass
- Compliant with the European RoHS Directive (2011/65/EU) and Delegated Directive (2015/863/EU, Amending Annex II of 2011/65/EU)

2. General Specifications

Feature		Spec	Unit
Display Spec	Size	12.1 inches	
	Resolution	1280(RGB)*800	
	Pixel Pitch	0.204*0.204	mm
	TFT Active Area	216.12*163.20	mm
	Technology Type	a-Si	
	Pixel Configuration	R.G.B Vertical Stripe	
	Display Mode	SFT, Normally Black	
	Surface Treatment	HC	
	Viewing Direction	ALL	
	Gray Scale Inversion Direction	NA	
Mechanical Characteristics	LCM (W x H x D)	281.78*183.17*9.46 (typ.)	mm
	Weight	TBD	g
Optical Characteristics	Luminance	1500 (typ.)	cd/m ²
	Contrast Ratio	1000:1 (typ.)	
	NTSC	72 (typ.)	%
	Viewing Angle	88/88/88/88	degree
Electrical Characteristics	Interface	LVDS	
	Color Depth	16.2M	color
	Power Consumption	LCD: TBD; Backlight: TBD Total: 10000	mW

Table 2.1 General TFT Specifications

3. Input / Output Terminals

3.1 CN1 Pin assignment (LCD Interface)

Connector Information	
LCD Module connector	FI-SEB20P-HFE(JAE);

Table 3.1.1 Connector information

No	Symbol	I/O	Description	Comment
1	VCC	P	Power supply(3.3V)	
2	VCC	P	Power supply(3.3V)	
3	GND	P	Guard	
4	GND	P	Guard	
5	D0-	I	- LVDS differential data input	
6	D0+	I	+ LVDS differential data input	
7	GND	P	Guard	
8	D1-	I	- LVDS differential data input	
9	D1+	I	+ LVDS differential data input	
10	GND	P	Guard	
11	D2-	I	- LVDS differential data input	
12	D2+	I	+ LVDS differential data input	
13	GND	P	Guard	
14	CLK-	I	- LVDS differential clock input	
15	CLK+	I	+ LVDS differential clock input	
16	GND	P	Guard	
17	D3-	I	- LVDS differential data input	
18	D3+	I	+ LVDS differential data input	
19	SEL 6/8	I	Select input data mode 6bit or 8bit	
20	NC	N	Not connect	

Table 3.1.2 Pin Assignment for LCD Interface

Note1: I/O definition: I---Input, O---Output, P---Power/Ground, N---No connection

Note2: All of the GND pins should be connected to the system ground.

Note3: This LCD module supports SYNC & SYNC-DE & DE mode, the pin setting is different from each other. Please refer to the descriptions.

3.2 CN2 Pin assignment (Back Light)

Connector Information	
LCD Module connector	SM10B-SHLS-TF(JST)

Table 3.2.1 Connector information

No	Symbol	I/O	Description	Wire Color
1	NC	N	Not connect	
2	NC	N	Not connect	
3	K1	P	Cathode1	
4	A1	P	Anode1	
5	A2	P	Anode2	
6	K2	P	Cathode2	
7	K3	P	Cathode3	
8	A3	P	Anode3	
9	A4	P	Anode4	
10	K4	P	Cathode4	

Table 3.2.2 Pin Assignment for Back Light Interface

Note1: I/O definition: I---Input, O---Output, P---Power/Ground, N---No connection

Note2: All of the GND pins should be connected to the system ground.

Note1: I/O definition: I---Input, O---Output, P---Power/Ground, N---No connection

Note2: All of the GND pins should be connected to the system ground.

4. Absolute Maximum Ratings

Item	Symbol	MIN	MAX	Unit	Remark
Power Voltage	VCC	-0.5	3.6	V	Note1
Input voltage	V _{IN}	-0.5	VCC	V	
Operating Temperature	Top	-30	85	°C	
Storage Temperature	Tst	-30	85	°C	
Relative Humidity Note2	RH	--	≤95	%	Ta≤40°C
		--	≤85	%	40°C < Ta≤50°C
		--	≤55	%	50°C < Ta≤60°C
		--	≤36	%	60°C < Ta≤70°C
		--	≤24	%	70°C < Ta≤80°C
Absolute Humidity	AH	--	≤70	g/m ³	Ta>70°C

Table 4.1 Absolute Maximum Ratings

Note1: Input voltage include all in put data.

Note2: Ta means the ambient temperature. It is necessary to limit the relative humidity to the specified temperature range. Condensation on the module is not allowed.

Note3: The absolute maximum rating values of this product are not allowed to be exceeded at any times. A module should be used with any of the absolute maximum ratings exceeded, the characteristics of the module may not be recovered, or in an extreme condition, the module may be permanently destroyed

5. Electrical Characteristics

5.1 DC Characteristics for Panel Driving

Item	Symbol	MIN	TYP	MAX	Unit	Remark
Supply Voltage	VDD	3.0	3.3	3.6	V	
Input Signal Voltage	Low Level	VIL	DGND	--	0.3×VDD	V
	High Level	VIH	0.7×VDD	--	VDD	V
Output Signal Voltage	Low Level	VOL	DGND	--	DGND+0.4	V
	High Level	VOH	VDD-0.4	--	VDD	V
Power Consumption	60Hz	P	--	TBD	--	mW
						Black pattern

Table 5.1.1 Operating Voltages

Note1: Indicated the subsequent version may be updated.

