FORTEC GROUP

Manual/Datasheet

Tianma

P0700WSF2ME00

TI-01-033

FORTEC UNITED STATES

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SPECIFICATION

[◉] Preliminary Specification
[ ] Final Specification

Description **7” 1024xRGBx600 TFT-LCD Module**

Part Number **P0700WSF2ME00**

Customer			Product Dept, PDBU Tianma Microelectronics Co., Ltd.	
Signatures	Date		Approved By	Date
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Comments:				

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

Rev	Date	Page	Revision Items	Editor
1.0	2023-Dec-25	-	Preliminary spec	Yao Zhang
1.1	2024-Jan-16	-	Overall update.	Yao Zhang
1.2	2024-Jan-23	10	Change LVDS data mapping from 6bit to 8bit.	Yao Zhang
1.3	2024-Jan-25	10	Add INT3 to LVDS data mapping	Yao Zhang
1.4	2024-Feb-21	2	Add “R/L/U/D” to viewing angle.	Yao Zhang
		4	Add **U/D R/L Function Description**	
		5	Add Figure4.1 Absolute Maximum Ratings chart	
		6	Add Note3: Inrush current test condition.	
1.5	2024-Mar-20	3	Add (Please keep NC) to pin 14, 15, 16	Yao Zhang
		4	Add note to **U/D R/L Function Description**	
		18	Add Label State.	
		7	Add VF for -20℃ and 70℃	

CONTENTS

1. Summary

1.1 General Description

This is a 7 inch a-Si TFT-LCD module with Normal- Black technology. It is composed of a TFT-LCD panel, a driver circuit, and a LED backlight unit.

1.2 Features

- Ultra-wide viewing angle
- Interface: LVDS

- Acquisition product for UL62368-1/CSA C22.2 No.62368-1-03 (File number: TBD)
- 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	7 inches	
	Resolution	1024(RGB)x600	
	Pixel Pitch	0.150x0.150	mm
	TFT Active Area	153.6 x 90	mm
	Technology Type	a-Si	
	Pixel Configuration	R.G.B Vertical Stripe	
	Display Mode	SFT, Normally Black	
	Surface Treatment	AG	
	Viewing Direction	All	
	Gray Scale Inversion Direction	NA	
Mechanical Characteristics	LCM (W x H x D)	164.5*104.2*3.5	mm
	Weight	TBD+/-5%	g
Optical Characteristics	Luminance	Typ 500	cd/m^2
	Contrast Ratio	Typ 900:1	
	NTSC	Typ 50	%
	Viewing Angle	R/L/U/D: typ 88/88/88/88	degree
Electrical Characteristics	Interface	LVDS	
	Color Depth	16.7 Million	color
	Power Consumption	LCD:TBD; Backlight:TBD	mW

Table 2.1 General TFT Specifications

3. Input / Output Terminals

3.1 CN1 Pin assignment (LCD Interface)

Connector Information	
LCD Module connector	-
Matching connector	FH28-40S-0.5SH(05)

Table 3.1.1 Connector information

No	Symbol	I/O	Description	Comment
1	GND	P	Ground	
2	NC	N	Not Connection	
3	VDD	P	Power supply for circuits	
4	VDD	P	Power supply for circuits	
5	VDD	P	Power supply for circuits	
6	NC	N	Not Connection	
7	UPDN	I	Vertical Reverse Scan Control	
8	SHLR	I	Horizontal Reverse Scan Control	
9	GND	P	Ground	
10	STBYB	I	Standby mode selection.	
11	GND	P	Ground	
12	RESET	I	Global reset pin，active low	
13	GND	P	Ground	
14	SDI	I/O	Serial Interface address and data input/output (Please keep NC)	
15	SCL	I	Serial Interface clock input (Please keep NC)	
16	CSB	I	Serial Interface chip enable signal. (Please keep NC)	
17	GND	P	Ground	
18	GND	P	Ground	
19	D3P	I	LVDS receiver positive signal channel 3	
20	D3N	I	LVDS receiver negative signal channel 3	
21	GND	P	Ground	
22	D2P	I	LVDS receiver positive signal channel 2	
23	D2N	I	LVDS receiver negative signal channel 2	
24	GND	P	Ground	
25	CKP	I	LVDS receiver positive signal clock	
26	CKN	I	LVDS receiver negative signal clock	
27	GND	P	Ground	
28	D1P	I	LVDS receiver positive signal channel 1	
29	D1N	I	LVDS receiver negative signal channel 1	

30	GND	P	Ground	
31	D0P	I	LVDS receiver positive signal channel 0	
32	D0N	I	LVDS receiver negative signal channel 0	Note1
33	GND	P	Ground	Note1
34	GND	P	Ground	Note1
35	NC	N	Not Connection	
36	LEDA	P	Power supply for circuits	
37	LEDA	P	Power supply for circuits	
38	NC	N	Not Connection	
39	LEDK	P	Power supply for circuits	
40	LEDK	P	Power supply for circuits	

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 DE mode. Please refer to the descriptions.

3.2 U/D R/L Function Description

Scan control input		Scanning direction
UPDN	SHLR	
L	L	From up to down, From left to right
H	L	From down to up, From left to right
L	H	From up to down, From right to left
H	H	From down to up, From right to left

Note：L -----GND; H----3.3V

4. Absolute Maximum Ratings

Item	Symbol	MIN	MAX	Unit	Remark
Power Voltage	VDD	-0.3	3.96	V	Note1
Operating Temperature	Top	-20	70	℃	
Storage Temperature	Tst	-30	80	℃	
Relative Humidity Note2	RH	-	≤95	%	Ta≤40℃
		-	≤85	%	40℃＜Ta≤50℃
		-	≤55	%	50℃＜Ta≤60℃
		-	≤36	%	60℃＜Ta≤70℃
		-	≤24	%	70℃＜Ta≤80℃
Absolute Humidity	AH	-	≤70	g/m³	Ta＞70℃

