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SPECIFICATION

[●] Preliminary Specification
[] Final Specification

Description 17.0” 1920xRGBx1200 TFT-LCD Module
Part Number P1700WUF1MB00

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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 17 inch a-Si TFT-LCD module with Normal-black technology. It is composed of a TFT-LCD panel, a driver circuit, PCBA , and a LED backlight unit, a LED driver circuit.

1.2 Features

- Ultra-wide viewing angle
- Interface: LVDS
- LED driver integrated
- This product will comply 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	17.0 inch	
	Resolution	1920(RGB) x 1200	
	Pixel Pitch	0.1905 x 0.1905	mm
	TFT Active Area	365.76 x 228.6	mm
	Technology Type	a-Si	
	Pixel Configuration	R.G.B Vertical Stripe	
	Display Mode	SFT, Normally Black	
	Surface Treatment	AG	
	Viewing Direction	All Direction	
	LCM (W x H x D)	386.8x250.8x18.6	mm
	Weight	(1160)	g
Optical Characteristics	Luminance	(800 typ)	cd/m ²
	Contrast Ratio	2000:1 typ	
	NTSC	80 typ	%
	Viewing Angle	88/88/88/88 typ	degree
Electrical Characteristics	Interface	2 port LVDS	
	Color Depth	16.7 M	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	5018643091(Molex)

Table 3.1.1 Connector information

No	Symbol	I/O	Description	Comment
1	RXO0-	I	-LVDS differential data input, Chan 0-Odd	
2	RXO0+	I	+LVDS differential data input, Chan 0-Odd	
3	RXO1-	I	-LVDS differential data input, Chan 1-Odd	
4	RXO1+	I	+LVDS differential data input, Chan 1-Odd	
5	RXO2-	I	-LVDS differential data input, Chan 2-Odd	
6	RXO2+	I	+LVDS differential data input, Chan 2-Odd	
7	VSS	P	Ground	
8	RXOC-	I	-LVDS differential Clock input (Odd)	
9	RXOC+	I	+LVDS differential Clock input (Odd)	
10	RXO3-	I	-LVDS differential data input, Chan 3-Odd	
11	RXO3+	I	+LVDS differential data input, Chan 3-Odd	
12	RXE0-	I	-LVDS differential data input, Chan 0-Even	
13	RXE0+	I	+LVDS differential data input, Chan 0-Even	
14	VSS	P	Ground	
15	RXE1-	I	-LVDS differential data input, Chan 1-Even	
16	RXE1+	I	+LVDS differential data input, Chan 1-Even	
17	VSS	P	Ground	
18	RXE2-	I	-LVDS differential data input, Chan 2-Even	
19	RXE2+	I	+LVDS differential data input, Chan 2-Even	
20	RXEC-	I	-LVDS differential Clock input (Even)	
21	RXEC+	I	+LVDS differential Clock input (Even)	
22	RXE3-	I	-LVDS differential data input, Chan 3-Even	
23	RXE3+	I	+LVDS differential data input, Chan 3-Even	
24	VSS	P	Ground	
25	VSS	P	Ground	
26	NC	N	No Connection	
27	AGMODE	O	Aging mode selection (Default connection GND) High (3.3V), Aging mode. Low (0V), Normal display	
28	VCC	P	+5.0V power supply	
29	VCC	P	+5.0V power supply	
30	VCC	P	+5.0V power supply	

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.

3.2 CN2 Pin assignmeng(Back Light)

Connector Information	
BL connector	190003-10021-30(P-TWO)
Matching Connector	Molex 43640 or 190001-00011-33(P-TWO) or compatible

Table 3.2.1 Connector information

No	Symbol	I/O	Description	Comment
1	Vi	I	Converter input voltage	
2	Vi	I	Converter input voltage	
3	Vi	I	Converter input voltage	
4	VGND	P	Converter ground	
5	VGND	P	Converter ground	
6	VGND	P	Converter ground	
7	EN	I	Enable pin	
8	NC	NC	NC	
9	ADJ	I	PWM diming	
10	NC	NC	NC	