5.2 DC Characteristics for Backlight Driving

Item	Symbol	MIN	TYP	MAX	Unit	Remark
Forward Current	IF	--	325		mA	55LEDs (5 LED Parallel,11 LED Serial)
Forward Current Voltage	VF	29.7	33	37.4	V	
Backlight Power Consumption	WBL	--	TBD	—	mW	
LED life time	--	50000		-	Hrs	

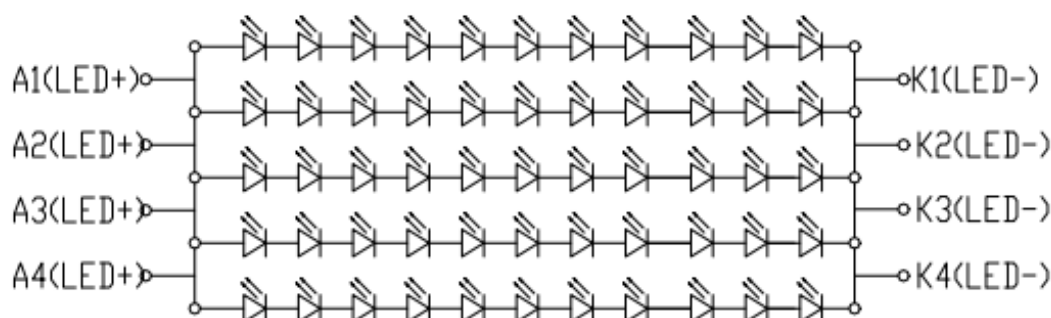
Table 5.2.1 LED Backlight Characteristics

Note1: I_F is defined for each channel.

Note2: Optical performance should be evaluated at $T_a=25^{\circ}\text{C}$ only.

Note3: If LED is driven by high current, high ambient temperature & humidity condition, The life time of LED will be reduced.

Note4: Operating life means brightness goes down to 50% of initial brightness. Typical operating life time is estimated data.