Table 4.1 Absolute Maximum Ratings

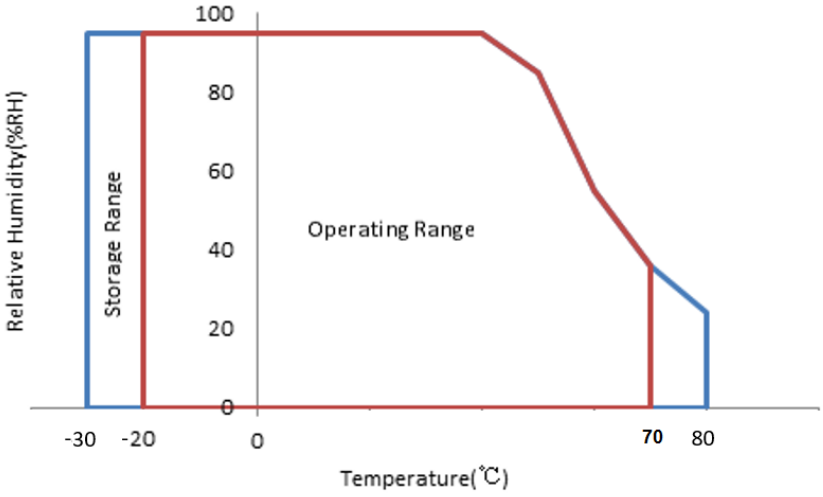


Figure4.1 Absolute Maximum Ratings chart

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

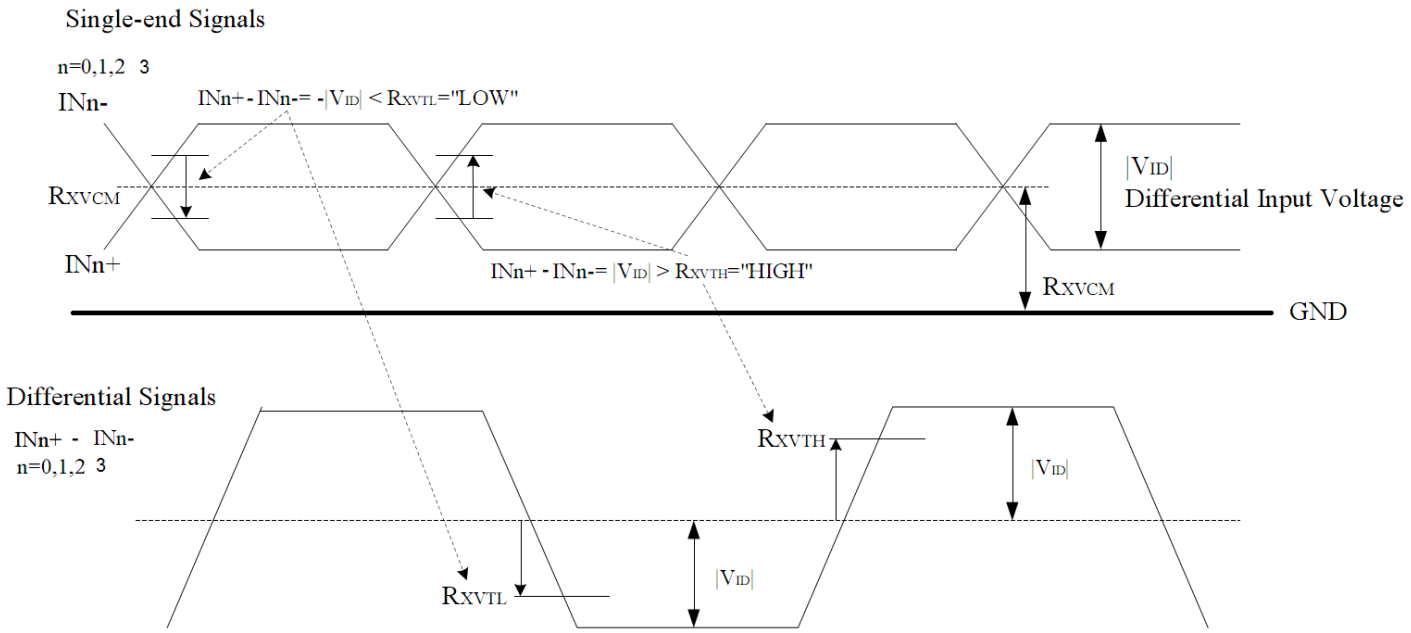
5. Electrical Characteristics

5.1 DC Characteristics for Panel Driving

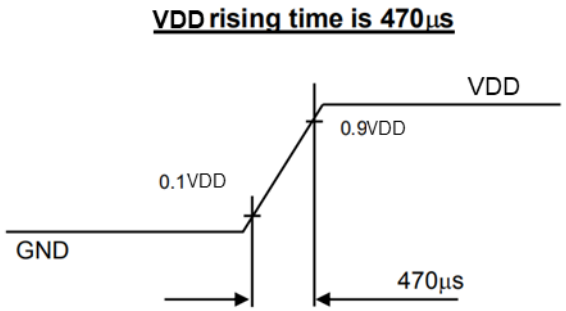
Item		Symbol	MIN	TYP	MAX	Unit	Remark
Supply Voltage		VDD	（3.0）	3.3	（3.6）	V	Include ripple
LVDS Differential input high threshold		R_{xVTH}	-	-	+37	mV	
LVDS Differential input low threshold		R_{xVTL}	-37	-	-	mV	
Differential input voltage		$\|V_{ID}\|$	0.1	-	0.4	V	
LVDS input common mode voltage		R_{xVCM}	600	1200	1375	mV	$R_{xVCM+1/2*}\|V_{ID}\|$<=1650 mV $R_{xVCM-1/2*}\|V_{ID}\|$>=400mV
Power Consumption	60Hz	P	-	TBD	-	mW	white pattern
VDD rush current		I_{rush}	-	-	1.5	A	

Table 5.1.1 Operating Voltages

Note1: Indicated the subsequent version may be updated.
Note2: LVDS DC characteristics.



Note3: Inrush current test condition.