Table 3.2.2 Pin Assignment for Back Light Interface

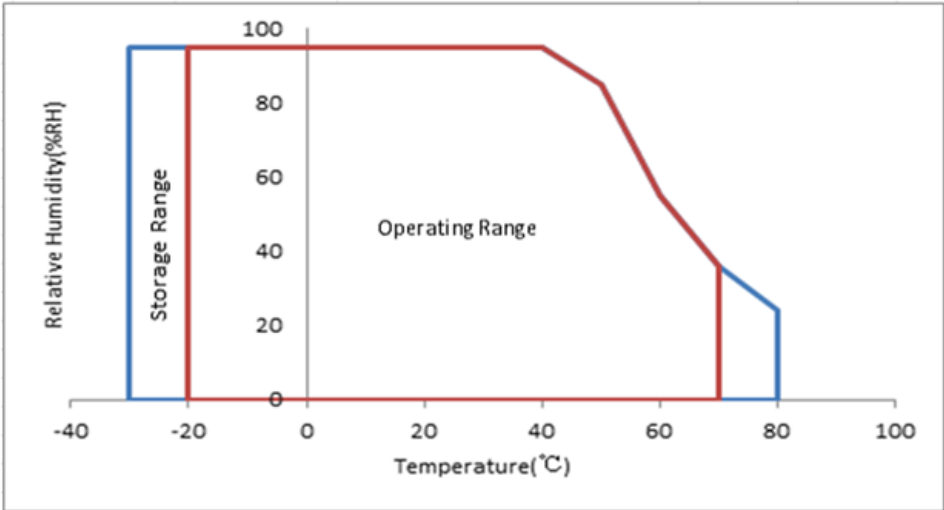
Note1: I/O definition: I---Input, O---Output, P---Power/Ground, N---No connection

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

4. Absolute Maximum Ratings

Item		Symbol	Rating	Unit	Remark
Power supply voltage	LCD panel	VCC	-0.3 to 5.5	V	Ta= 25℃
	Backlight	Vi	-0.3 to 13.2	V	
Input voltage for signals	Display signals Note1	V _D	-0.3 to 5.5	V	
	Function signal for Backlight	EN	-0.3 to 13.2	V	
		ADJ	-0.3 to 13.2		
Storage temperature		Tst	-30 to +80	℃	-
Operating temperature		Top	-20 to +70	℃	-
Relative humidity Note2		RH	≤ 95	%	Ta ≤ 40℃
			≤ 85	%	40℃ < Ta ≤ 50℃
			≤ 55	%	50℃ < Ta ≤ 60℃
			≤ 36	%	60℃ < Ta ≤ 70℃
Absolute humidity Note2		AH	≤ 70 Note3	g/m3	Ta= 70℃

Table 4.1 Absolute Maximum Ratings



- Note1: V_D include: RXO0-/+, RXO1-/+, RXO2-/+, RXO3-/+, RXE0-/+, RXE1-/+, RXE1-/+, RXE2-/+, RXE3-/+, RXEC-/+
- Note2: No condensation
- Note3: Water amount at Ta= 70℃ and RH= 36%
- Note4: 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	VCC	(4.5)	5.0	(5.5)	V	Note1
Permissible ripple voltage	VRPC	-	-	-	mVp-p	for VCC Note2
Supply current	I _{VCC}	-	TBD	-	mA	At VCC= 3.3V Note3
Power Consumption	P _{VCC}	-	TBD	-	W	
Input Voltage Low level	VIL	0	--	0.3×VCC	V	
Input Voltage High level	VIH	0.7×VCC	--	VCC	V	
Inrush current	Inrush	-	-	TBD	A	Note 4

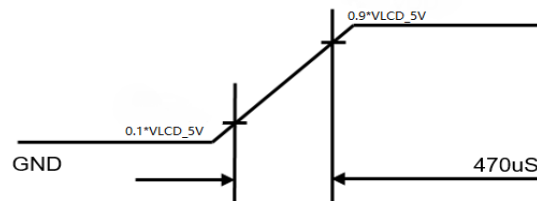
Table 5.1.1 Operating Voltages for Panel Driving

Note1: VCC should be voltage on the LCD module connector, Including ripple.

Note2: The permissible ripple voltage includes spike noise.

Note3: Test at White pattern.

