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SPECIFICATION

[☒] Preliminary Specification
[] Final Specification

Description 10.1” 1280xRGBx800 TFT-LCD Module
Part Number P1010WXF2ME30

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

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1. Summary

1.1 General Description

This is a 10.1 inch a-Si TFT-LCD module with Normal-black technology. It is composed of a TFT-LCD panel, a driver circuit, FPC , 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
- 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	10.1 inch	
	Resolution	1280(RGB) × 800	
	Pixel Pitch	0.1695x0.1695	mm
	TFT Active Area	216.96 x 135.60	mm
	Technology Type	a-Si	
	Pixel Configuration	R.G.B Vertical Stripe	
	Display Mode	SFT, Normally Black	
	Surface Treatment	Anti-Glare	
	Viewing Direction	All Direction	
	Gray Scale Inversion Direction	NA	
Mechanical Characteristics	LCM (W x H x D)	224.8 x 147.92 x 3.0	mm
	Weight	TBD	g
Optical Characteristics	Luminance	400	cd/m ²
	Contrast Ratio	1200:1	
	NTSC	72	%
	Viewing Angle	88/88/88/88	degree
Electrical Characteristics	Interface	LVDS 8-bit	
	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	FPC
Matching connector	F62240-H1210A

Table 3.1.1 Connector information

No	Symbol	I/O	Description	Comment
1	VCOM	P	For external VCOM DC input	
2	VDD	P	Power supply +3.3V	
3	VDD	P	Power supply +3.3V	
4	NC(CS)	N	SPI signal only use byTM, No connection required for customer	
5	NC(SDA)	N	SPI signal, no connection required	
6	NC(SCL)	N	SPI signal, no connection required	
7	GND	P	Ground	
8	Rxin0-	I	-LVDS differential data input	
9	Rxin0+	I	+LVDS differential data input	
10	GND	P	Ground	
11	Rxin1-	I	-LVDS differential data input	
12	Rxin1+	I	+LVDS differential data input	
13	GND	P	Ground	
14	Rxin2-	I	-LVDS differential data input	
15	Rxin2+	I	+LVDS differential data input	
16	GND	P	Ground	
17	RxCLK-	I	-LVDS differential clock input	
18	RxCLK+	I	+LVDS differential clock input	
19	GND	P	Ground	
20	Rxin3-	I	-LVDS differential data input	
21	Rxin3+	I	+LVDS differential data input	
22	GND	P	Ground	
23	NC(VOTP)	N	For OTP use, no connection is required	
24	NC(ROM_RLB)	N	For OTP use, no connection is required	
25	GND	P	Ground	
26	NC	N	No connection	
27	VSN	P	PANEL operating negative voltage	
28	NC	N	No connection	
29	VSP	P	PANEL operating positive voltage	
30	GND	P	Ground	
31	VLED-	P	Back light cathode	

32	VLED-	P	Back light cathode	Note1
33	NC		No Connect	Note1
34	NC		No Connect	Note1
35	VGL	P	Gate OFF Voltage	
36	NC		No Connect	
37	NC		No Connect	
38	VGH		Gate ON Voltage	
39	VLED+	P	Back light anode	
40	VLED+	P	Back light anode	

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.

4. Absolute Maximum Ratings

Item	Symbol	MIN	MAX	Unit	Remark
------	--------	-----	-----	------	--------

Power Voltage	VDD	-0.5	4	V	Note1
Input voltage	V _{IN}	-0.5	4	V	
Operating Temperature	Top	-20	70	°C	
Storage Temperature	Tst	-30	80	°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	3.2	3.3	3.4	V	
Input Signal Voltage	Low Level	VIL	DGND	--	$0.2 \times VDDIO$	V
	High Level	VIH	$0.8 \times VDDIO$	--	VDDIO	V
Output Signal Voltage	Low Level	VOL	DGND	--	$0.2 \times VDDI$	V
	High Level	VOH	$0.8 VDDI$	--	VDD	V
Power Consumption	60Hz	P	--	/	--	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	--	180	50	mA	45 LEDs (9 LED Parallel, 5 LED Serial)
Forward Current Voltage	VF	14	15	16	V	
Backlight Power Consumption	WBL	--	2700	—	mW	
LED life time	--	20000	30000	-	Hrs	

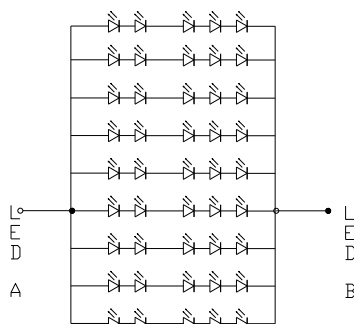
Table 5.2.1 LED Backlight Characteristics

Note1: I_F is defined for each channel.