Backlight Circuit Diagram
11S-5P; $I_F=65\text{mA/LED}$

5.3 Recommended Power ON/OFF Sequence

Power ON Sequence

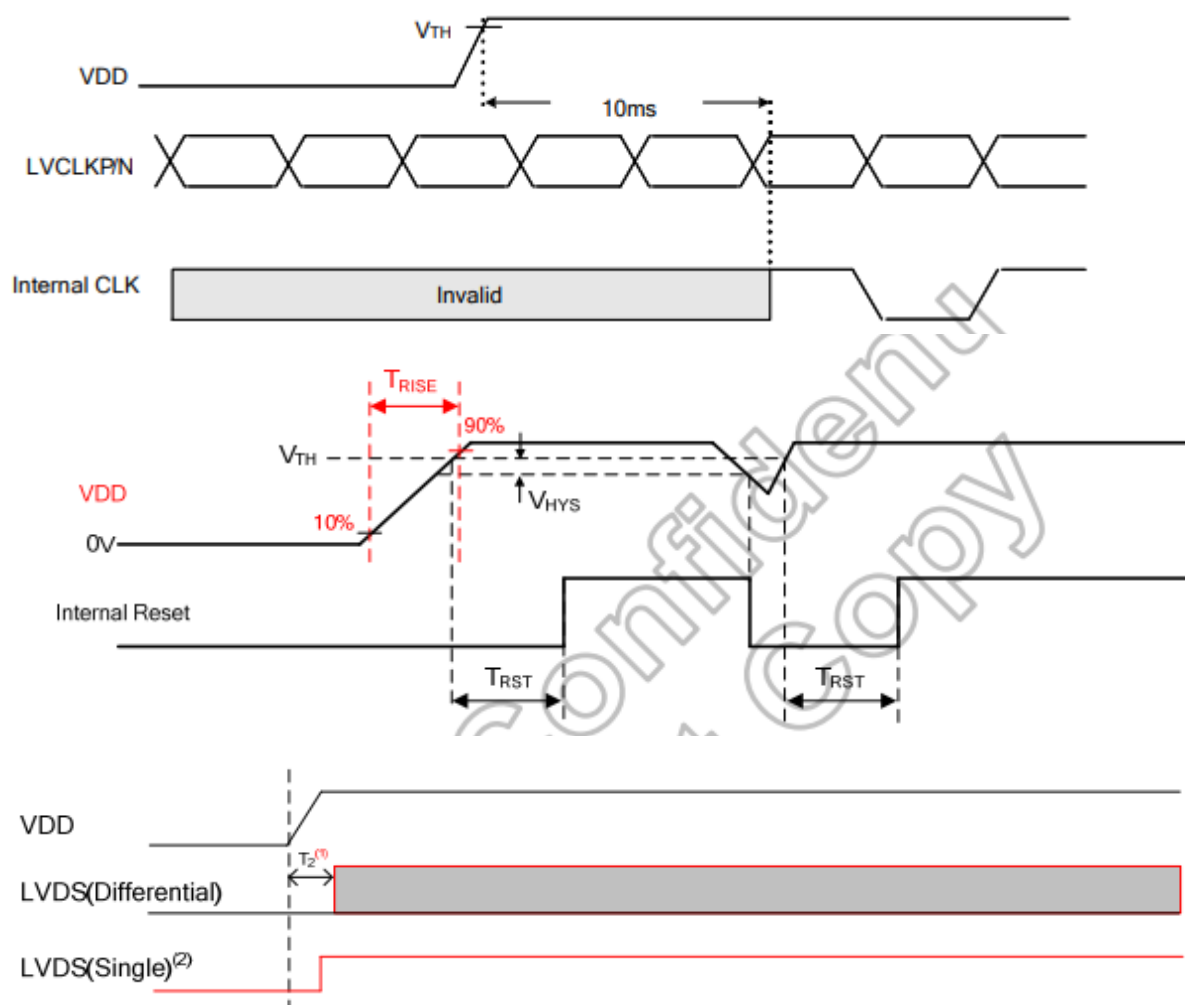


Figure 5.4.1 Power on sequence

Parameter	Symbol	Condition	Spec.			Unit
			Min.	Typ.	Max.	
Reset threshold voltage	V_{TH}	-	1.7	1.9	2.1	V
Hysteresis voltage	V_{HYS}	-	200	-	-	mV
Time constant of RC	T_{RST}	-	-	0.8RC	-	s
VDD rising time ⁽¹⁾	T_{RISE}	For all power	0.1	-	10	ms

Note: (1) $T_{RISE} < T_{RST}$.