5.2 DC Characteristics for Backlight Driving

Item	Symbol	MIN	TYP	MAX	Unit	Remark
Forward Current	IF	-	60	-	mA	27 LEDs (3 LED Parallel,9 LED Serial)
Forward Current Voltage	VF	24.3	27	28.8	V	Ta=25℃,IF=60mA
		24.8	27.5	29.4		Ta=-20℃,IF=60mA
		17.6	19.5	20.8		Ta=70℃,IF=60mA
Backlight Power Consumption	WBL	-	1620	-	mW	
LED life time	-	20000	30000	-	Hrs	

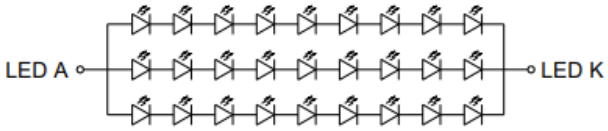
Table 5.2.1 LED Backlight Characteristics

Note1: I_F is defined for each channel.

Note2: Optical performance should be evaluated at Ta=25℃ 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.



LED CIRCUIT

(If=3*20mA / Vf=27V TYP)

5.3 Recommended Power ON/OFF Sequence

Item	Symbol	Min	Typ	Max	Unit	Remark
VDD 10% to VDD 90%	Tp0	0.47	-	5	ms	
VDD to signal starting	Tp1	20	-	50	ms	
Signal starting to VLED on	Tp2	200	-	-	ms	
Signal off to VDD	Tp3	50	-	100	ms	
VLED off to signal off	Tp4	200	-	-	ms	
To next VDD	Tp5	2	-	-	S	
VDD to Signal stability	Tp6	80	-	-	ms	

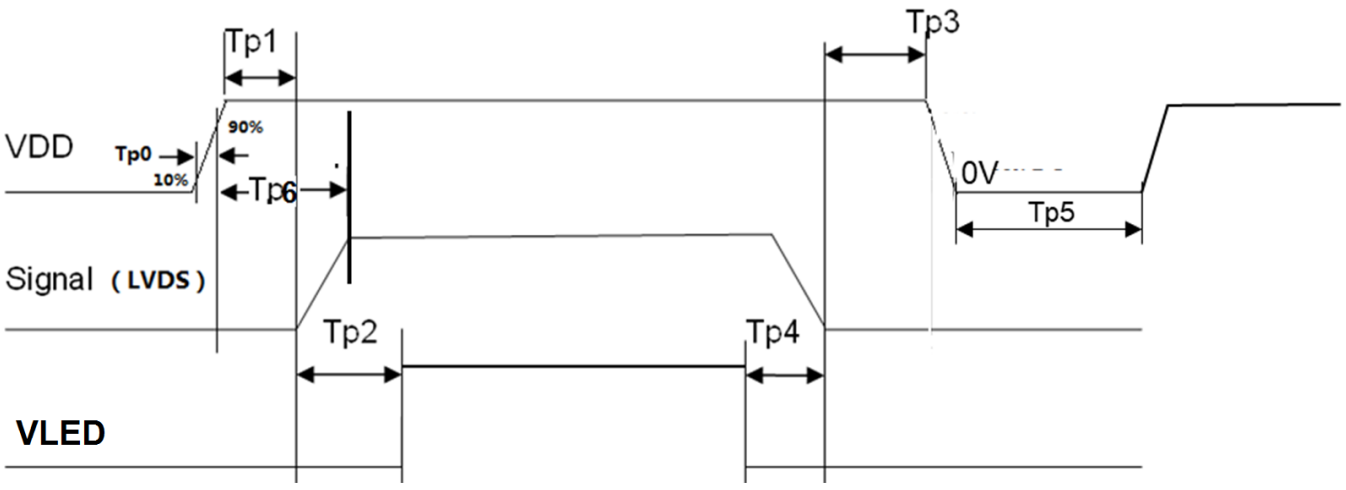


Figure 5.3.2 Power off sequence

Note1: The low level of these signals and analog powers are GND level.
Note2: All of the power and signals should be kept at GND level before power on. If there are residual voltages on them, the LCD might not work properly.
Note3: The power on/off sequence is the first version. It will be updated when the design is fixed.