Note4: To test the current dissipation, using the “white pattern” shown



5.2 DC Characteristics for Backlight Driving

GND=0V, Ta = 25°C

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remarks
Power supply voltage	V_i	9	12.0	16	V	Note1, Note2
Power supply current	I_i	-	-	T.B.D. Note3	mA	at VLED = 12.0V Note4
Power Consumption	P_i	-	-	T.B.D. Note3	W	
Permissible ripple voltage	VRPD	-	-	200	mVp-p	for VLED Note2, Note5
Input voltage for VLED_PWM, EN signal	V_{IH}	1.6	-	12	V	
	V_{IL}	0	-	0.8	V	
VLED_PWM frequency	f_{PWM}	200		20K	Hz	Note6
VLED_PWM duty ratio	DR_{PWM}	1	-	100	%	Note7, Note8
Operating Life time		(30000)			hrs	Note 9

Table 5.2 Backlight Operating Voltages

Note1: When designing of the power supply, take the measures for the prevention of surge voltage.

Note2: The power supply lines (V_i and V_{GND}) may have ripple voltage during luminance control of LED.

There is the possibility that the ripple voltage produces acoustic noise and signal wave noise in audio circuit and so on.

Note3: This value excludes peak current such as overshoot current.

Note4: At the maximum luminance control.

Note5: The permissible ripple voltage includes spike noise.

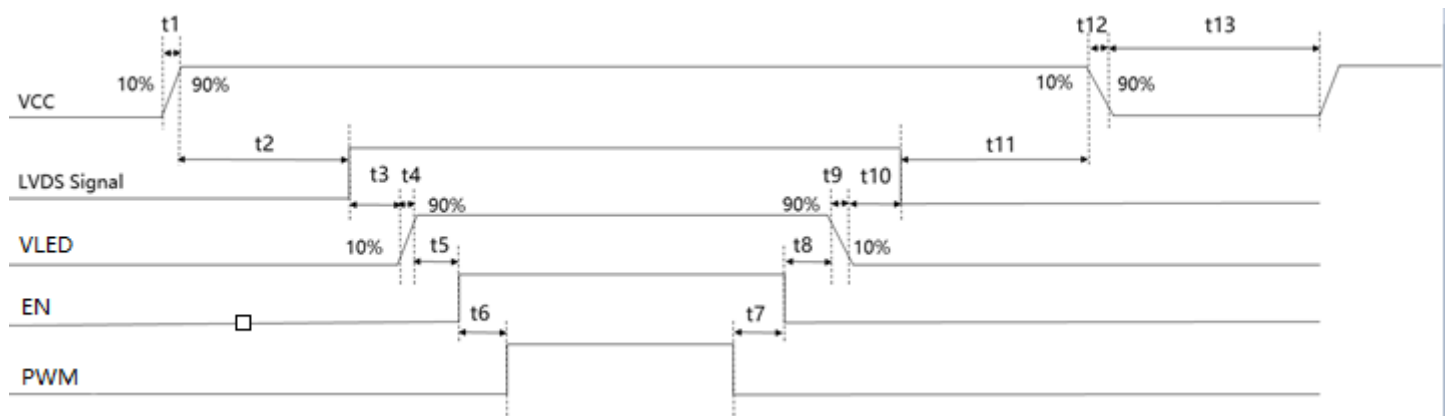
Note6: Depending on the frequency used, some noise may appear on the screen, please conduct a thorough evaluation.

Note7: While the EN signal is high, do not set the tPWH (PWM pulse width) is less than minimum value. It may cause abnormal working of the backlight. In this case, turn the backlight off and then on again by EN signal.

Note8: Regardless of the PWM frequency, both PWM duty ratio and PWM pulse width must be always more than the minimum values.

Note9: Optical performance should be evaluated at Ta=25°C. Only If LED is driven by high current, high ambient temperature & humidity condition. The life time of LED will be reduced. Operating life means brightness goes down to 50% of initial brightness. Typical operating life time is an estimated data

5.3 Power ON/OFF Sequence



Symbol	Min	Typ	Max	Unit	Remark
t1	0.5	-	10	ms	
t2	100	-	-	ms	
t3	200	-	-	ms	
t4	1	-	-	ms	Note 1
t5	2	-	-	ms	
t6	2	-	-	ms	
t7	2	-	-	ms	
t8	2	-	-	ms	
t9	1	-	-	ms	
t10	200	-	-	ms	
t11	200	-	-	ms	
t12	-	-	200	ms	
t13	1000	-	-	ms	

Note1: The low level of these signals and analog powers are GND level.