Figure 5.4.2 Power off sequence

Note1: $0ms < T_2 < 50MS$, and $T_2 \leq Trst$

Note2: $Trise < Trst$

Note3: $Trst$ RC: $R=100K, C=0.1uF$

5.4 LCD Module Block Diagram

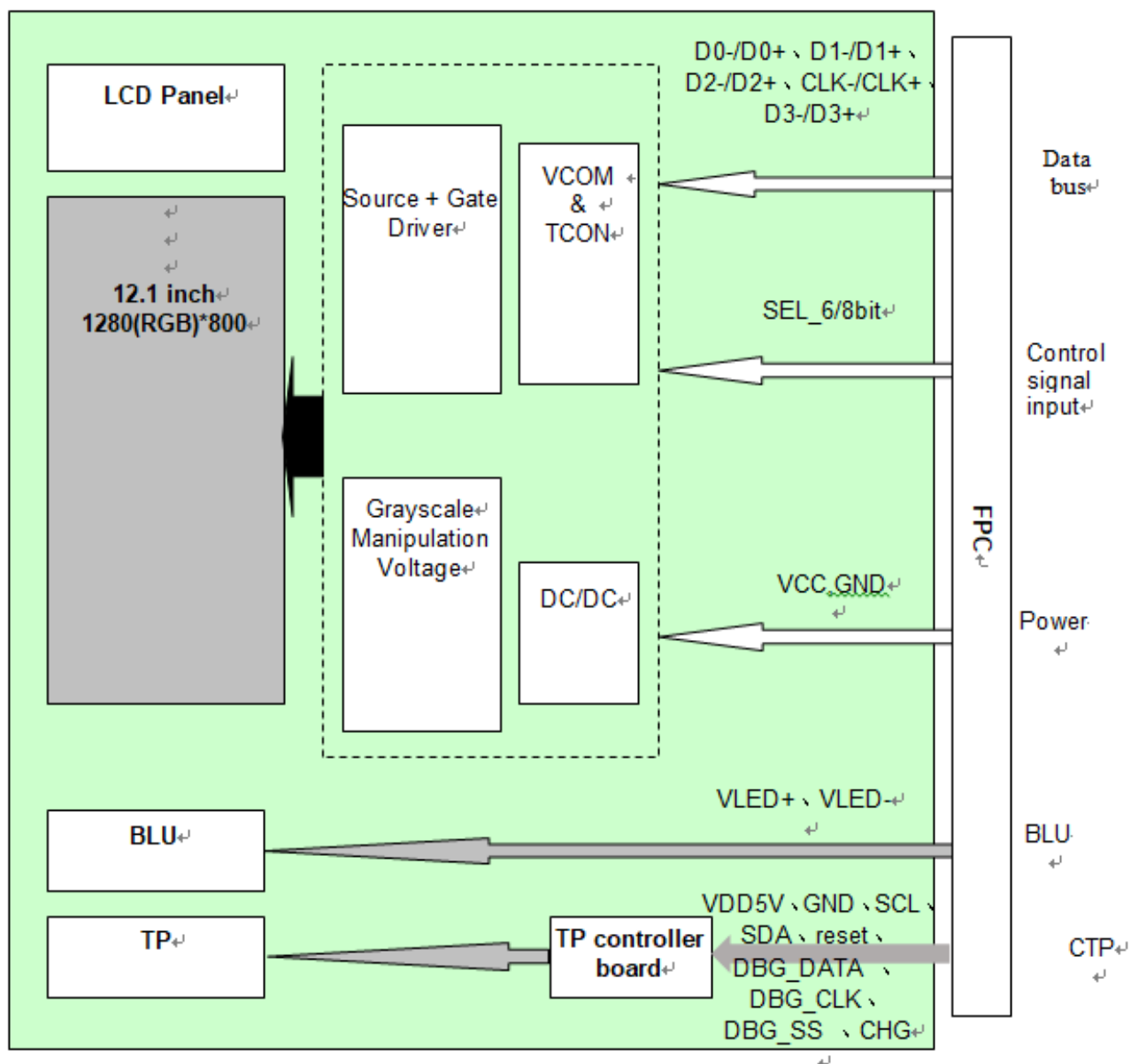


Figure 5.5.1 LCD Module Block Diagram

6. Timing Characteristics

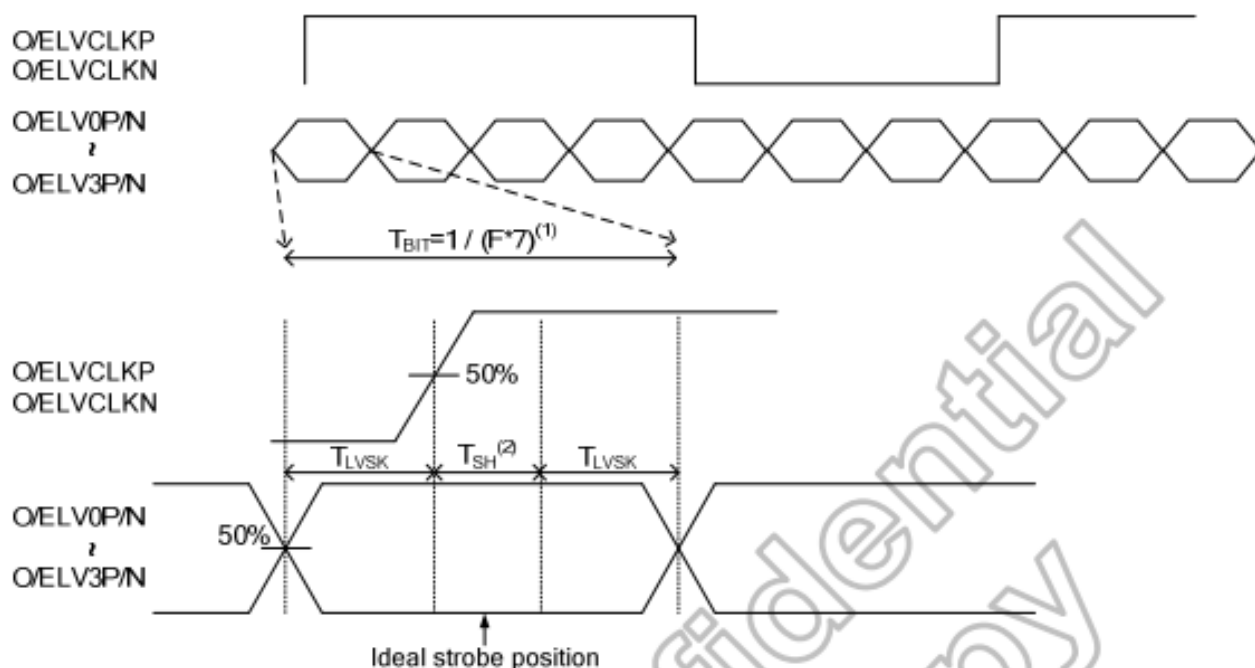
6.1 AC characteristics

Parameter	Symbol	Condition	Spec.			Unit
			Min.	Typ.	Max.	
LVDS Input frequency	F	-	25	-	85	MHz
LVDS channel to channel skew	T_{LVSK}	$F=65\text{MHz}$ $V_{IC}=1.2\text{V}$ $V_{ID}=\pm 200\text{mV}$	-600	-	+600	ps
Modulating frequency of input clock during SSC	F_{LVMOD}	$F=85\text{MHz}$ $V_{IC}=1.2\text{V}$ $V_{ID}=\pm 200\text{mV}$	10	-	300	KHz
Maximum deviation of input clock frequency during SSC	F_{LVDEV}		-3	-	+3	%
Cycle to cycle jitter	T_{CY-CY}		-	-	200	ps

Table

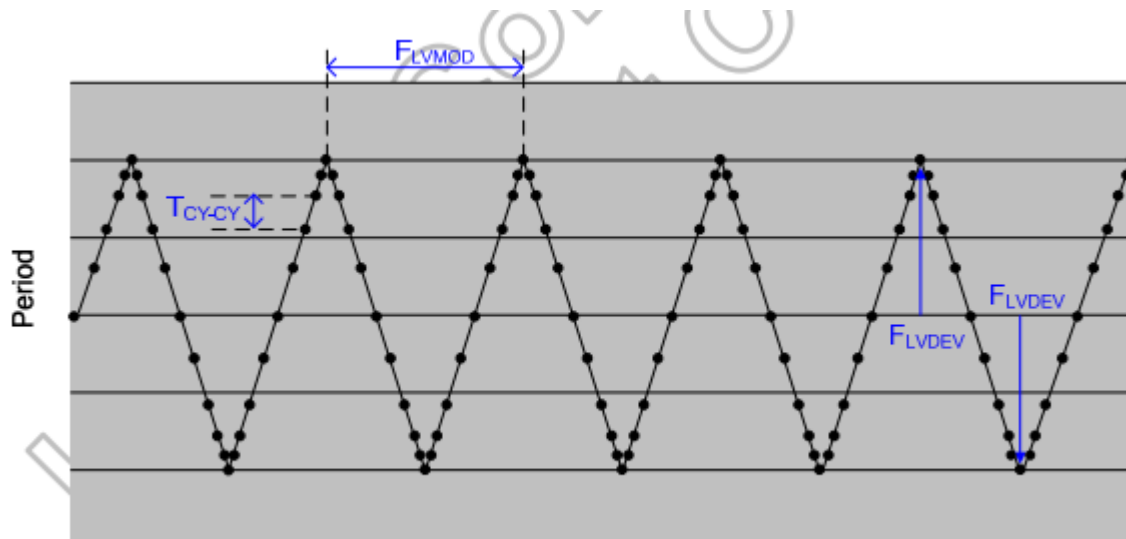
6.1.1 Input Setup Timing Parameters Requirement

LVDS AC electrical characteristics



Note: (1) T_{BIT} : Data period.