5.4 LCD Module Block Diagram

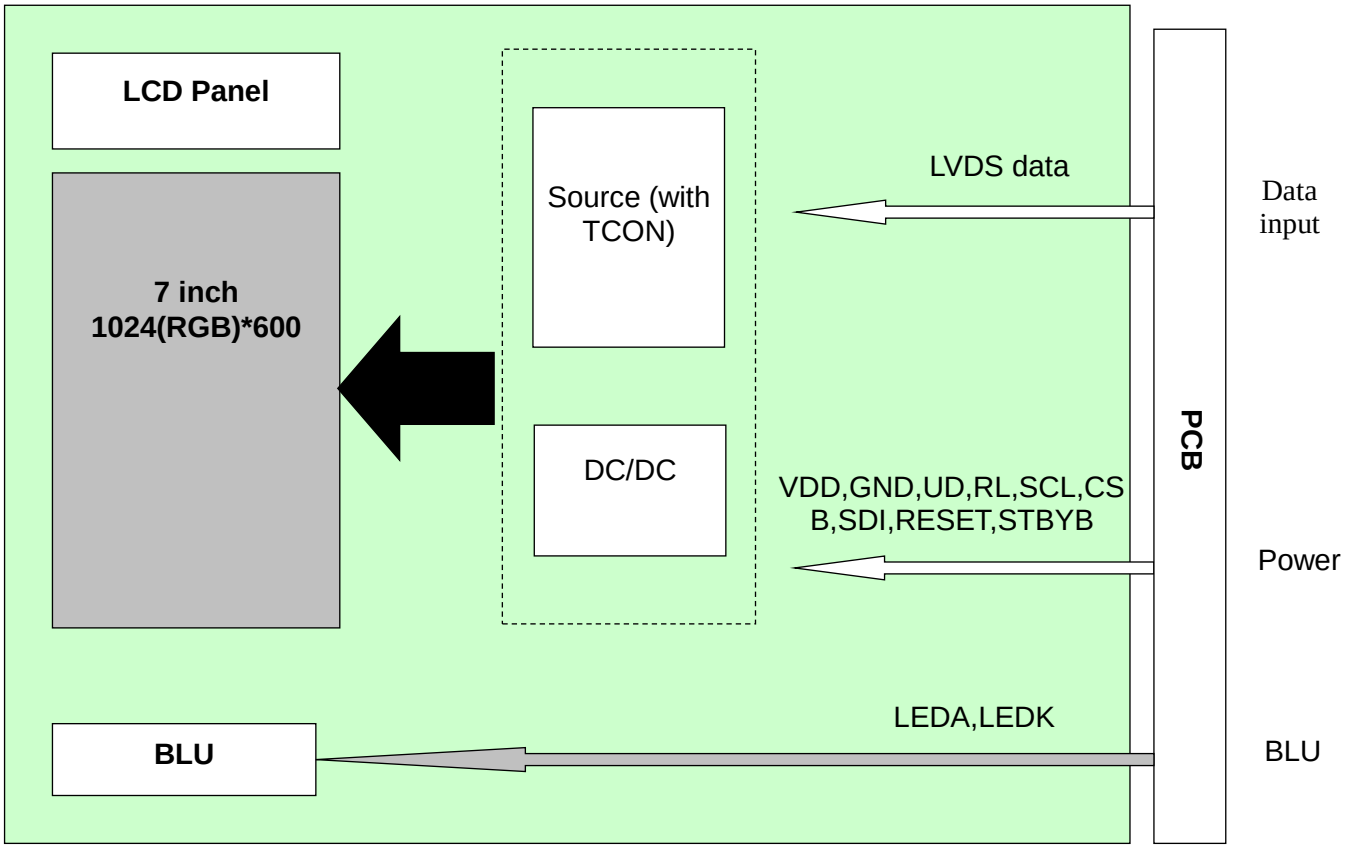


Figure 5.4.1 LCD Module Block Diagram

6. Timing Characteristics

6.1 AC characteristics

Parameter	Symbol	Min	Typ	Max	Unit	Remark
Dclk Frequency	RXFCLK	46.2	-	59.0	MHZ	
Input Data Skew Margin	TRSKM	-0.2	-	0.2	UI	|VID| = 200mV RxVCM = 1.2V 1UI=1/(RxFCLKx7)
Clock High Time	TLVCH	-	3.5/(7*RXFCLK)	-	ns	
Clock Low Time	TLVCL	-	3.5/(7*RXFCLK)	-	ns	
PLL Wake-up Time	TemPLL	-	-	150	us	

Table 6.1.1 AC characteristics

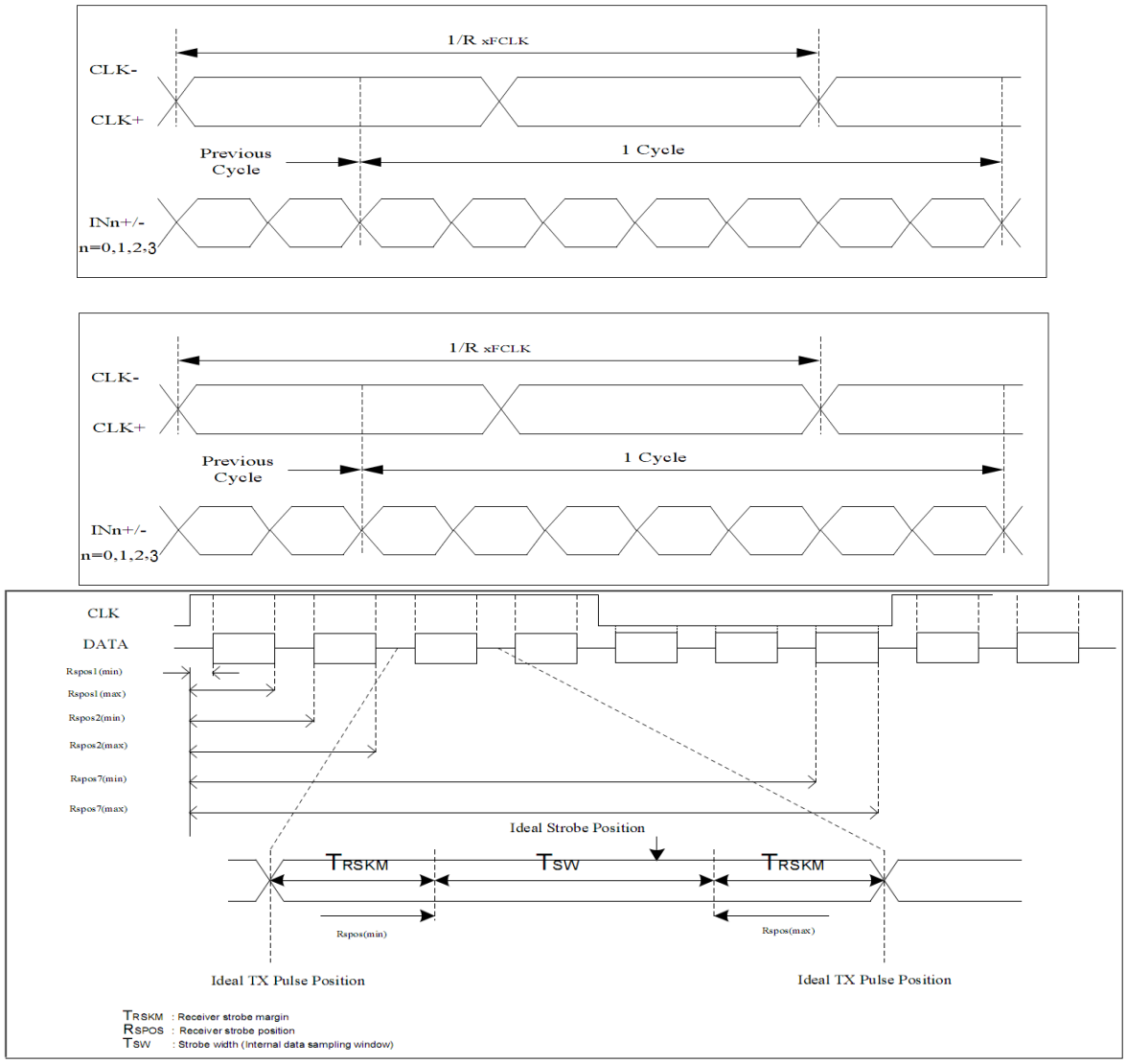


Figure 6.1.1 AC characteristics

6.2 Data Input Timing Parameter Setting

Parameter		Symbol	Min.	Typ.	Max.	Unit	Remark
DCLK frequency		Fclk	(46.2)	51.2	(59.0)	MHz	Tclk=1/Fclk
Horizontal section	Horizontal total	TH	1229	1344	1372	Tclk	
	Horizontal blanking	Thb	110	160	160	Tclk	
	Valid Data Width	Thd	1024			Tclk	
Vertical section	Vertical total	TV	(627)	635	(717)	TH	
	Vertical blanking	Tvb	16	23	61	TH	
	Valid Data Width	Tvd	600			TH	
Frame Rate		F	60			HZ	