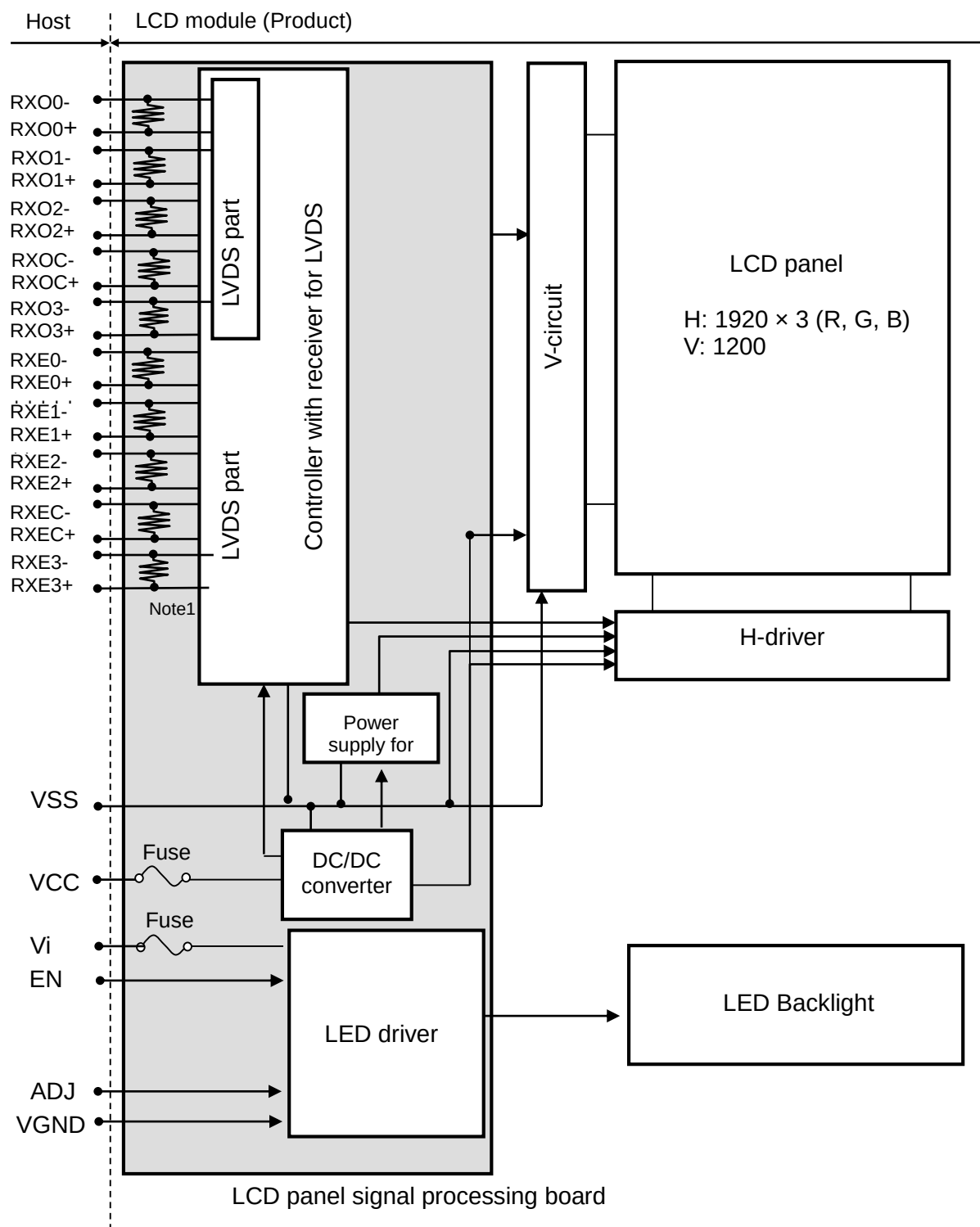
Note2: All of the power and signals should be kept at GND level before power on. If there are residual voltages on them, the LCD might not work properly.

Note3: The power on/off sequence is the first version. It will be updated when the design is fixed.

Note4: Keep Enable low level until the display has stabilized.

Note5: Indicated the subsequent version may be updated.