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



5.3 Recommended Power ON/OFF Sequence

Power ON Sequence

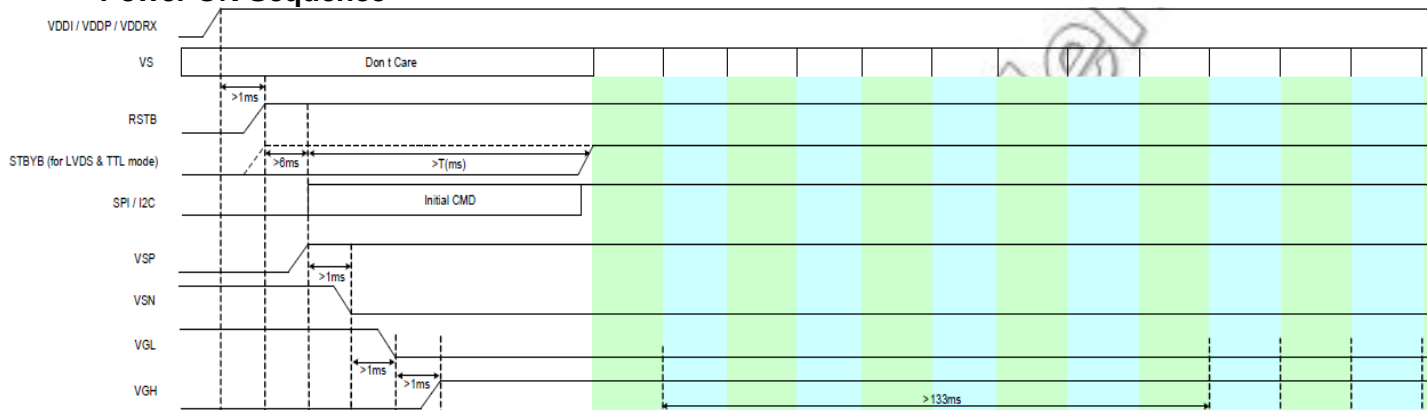


Figure 5.3.1 Power on sequence

Power OFF Sequence

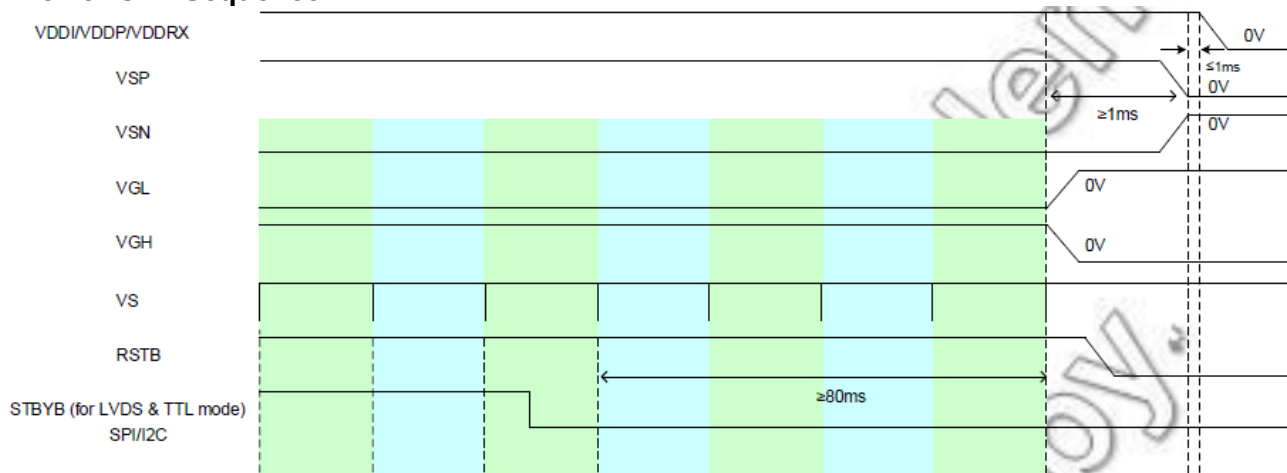


Figure 5.3.2 Power off sequence

Note1: $T1 < T2$.

Note2: The low level of these signals and analog powers are GND level.

Note3: 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.

Note4: The power on/off sequence is the first version. It will be updated when the design is fixed.

Note5: BL is the voltage applied to backlight. Keep it turned off until the display has stabilized.