Table 6.2.1 Data Input Timing Parameters

6.3 DE Mode Timing Diagram

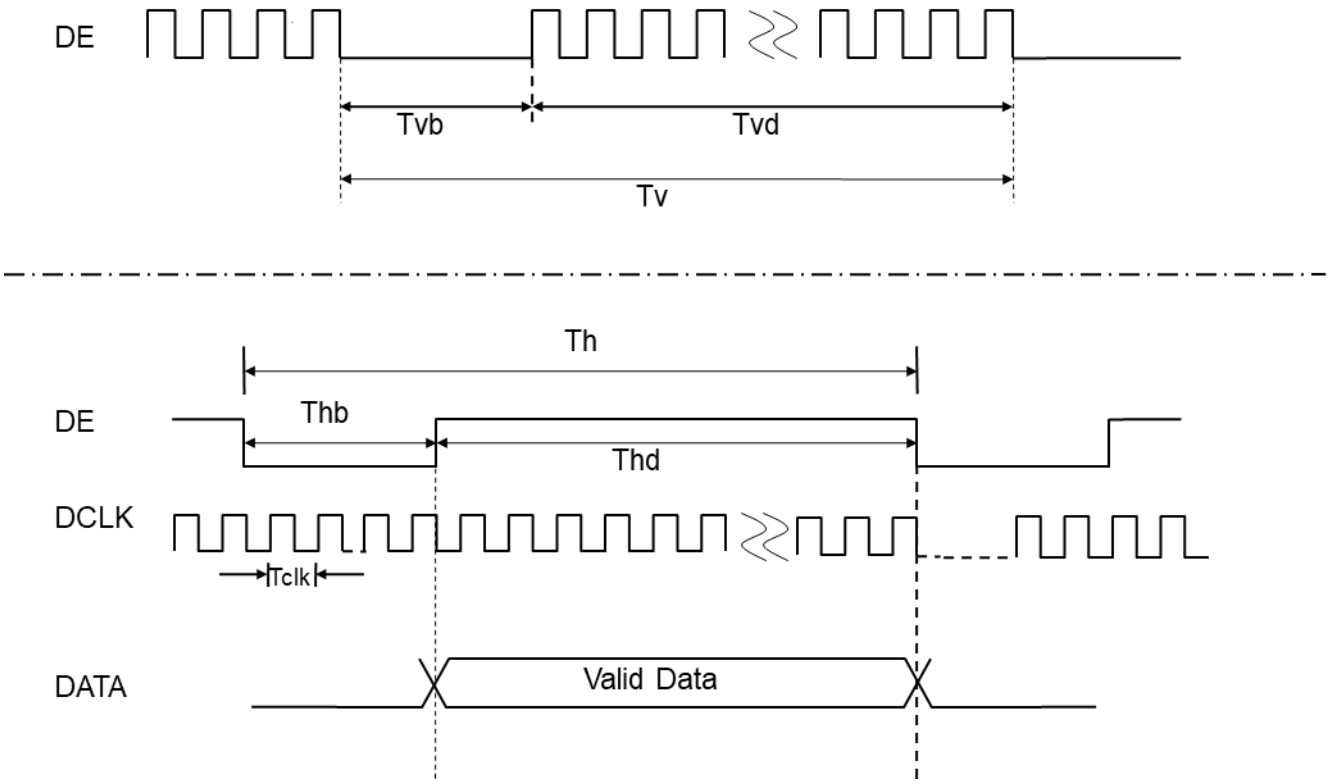


Figure 6.3.1 Data Input Timing Diagram Under SYNC Mode

6.4 LVDS data mapping

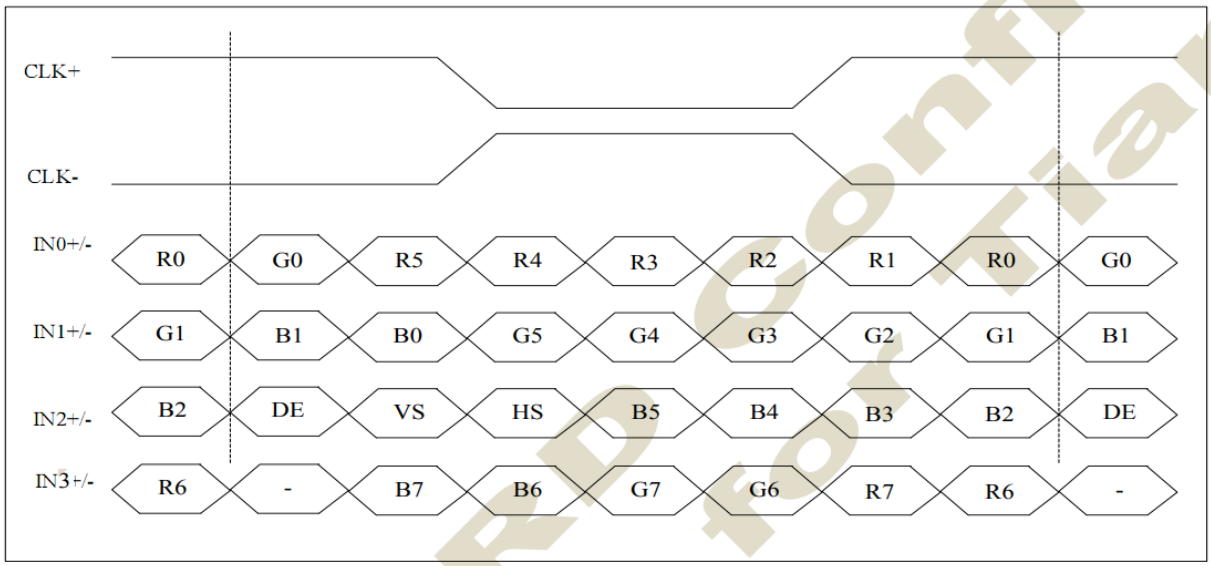


Figure 6.4.1 LVDS data mapping (VESA standard)