(2) T_{SH} : Internal clk sampling data window.



6.2 Data Input Timing Parameter Setting

Parameter	Symbol	Condition	1920x1080	Unit
Horizontal total timing	HT	Min.	1060	Clock
		Typ.	1100	Clock
		Max.	1298	Clock
Horizontal active timing	HVD	Typ.	1920/2	Clock
Vertical total timing	VT	Min.	1090 ⁽¹⁾	Line
		Typ.	1125	Line
		Max.	1336	Line
Vertical active timing	VVD	Typ.	1080	Line

Table 6.2.1 Data Input Timing Parameters

6.3 SYNC Mode Timing Diagram

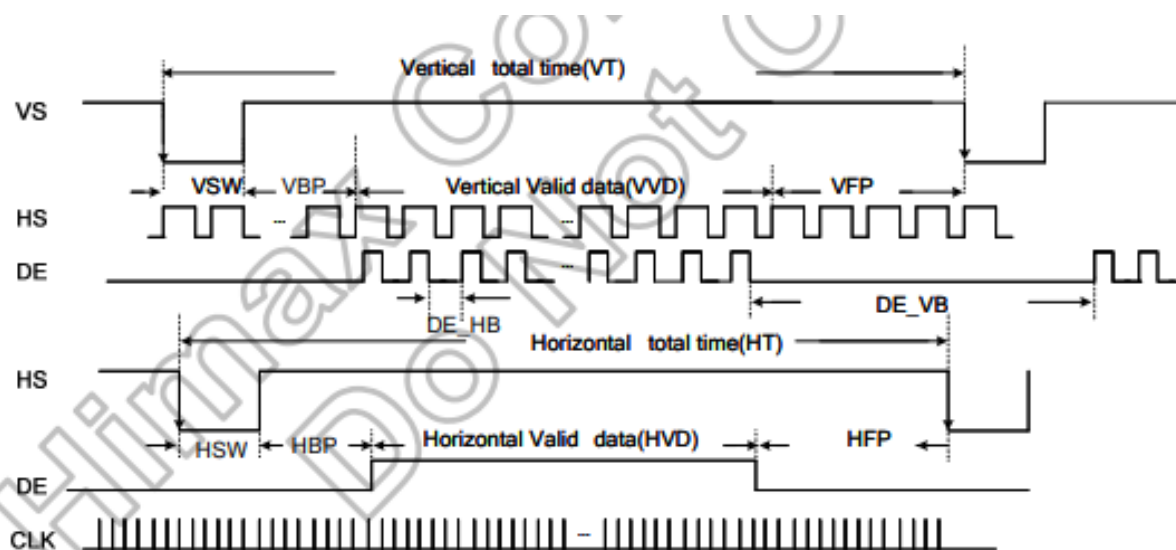


Figure 6.3.1 Data Input Timing Diagram Under SYNC Mode

7. Optical Characteristics

Item		Symbol	Condition	Min	Typ	Max	Unit	Remark
View Angles		θT	CR ≥ 10	75	88	-	degree	Note2,3
		θB		75	88	-		
		θL		75	88	-		
		θR		75	88	-		
Contrast Ratio		CR	θ=0°	800	1000	-		Note 3
Response Time		T _{ON}	25℃		20	30	ms	Note 4
		T _{OFF}						
Chromaticity	White	x	Backlight is on	0.257	0.307	0.357		Note 1,5
		y		0.288	0.338	0.388		
	Red	x		0.576	0.636	0.676		Note 1,5
		y		0.284	0.334	0.384		
	Green	x		0.250	0.300	0.350		Note 1,5
		y		0.549	0.599	0.649		
	Blue	x		0.099	0.149	0.199		Note 1,5
		y		0.017	0.067	0.117		
Uniformity		U		70	80		%	Note 6
NTSC		-		65	70		%	Note 5
Luminance		L		1000	1500		cd/m ²	Note 7

Table 7.1 Optical Parameters

Test Conditions:

1. $I_F = XX$ mA, and the ambient temperature is 25°C.
2. The test systems refer to Note1 and Note2.

Note1: Definition of optical measurement system.

The optical characteristics should be measured in dark room. After 5 Minutes operation, the optical characteristics are measured at the center point of the LCD screen.

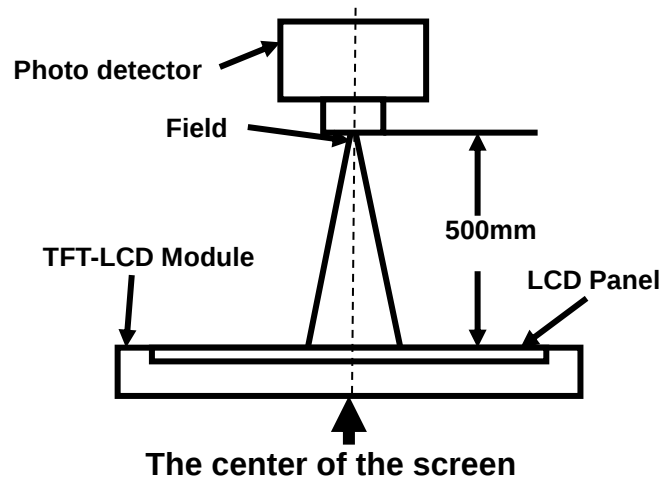


Fig1. Measurement Set Up

Note2: Definition of viewing angle range and measurement system. Viewing angle is measured at the center point of the LCD .