5.4 LCD Module Block Diagram



Note1: Each pair of the LVDS signal lines has 100Ω terminating resistance

Figure 5.4 LCD Module Block Diagram

6. Timing characteristics

6.1 LVDS DC Electrical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
Differential input high Threshold voltage	V_{TH}	-	-	0.1	V	
Differential input Low Threshold voltage	V_{TL}	-0.1	-	-	V	
Input voltage range(single-end)	V_{IN}	0	-	V_{CC_LVDS}	V	$V_{CC_LVDS}=3.3V$
Differential input common Mode voltage	V_{CMLVDS}	-	1.2	2.6	V	
Differential input voltage	$ V_{ID} $	0.1	-	0.6	V	
Differential input leakage current	I_N	-10	-	10	μA	

Table 6.1 LVDS DC Characteristics

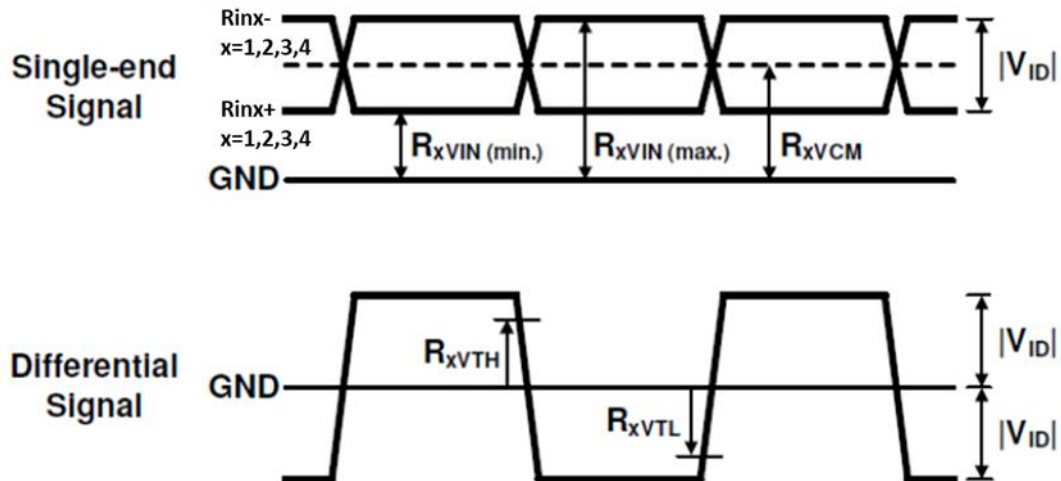


Figure 6.1 LVDS DC Characteristics

6.2 LVDS AC Electrical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Clock Period	t_{LVCP}	9.5	T	25	ns	
Clock high time	t_{LVCH}	4T/7			ns	
Clock low time	t_{LVCL}	3T/7			ns	
PLL Wake-Up Time	t_{LVPLL}	-	-	1	ms	
Strobe Width	t_{SW}	200	-	-	ps	
Receiver Strobe Margin	t_{RSM}	400	-	-	ps	