7. Optical Characteristics

Item		Symbol	Condition	Min	Typ	Max	Unit	Remark
View Angles		θT	CR≧10	70	88	-	degree	Note2,3
		θB		70	88	-		
		θL		70	88	-		
		θR		70	88	-		
Contrast Ratio		CR	θ=0°	700	900	-		Note 3
Response Time		T_{ON}	25℃	-	30	35	ms	Note 4
		T_{OFF}						
Chromaticity	**White**	x	Backlight is on	0.253	0.303	0.353		Note 1,5
		y		0.284	0.334	0.384		
	Red	x		0.550	0.600	0.650		Note 1,5
		y		0.310	0.360	0.410		
	Green	x		0.285	0.335	0.385		Note 1,5
		y		0.545	0.595	0.645		
	Blue	x		0.105	0.155	0.205		Note 1,5
		y		0.075	0.125	0.175		
Uniformity		U		80	85	-	%	Note 6
NTSC		-		45	50	-	%	Note 5
Luminance		L		400	500	-	cd/m^2	Note 7

Table 7.1 Optical Parameters

Test Conditions:

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

Note: The content of Chromaticity is all reference values, and will be modified after the sample is produced.

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.

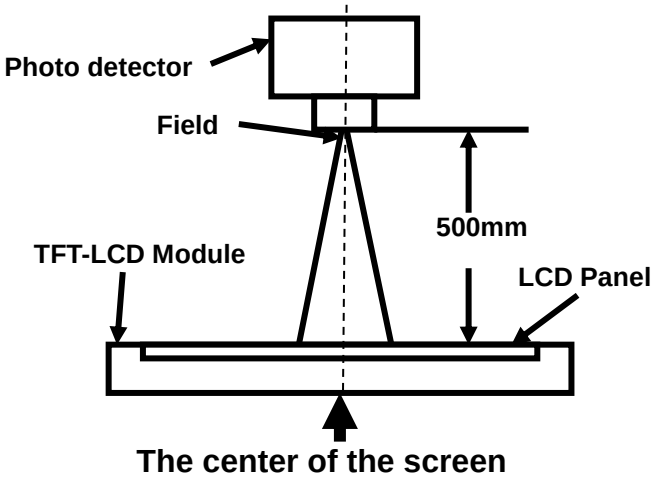


Fig1. Measurement Set Up

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

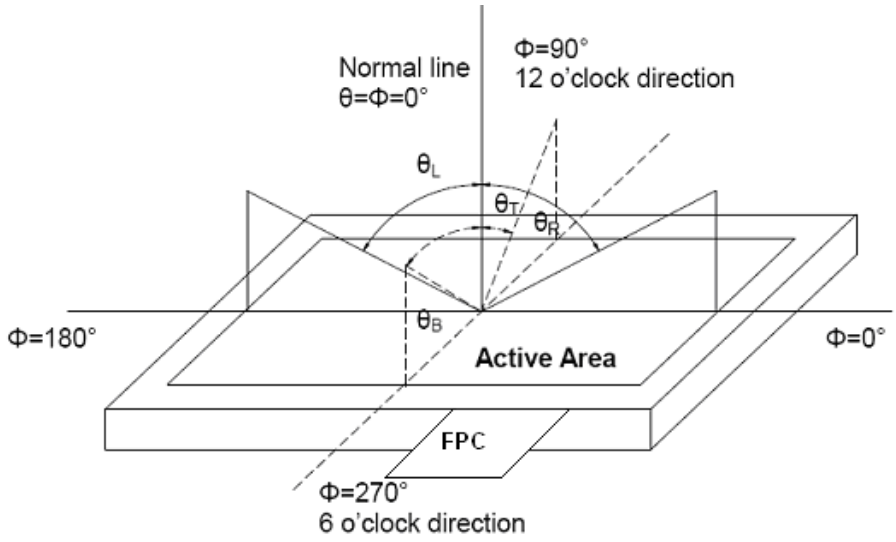


Fig2. Measurement viewing angle

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%.

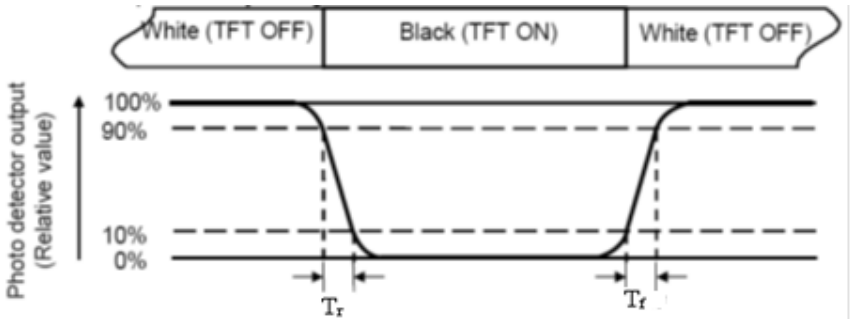


Fig3. Response Time Testing(TN)

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%.

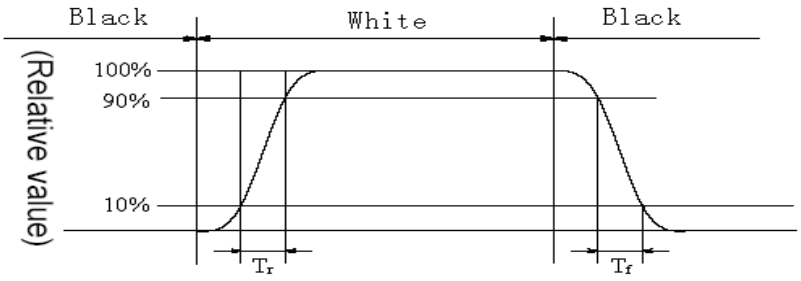


Fig4. Response Time Testing(SFT)

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) = Lmin/ Lmax

Lmax: The measured Maximum luminance of all measurement position.

Lmin: The measured Minimum luminance of all measurement position.