5.4 LCD Module Block Diagram

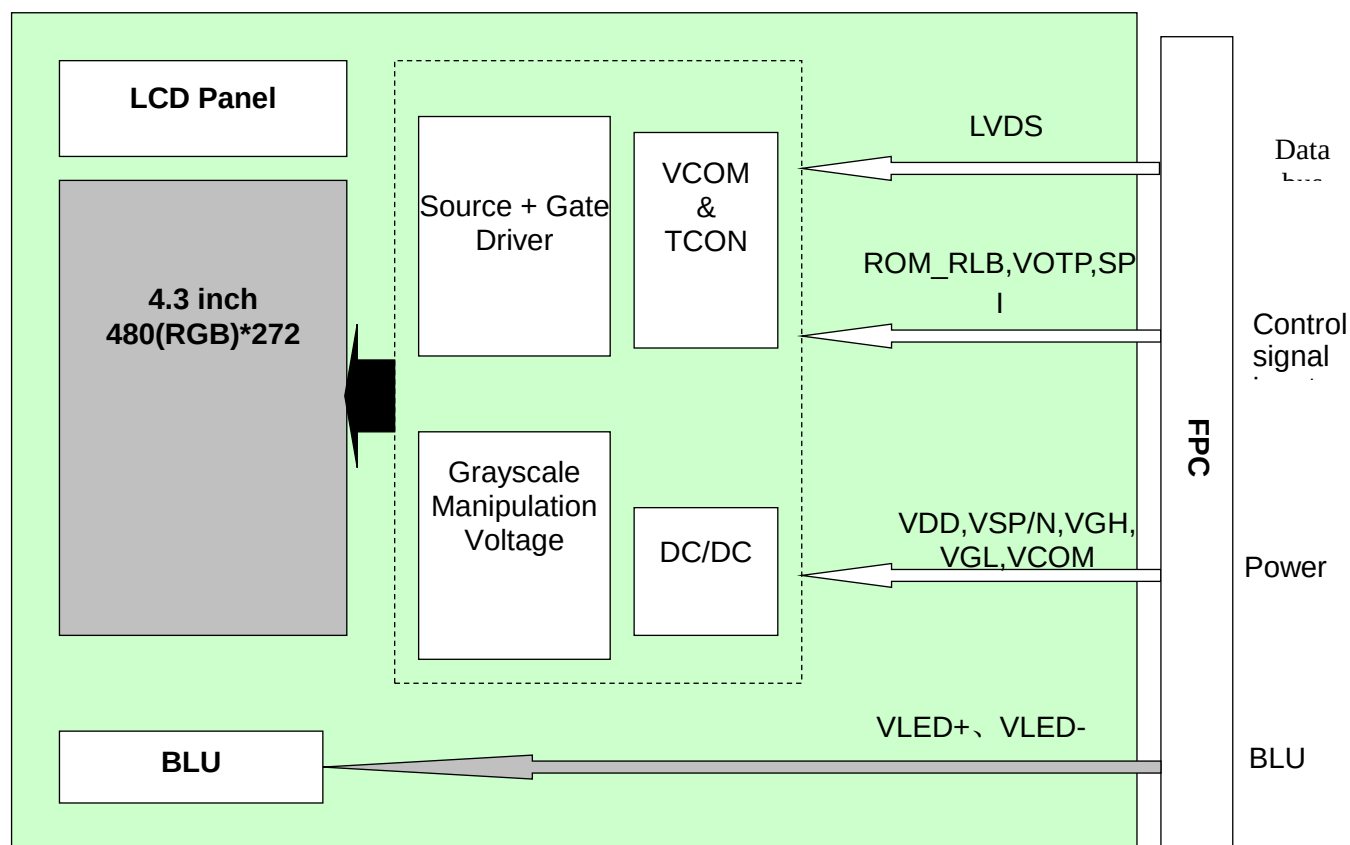


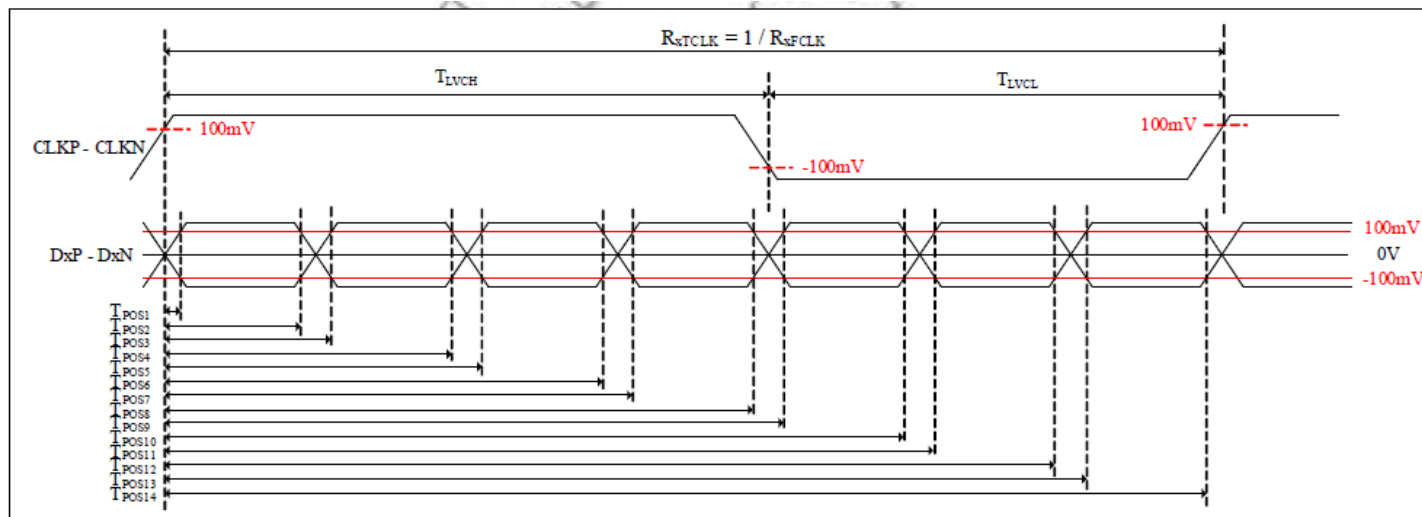
Figure 5.5.1 LCD Module Block Diagram

6. Timing Characteristics

6.1 AC characteristics

Item	Signal	Symbol	Rating			Unit
			Min.	Typ.	Max.	
Clock Frequency	CLK	R_{xFCLK}	20	-	100	MHz
Clock Period		R_{xTCLK}	10	-	50	ns
1 data bit time		UI	-	1/7	-	R_{xTCLK}
Clock high time	CLK	T_{LVCH}		4		UI
Clock low time		T_{LVCL}		3		UI
Position 1	DATA	T_{POS1}	-0.25	0	0.25	UI
Position 2		T_{POS2}	0.75	-	1.25	
Position 3		T_{POS3}	0.75	1	1.25	
Position 4		T_{POS4}	1.75	-	2.25	
Position 5		T_{POS5}	1.75	2	2.25	
Position 6		T_{POS6}	2.75	-	3.25	
Position 7		T_{POS7}	2.75	3	3.25	
Position 8		T_{POS8}	3.75	-	4.25	
Position 9		T_{POS9}	3.75	4	4.25	
Position 10		T_{POS10}	4.75	-	5.25	
Position 11		T_{POS11}	4.75	5	5.25	
Position 12		T_{POS12}	5.75	-	6.25	
Position 13		T_{POS13}	5.75	6	6.25	
Position 14		T_{POS14}	6.75	-	7.25	
Input eye width		T_{EYEW}	0.5	-	-	
Input eye border		T_{EX}	-	-	0.25	
PLL wake-up time		T_{enPLL}	-	-	150	us