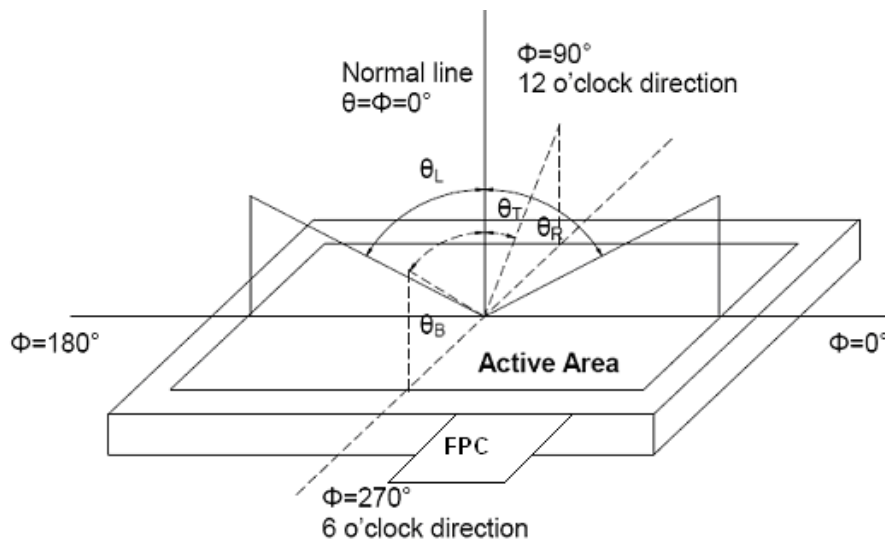


Fig2. Measurement viewing angle

Note3: Definition of contrast ratio

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

Note4: Definition of Response time

For TN LCM, the response time is defined as the LCD optical switching time interval between "White" state and "Black" state. Rise time (T_r) is the time between photo detector output intensity changed from 90% to 10%. And fall time (T_f) is the time between photo detector output intensity changed from 10% to 90%.

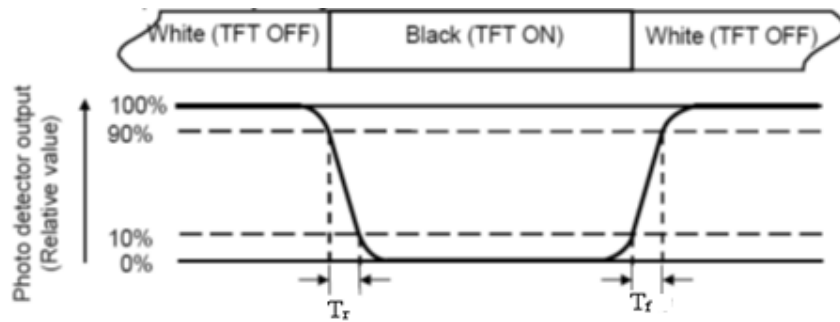


Fig3. Response Time Testing(TN)

For SFT LCM, the response time is defined as the LCD optical switching time interval between “White” state and “Black” state. Rise time (T_r) is the time between photo detector output intensity changed from 10% to 90%. And fall time (T_f) is the time between photo detector output intensity changed from 90% to 10%.

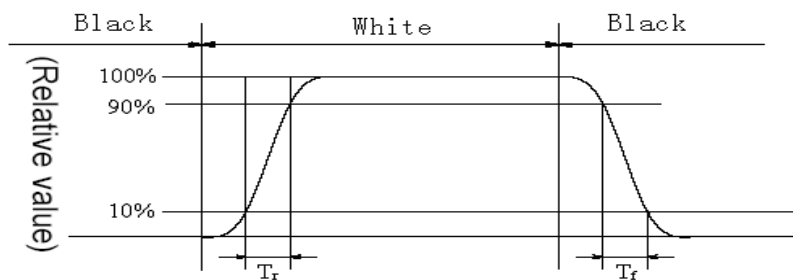


Fig4. Response Time Testing(SFT)

Note5: Definition of color chromaticity (CIE1931)

Color coordinates measured at center point of LCD.

Note6: Definition of Luminance Uniformity

Active area is divided into 9 measuring areas (Refer Fig.5). Every measuring point is placed at the center of each measuring area.

Luminance Uniformity (U) = L_{min} / L_{max}

L_{max} : The measured Maximum luminance of all measurement position.

L_{min} : The measured Minimum luminance of all measurement position.

L -----Active area length; W ----- Active area width

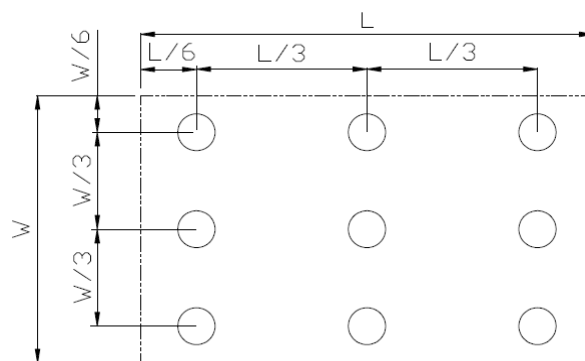


Fig5. Luminance Uniformity Measurement Locations(9 points)

Note7: Definition of Luminance:

Measure the luminance of white state at center point.