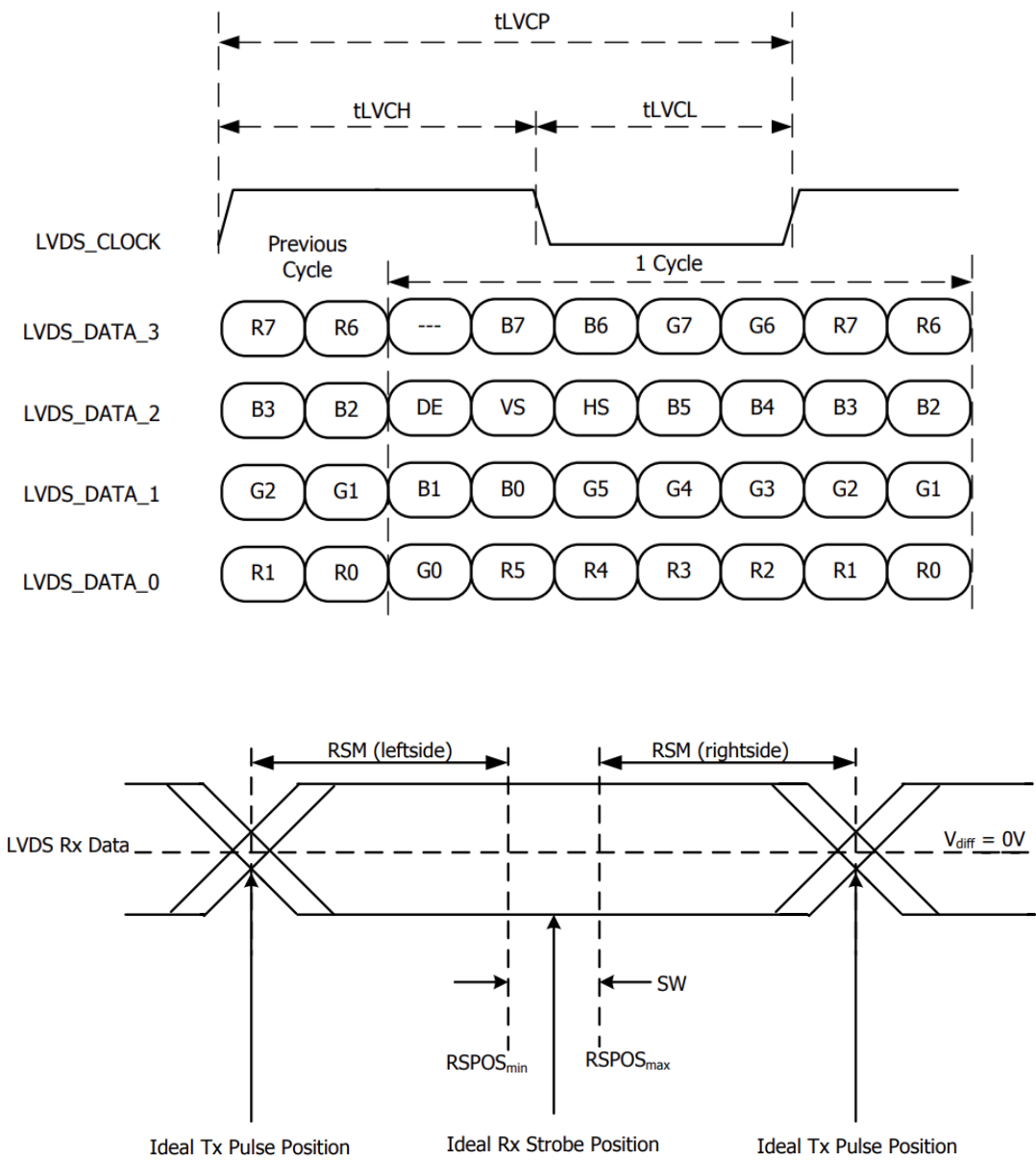


Table 6.2.LVDS AC Characteristics

6.3 LVDS signal timing characteristics

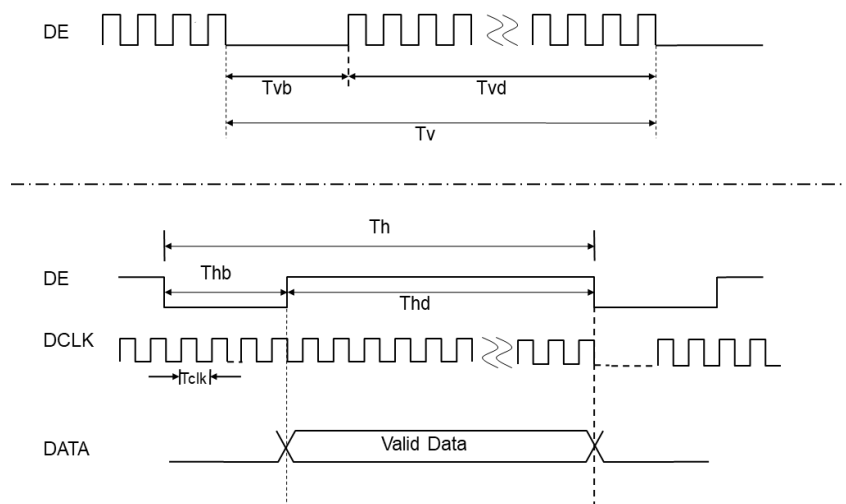
(Note1)

Parameter		Symbol	Min.	Typ.	Max.	Unit	Remark
DCLK frequency		Fclk	74.72	77.25	80.23	MHz	Tclk=1/Fclk
Horizontal section	Horizontal total	Th	1025	1030	1035	Tclk	
	Horizontal blanking	Thb	65	70	75	Tclk	
	Valid Data Width	Thd	960			Tclk	
Vertical section	Vertical total	Tv	1215	1250	1292	TH	
	Vertical blanking	Tvb	15	50	92	TH	
	Valid Data Width	Tvd	1200			TH	
Frame Rate		FR	59	60	61	Hz	