Table 6.1.1 Input Setup Timing Parameters Requirement



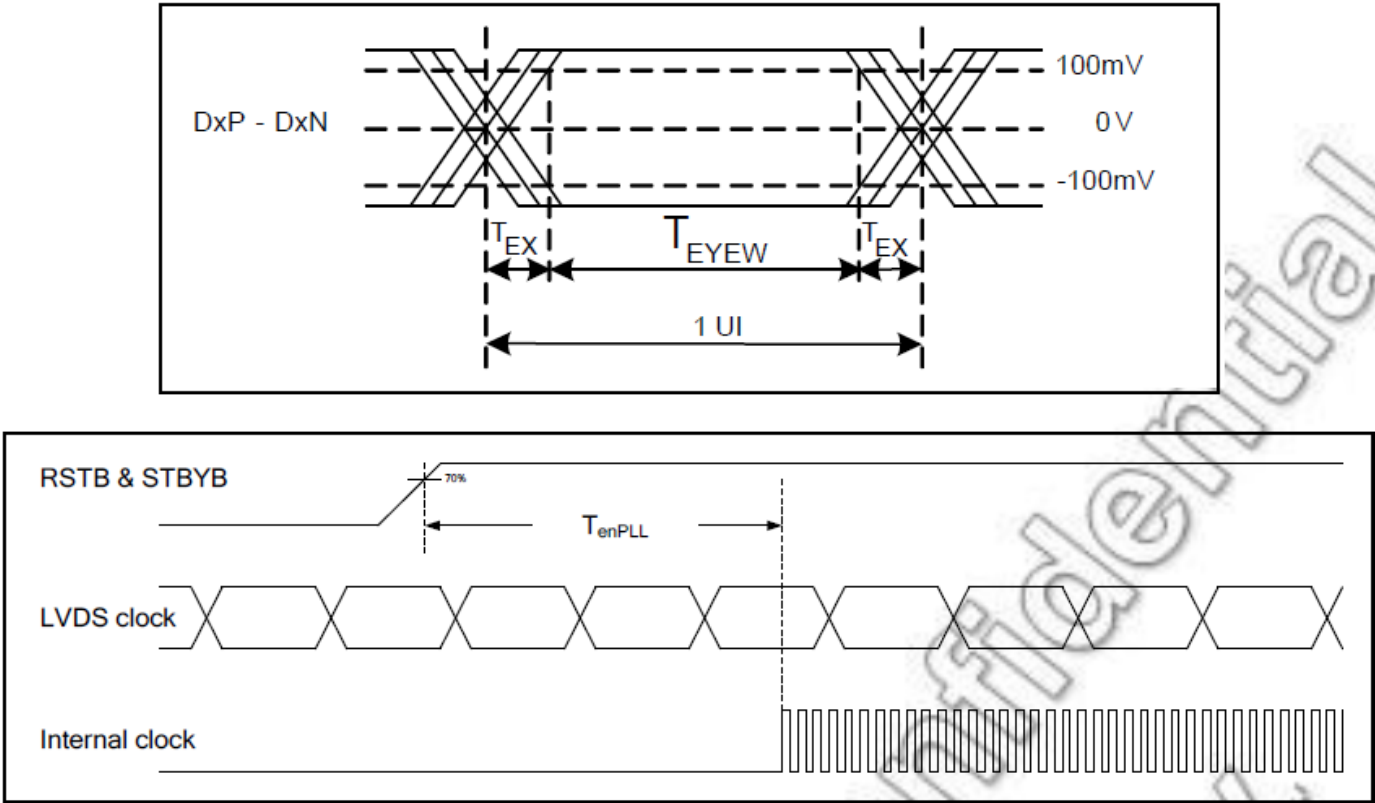


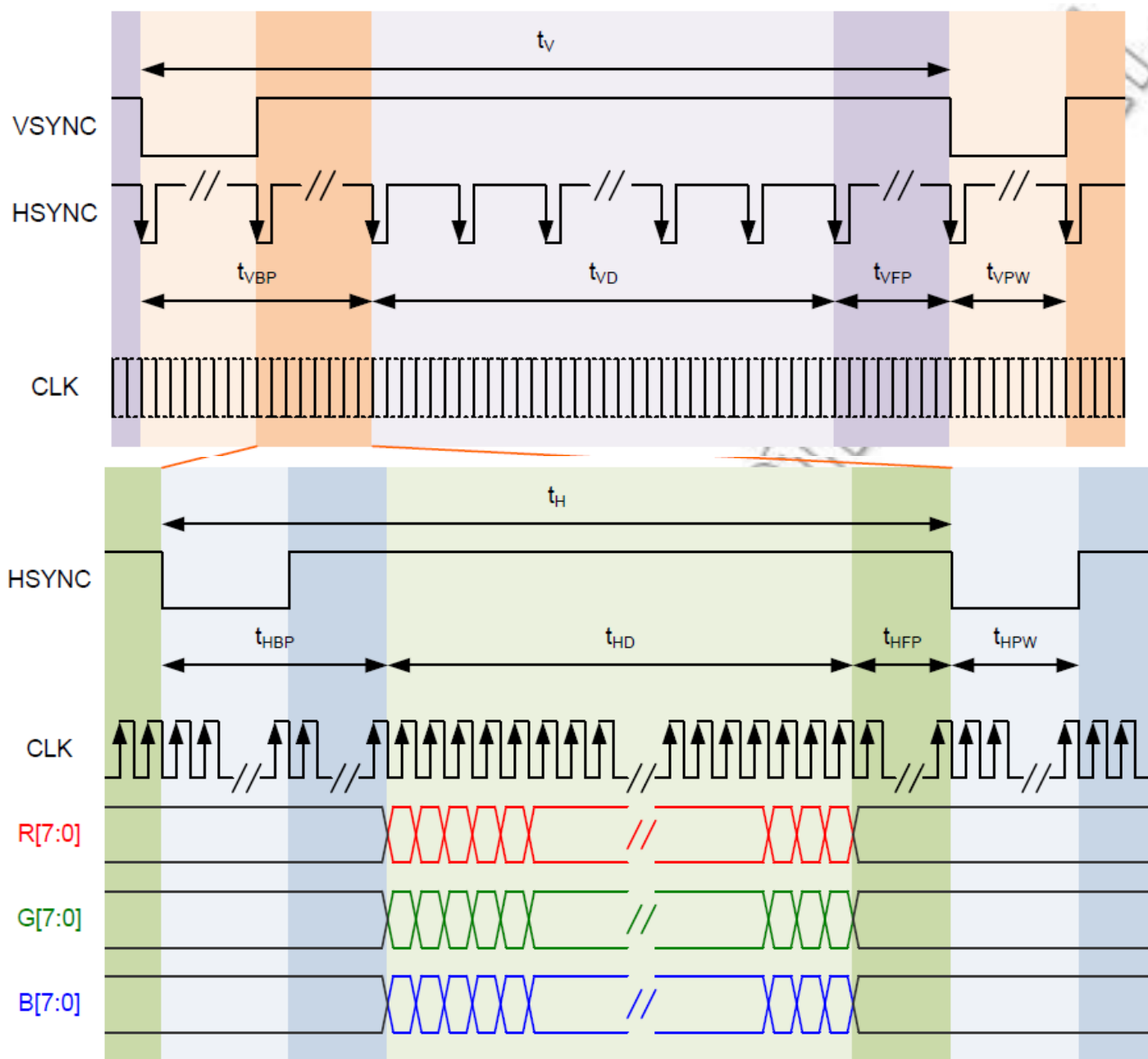
Figure 6.1.1 Clock and Data Input Timing Diagram