8. Reliability Test

No	Test Item	Condition	Remarks
1	High Temperature Operation	+80℃ , 240H	IEC60068-2-1:2007 GB2423.2-2008
2	Low Temperature Operation	-30℃ , 240H	IEC60068-2-1:2007 GB2423.1-2008
3	High Temperature Storage	+80℃ , 240H	IEC60068-2-1:2007 GB2423.2-2008
4	Low Temperature Storage	-30℃ , 240H	IEC60068-2-1:2007 GB2423.1-2008
5	Storage at High Temperature and Humidity(non-operation)	+60℃ , 90%RH , 240H	IEC60068-2-78 :2001 GB/T2423.3—2006
6	Thermal Shock (non-operation)	-30℃ , 30min~80℃ , 30min , change total: 50 cycles	Start with cold temperature, End with high temperature, IEC60068-2-14:1984,GB2423.22-2002
7	ESD	C=150pF、R=330Ω Air: ±15KV Contact:±8KV 9 points/panel, 5times Level B (Environment:15℃~35℃, 30%~60%.86Kpa~106Kpa)	IEC61000-4-2:2001 GB/T17626.2-2006
8	Vibration (Non-operation)	Acceleration: 2.0G Frequency range: 10~100 Hz 2 hours for each direction of X, Y, Z. (6 hours for total)	IEC60068-2-6:2007 GB/T 2423.10-2019
9	Package Vibration	5-20-200HZ , PSD : 0.01-0.01-0.001 Total:0.781g2/HZ,x/y/z 30min)	GB/T 4857.23-2012
10	Package Drop Test	Height:60cm, 1corner,3edges,6surfaces	IEC60068-2-32:1990 GB/T2423.8—1995

Table 8.1 RA test condition

Note1: Temperature is the ambient temperature of sample

Note2: Before cosmetic and function test, the product must have enough recovery time, at least 2 hours at room temperature.

Note3: In the standard condition, there shall be no practical problem that may affect the display function. After the reliability test, the product's function only be guaranteed, but not for all of the cosmetic specification.

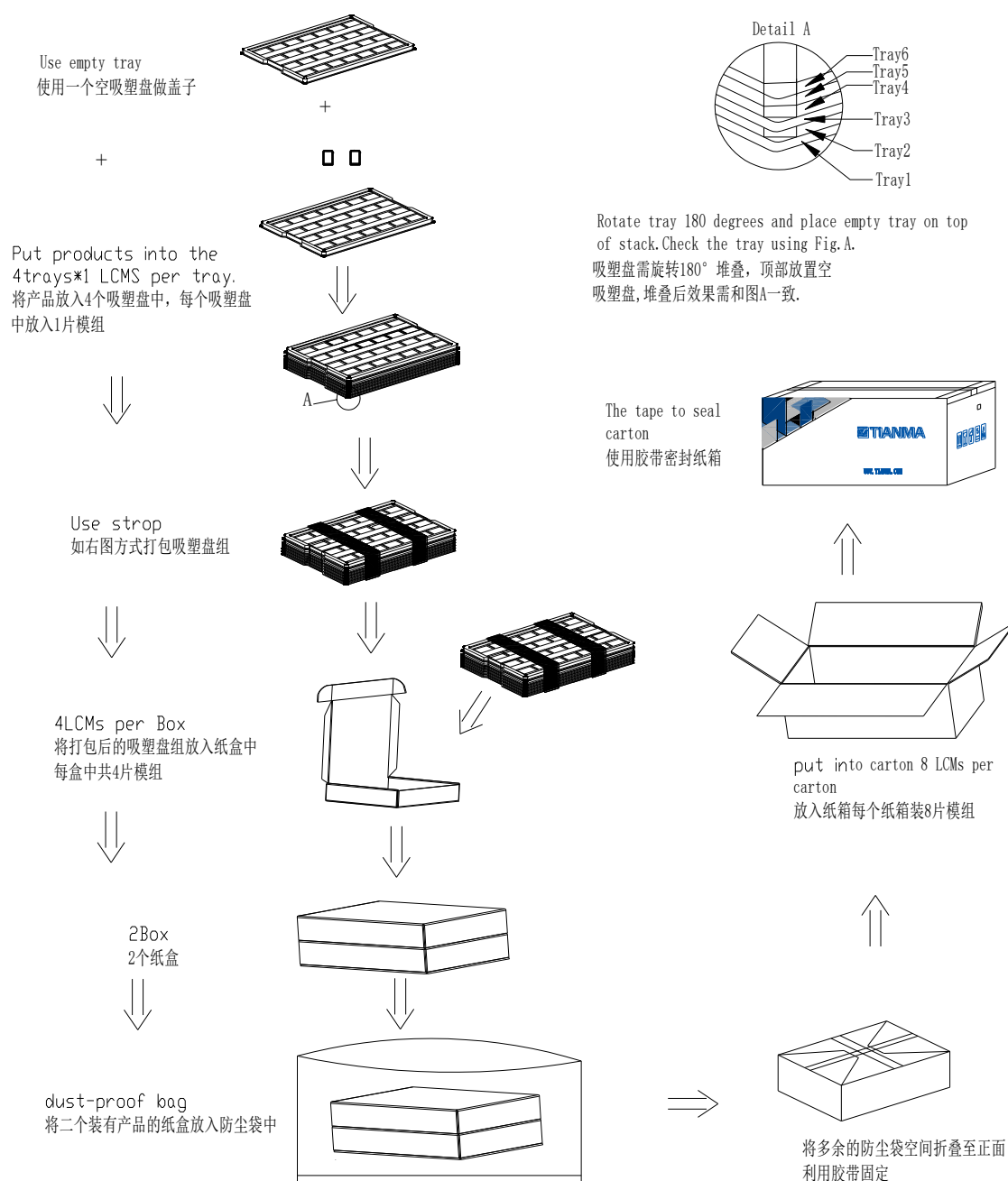
Note4: Please also refer to JOI's file-ESD1022-A and ESD 1023-A.