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

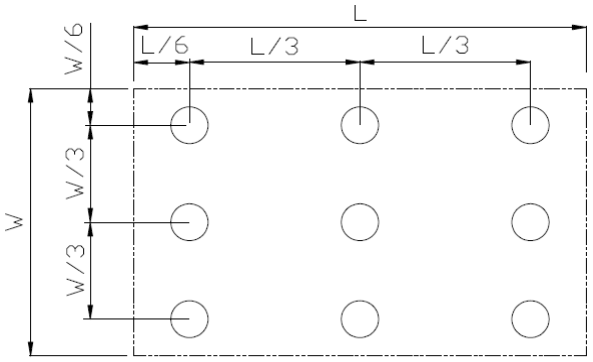


Fig5. Luminance Uniformity Measurement Locations(9 points)

Note7: Definition of Luminance:

Measure the luminance of white state at center point.

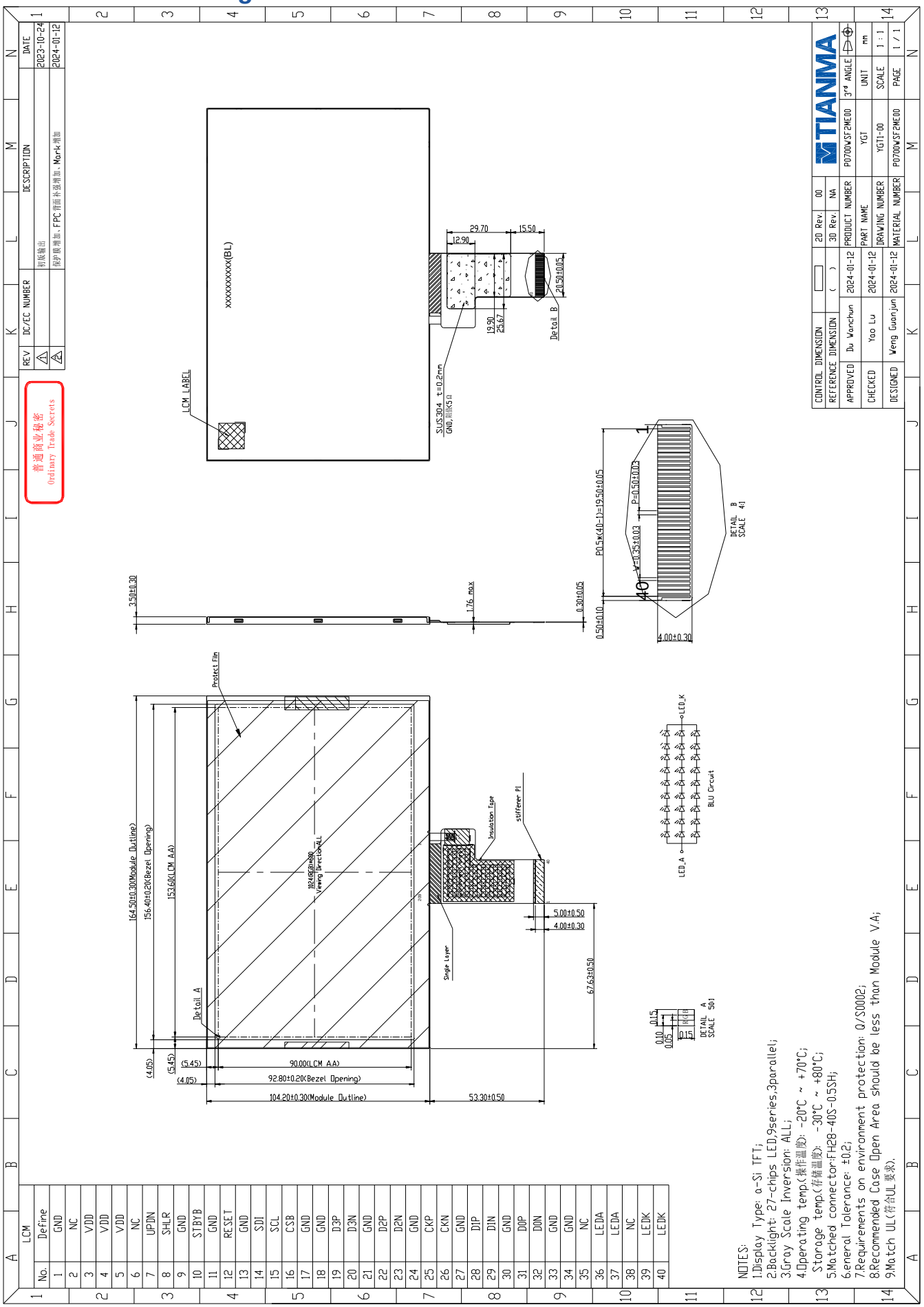
8. Reliability Test

No	Test Item	Condition	Remarks
1	High Temperature Operation	+70℃，240H	IEC60068-2-1:2007 GB2423.2-2008
2	Low Temperature Operation	-20℃，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 time：5min，100cycle	Start with cold temperature, End with high temperature, IEC60068-2-14:1984,GB2423.22-2002
7	ESD	C=150pF，R=330Ω，5point/panel Air：±8kv，5times； Contact：±4kv，5times； （Environment：15℃~35℃，30%~60%，86Kpa~106Kpa）	IEC61000-4-2:2001 GB/T17626.2-2006
8	Vibration (Non-operation)	Frequency range:10~55Hz Stroke:1.5mm Sweep:10Hz~55Hz~10Hz 2 hours for each direction of X.Y.Z. (6 hours for total)	IEC60068-2-6:1982 GB/T2423.10—1995
9	Shock (Non-operation)	Half Sine Wave 60G 6ms, ±X,±Y,±Z 3times for each direction	IEC60068-2-27:1987 GB/T2423.5—1995
10	Package Vibration	5-20-200HZ，PSD：0.01-0.01-0.001 Total:0.781g2/HZ, x/y/z 30min）	IEC60068-2-34 GB/T2423.11
11	Package Drop Test	Height: X cm,1 corner, 3edges, 6 surfaces Note：X＞10Kg:60cm；≤10Kg:80cm	IEC60068-2-32:1990 GB/T2423.8—1995