6.2 Data Input Timing Parameter Setting

TBD

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

6.4 DE Mode Timing Diagram

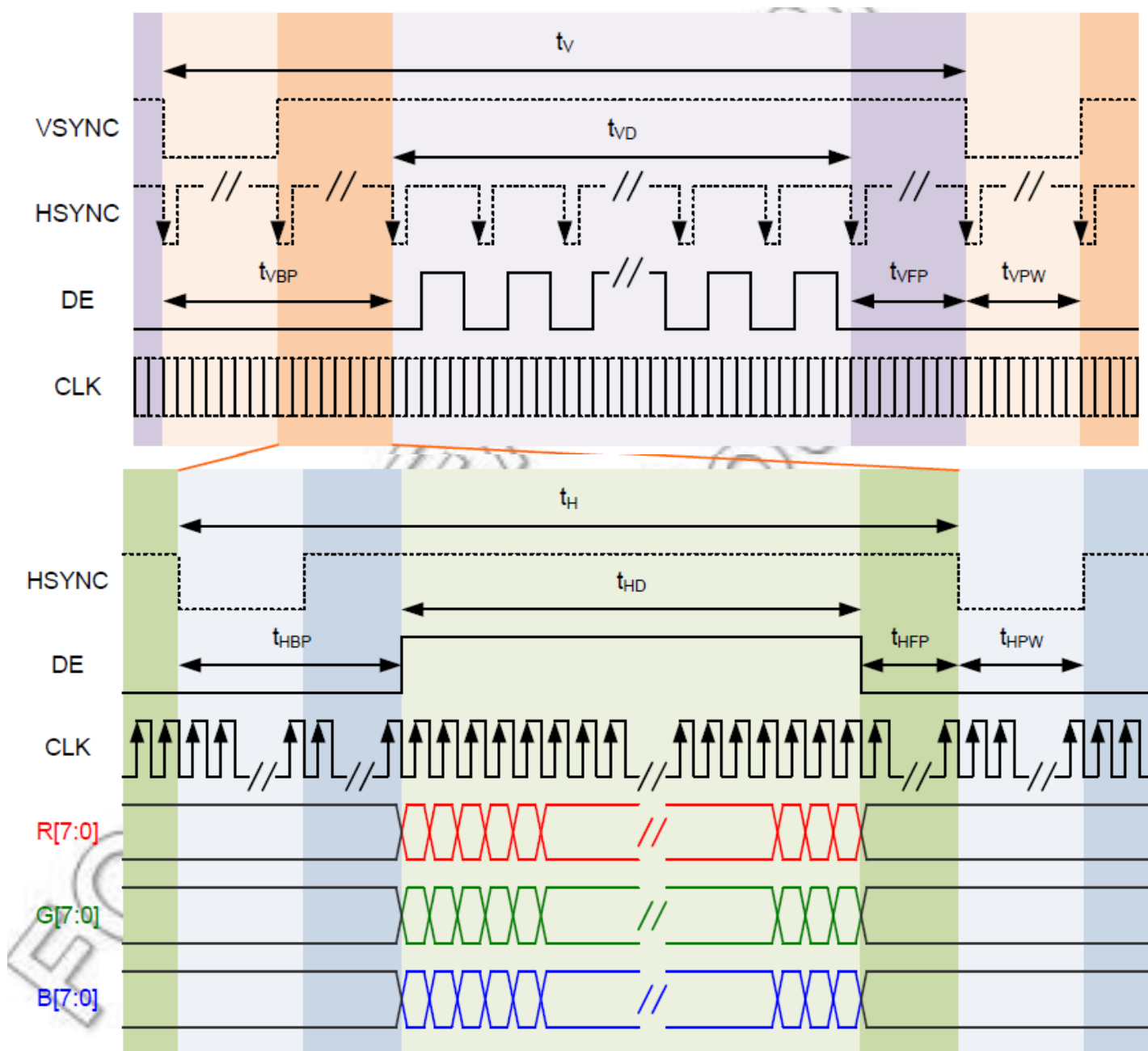


Figure 6.5.1 Data Input Timing Diagram Under DE Mode

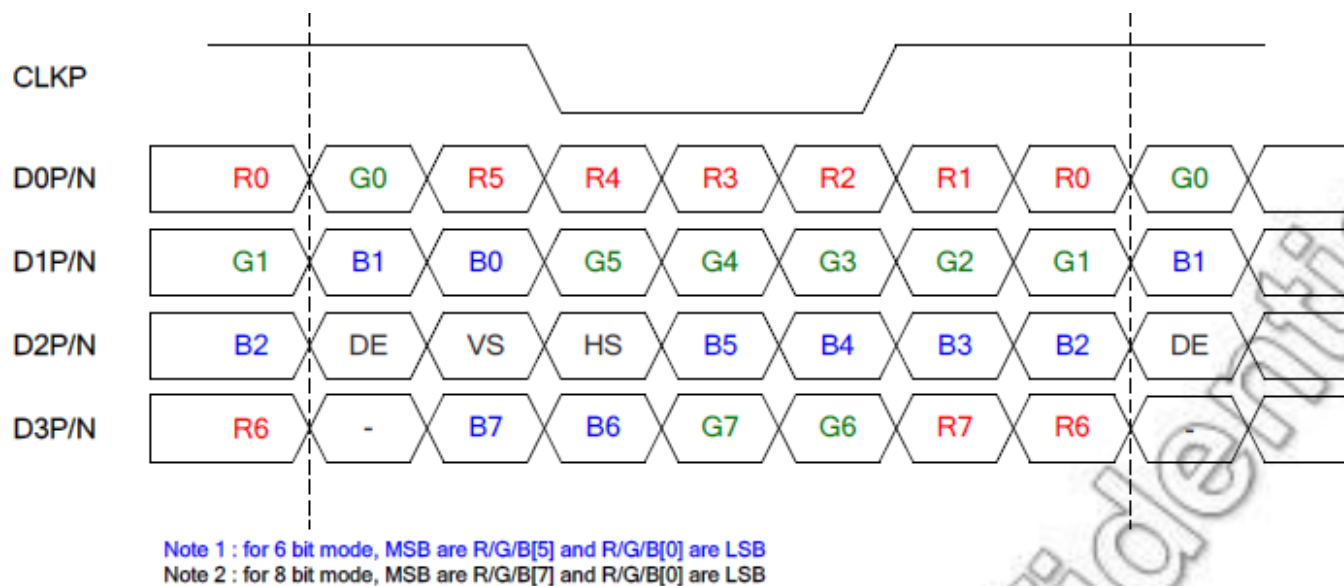


Figure 6.5.1 1PORT LVDS VESA Mode

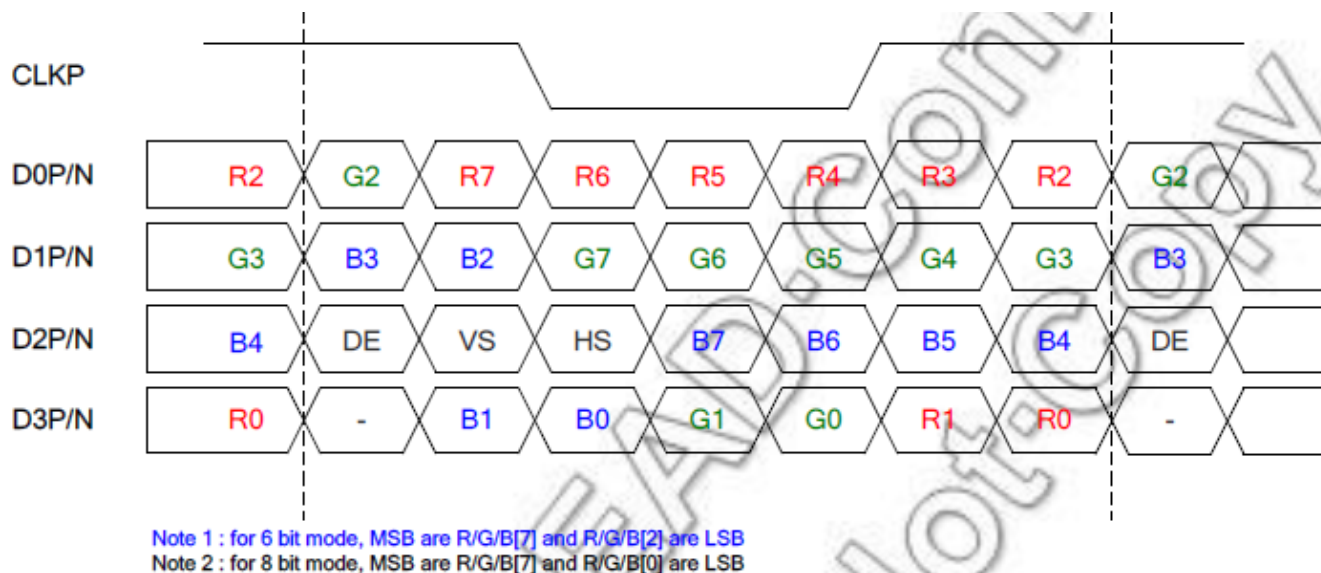


Figure 6.5.1 1PORT LVDS JEIDA Mode

7. Optical Characteristics

Item		Symbol	Condition	Min	Typ	Max	Unit	Remark
View Angles		θT	CR ≧ 10	78	88		degree	Note2,3
		θB		78	88			
		θL		78	88			
		θR		78	88			
Contrast Ratio		CR	θ=0°	900	1200			Note 3
Response Time		T _{ON}	25℃		35	45	ms	Note 4
		T _{OFF}						
Chromaticity	White	x	Backlight is on		TBD			Note 1,5
		y			TBD			
	Red	x			TBD			Note 1,5
		y			TBD			
	Green	x			TBD			Note 1,5
		y			TBD			
	Blue	x			TBD			Note 1,5
		y			TBD			
Uniformity		U		70	75		%	Note 6
NTSC		-		67	72		%	Note 5
Luminance		L			400		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.