9. Mechanical Drawing

Item	Part	Description
1	PCB	PCB
2	BEZEL	BEZEL
3	CM	CM
4	PC	PC
5	R	R
6	C	C
7	P	P
8	A	A
9	M	M
10	N	N
11	I	I
12	J	J
13	K	K
14	L	L
15	M	M
16	N	N
17	I	I
18	J	J
19	K	K
20	L	L
21	M	M
22	N	N
23	I	I
24	J	J
25	K	K
26	L	L
27	M	M
28	N	N
29	I	I
30	J	J
31	K	K
32	L	L
33	M	M
34	N	N
35	I	I
36	J	J
37	K	K
38	L	L
39	M	M
40	N	N
41	I	I
42	J	J
43	K	K
44	L	L
45	M	M
46	N	N
47	I	I
48	J	J
49	K	K
50	L	L
51	M	M
52	N	N
53	I	I
54	J	J
55	K	K
56	L	L
57	M	M
58	N	N
59	I	I
60	J	J
61	K	K
62	L	L
63	M	M
64	N	N
65	I	I
66	J	J
67	K	K
68	L	L
69	M	M
70	N	N
71	I	I
72	J	J
73	K	K
74	L	L
75	M	M
76	N	N
77	I	I
78	J	J
79	K	K
80	L	L
81	M	M
82	N	N
83	I	I
84	J	J
85	K	K
86	L	L
87	M	M
88	N	N
89	I	I
90	J	J
91	K	K
92	L	L
93	M	M
94	N	N
95	I	I
96	J	J
97	K	K
98	L	L
99	M	M
100	N	N

10. Packing Instruction

No	Item	Model (Material)	Dimensions(mm)	Unit Weight(Kg)	Quantity	Remark
1	LCM module	P1210WXF2MA00	281.78*183.17*9.46	TBD	8	
2	Tray	PET	485*330*15.5	0.260	10	
3	Dust-proof Bag	PE	700*545*0.05	0.021	1	
4	Carton	Corrugated Paper	544*365*250	1.01	1	
5	BOX	Corrugated Paper	520*345*74	0.38	2	
6	Label		100*52	0.001	1	



11. Precautions for Use of LCD Modules

11.1 Handling Precautions

- (1) The display panel is made of glass. Do not subject it to mechanical shock by dropping it, etc.
- (2) If the display panel is damaged and the liquid crystal fluid inside it leaks out be sure not to get any in your mouth. If the fluid comes into contact with your skin or clothes promptly wash it off using soap and water.
- (3) Do not apply excessive force to the display surface or the bezel since this may cause the color tone to vary.
- (4) The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle the polarizer carefully.
- (5) If the display surface is contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If it is still not completely clear use a moist cloth with one of the following solvents:
 - Isopropyl alcohol
 - Ethyl alcohol
 Solvents other than those mentioned above may damage the polarizer. Specifically, do not use the following:
 - Water
 - Ketone
 - Aromatic solvents
- (6) Do not disassemble the LCD Module.
- (7) If powered off, do not apply the input signals.
- (8) To prevent destruction of the module by static electricity, be careful to maintain an optimum work environment.
- (9) Be sure to ground your body when handling the LCD Modules.
- (10) Tools used for assembly, must be properly grounded.
- (11) To reduce the amount of static electricity generated, do not conduct assembly or other work under very low humidity conditions.
- (12) The LCD Module is covered with a film to protect the display surface, remove film slowly under the ionizer.

11.2 Storage precautions

- (1) When storing the LCD modules avoid exposure to direct sunlight or to the light of fluorescent lamps.
- (2) The LCD modules should be stored within the rated storage temperature range. The recommend condition is: Temperature: 0 ~ 35 °C at normal humidity.
- (3) The LCD modules should be stored in a room without acid, alkali or other harmful gas.

11.3 Transportation Precautions

The LCD modules should not be dropped or subject to violent mechanical shock during transportation. Also they should avoid excessive pressure, water, high humidity and direct sunlight.

11.4 Screen saver Precautions

Not display the fixed pattern for a long time. Use a screen saver, if the fixed pattern is displayed on the screen

11.5 Safety Precautions

- (1) When you waste damaged or unnecessary LCDs, it is recommended to crush LCDs into pieces and wash them off with solvents such as acetone and ethanol, which should later be burned
- (2) Be sure to turn off the power supply when inserting or disconnecting the LED backlight cable.
- (3) LED driver should be designed to limit or stop its function when over current is detected on the LED.