Table 8.1 RA test condition

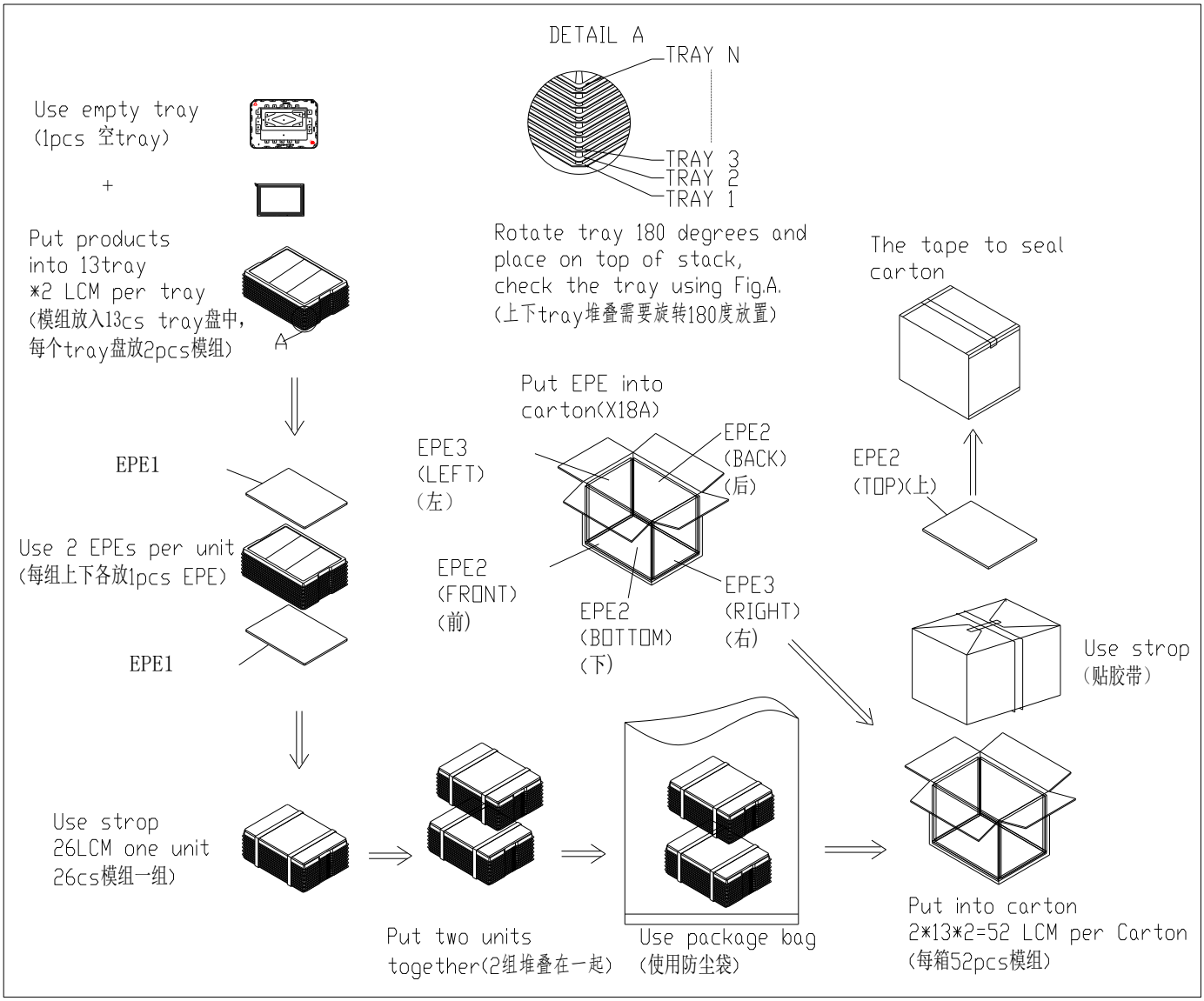
Note1: Temperature is the ambient temperature of sample
Note2: Before cosmetic and function test, the product must have enough recovery time, at least 24 hours at room temperature.
Note3: In the standard condition, there shall be no practical problem that may affect the display function. After the reliability test, the product's function only be guaranteed, but not for all of the cosmetic specification.

9. Mechanical Drawing



10. Packing Instruction

No	Item	Model (Material)	Dimensions(mm)	Unit Weight(Kg)	Q'ty	Remark
1	LCM	P0700WSF2ME00	140.6×80.41×5.85	TBD	52	
2	Tray	PET	356×256×20	0.125	28	
3	EPE1	EPE	336×246×6	0.01	4	
4	EPE2	EPE	375×275×10	0.014	4	
5	EPE3	EPE	250×280×12	0.015	2	
6	Carton	Corrugated Paper	398×290×315	0.75	1	
7	Package bag	PE	680×520	0.042	1	
8	Lable	Paper	100×52	0.001	1	
9	Total Weight	TBD				



11. Module label

QR code content:

PN+LOT NO+S/N

PN: P0700WSF2ME00
LOT NO: SR22D0E01B
1) SR S-Version number （Value description：New stage is SR，MP starts from A~）
2) “2”: year 2022. 3: 2023, 4: 2024
3) “2”: February. (Value description：1-9 ,10/A ,11/ B,12/ C)
4) “D”: fixed value.
5) 0 is S-rank（Value description：SR=0，MP starts from 1~）
6) “E”: 14th. Day: 1-9, A-Z (except for O, I, Q, U).
7) “01”: which production line in the factory: 01-32.
8) “B”: evening shift. A: day shift.

S/N: 070010022E004
1) “0700100”: fixed value.
2) “2”: 2022. Year: 3: 2023, 4: 2024.
3) “2”: February. Month: 1-9, A, B, C means from January to December.
4) “E”: 14th. Day: 1-9, A-Z (except for O, I, Q, U).
5) “004”: the fourth product. Serial number, the number of products produced on the same day. 000-ZZZ(except for O, I, Q, U).

12. Precautions for Use of LCD Modules

12.1 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.

12.2 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 ℃ at normal humidity.
(3) The LCD modules should be stored in a room without acid, alkali or other harmful gas.

12.3 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.

12.4 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

12.5 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.

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