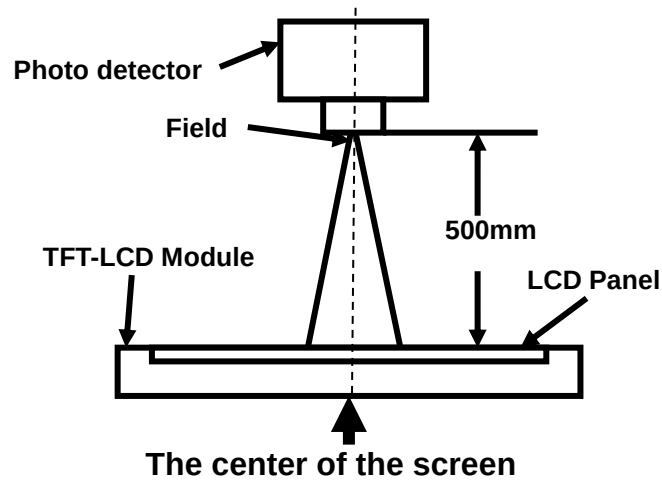


Fig1. Measurement Set Up

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

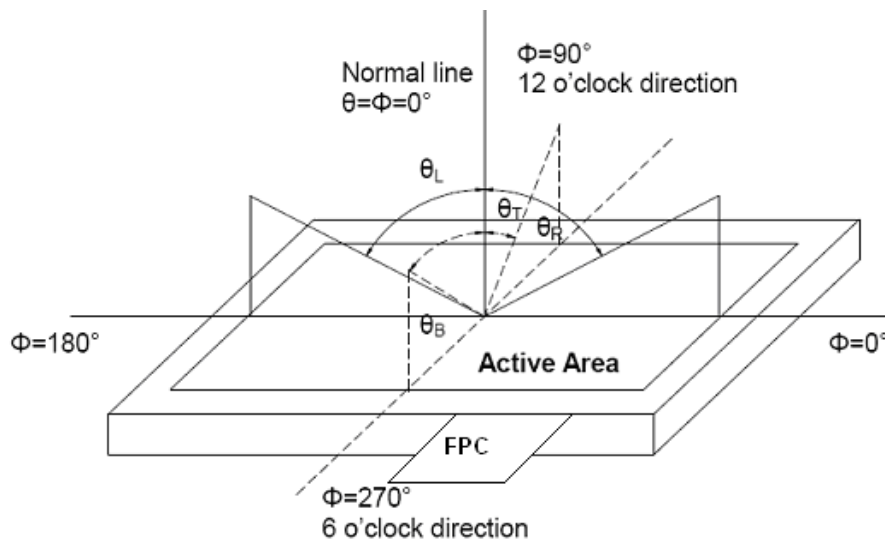


Fig2. Measurement viewing angle

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%.

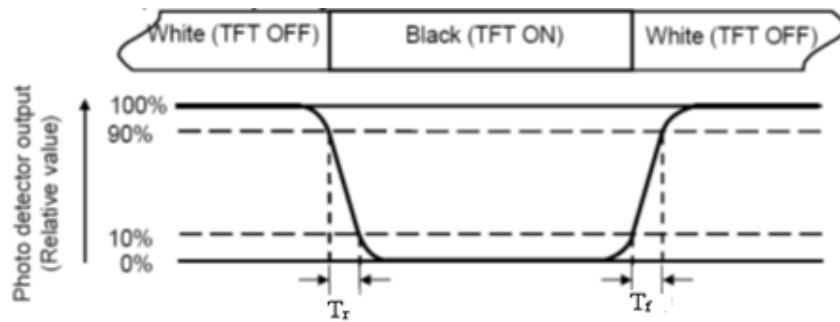


Fig3. Response Time Testing(TN)

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%.

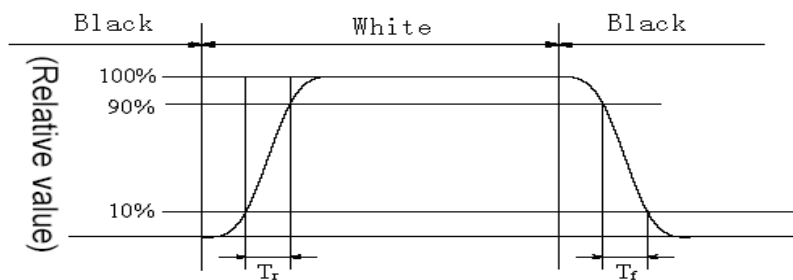


Fig4. Response Time Testing(SFT)

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

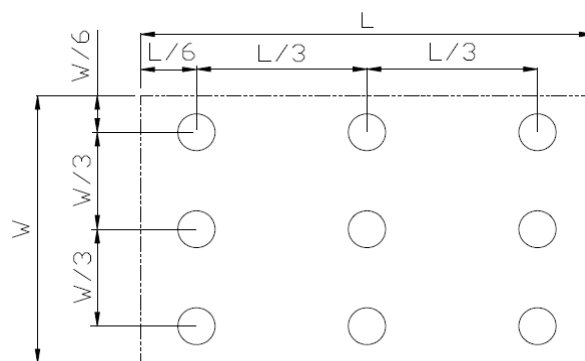


Fig5. Luminance Uniformity Measurement Locations(9 points)

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	+70℃ , 120H	IEC60068-2-1:2007 GB2423.2-2008
2	Low Temperature Operation	-20℃ , 120H	IEC60068-2-1:2007 GB2423.1-2008
3	High Temperature Storage	+80℃ , 120H	IEC60068-2-1:2007 GB2423.2-2008
4	Low Temperature Storage	-30℃ , 120H	IEC60068-2-1:2007 GB2423.1-2008
5	Storage at High Temperature and Humidity(Operation)	+60℃ , 90%RH , 120H	IEC60068-2-78 :2001 GB/T2423.3—2006
6	Thermal Shock (non-operation)	-30℃ , 30min~80℃ , 30min , change time : 5min , 20cycle	Start with cold temperature, End with high temperature, IEC60068-2-14:1984,GB2423.22-2002
7	ESD	C=150pF , R=330Ω , 5point/panel Air : ±4kv , 5times ; Contact : ±2kv , 5times ; (Environment : 15℃~35℃ , 30%~60% , 86Kpa~106Kpa)	IEC61000-4-2:2001 GB/T17626.2-2006
8	Vibration Test	Stroke:1.5m Sweep:10Hz~55Hz~10Hz 2 hours for each direction of X.Y.Z. (6 hours for total)(Package condition)	IEC60068-2-6:1982 GB/T2423.10—1995
9	Mechanical Shock (Non OP)	100G 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)	
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

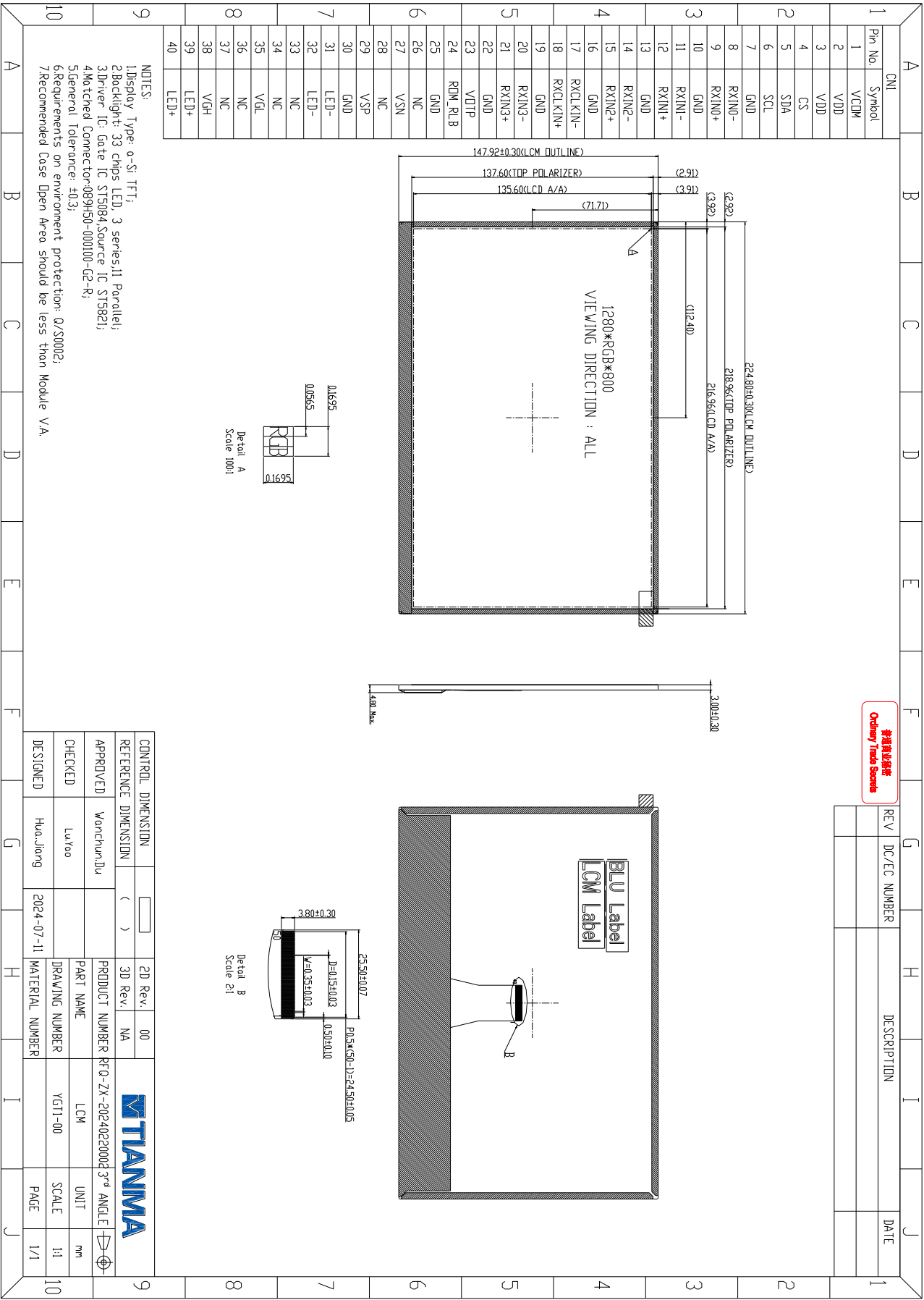
Table 8.1 RA test condition

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(m m)	Unit Weight(Kg)	Q'ty	Remark
1	LCM module					
2	Tray	PET (Transmit)				
3	Dust Proof Bag	PE				
4	BOX	CORRUGATED PAPER				
5	Carton	CORRUGATED PAPER				
6	Total weight	TBD				

TBD

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.