Table 6.3 Timing Characteristics

Note1: Definition of parameters is as follows.

tc= 1CLK, th= 1H


Figure 6.3 Clock and Data Input Timing Diagram

6.4 LVDS data mapping

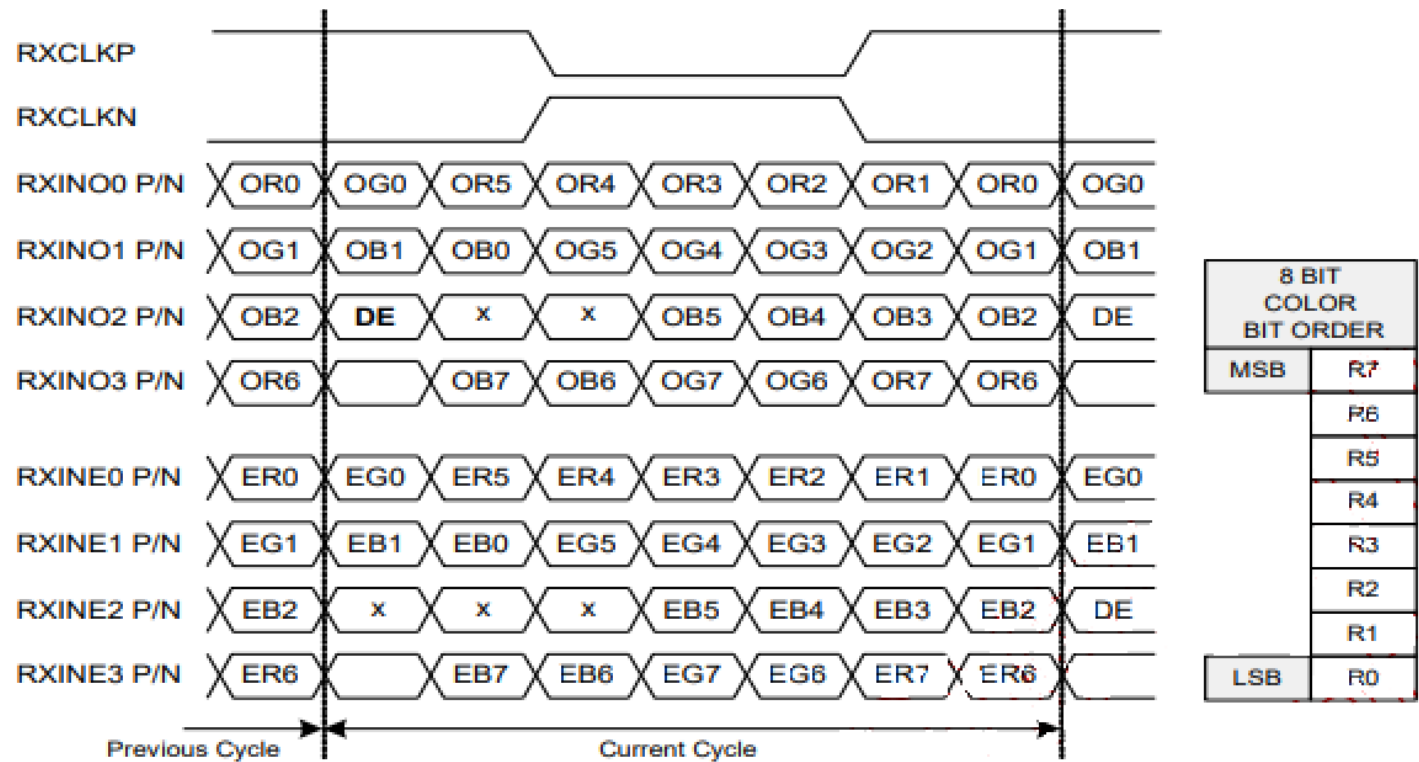


Figure 6.4LVDS data mapping (VESA standard)

7. Optical Characteristics

Item		Symbol	Condition	Min	Typ	Max	Unit	Remark
View Angles		θT	CR ≥ 10	80	88		degree	Note2,3
		θB		80	88			
		θL		80	88			
		θR		80	88			
Contrast Ratio		CR	θ=0°	1500	2000			Note 3
Response Time		T _{ON}	25℃		29	40	ms	Note 4
		T _{OFF}						
Chromaticity	White	x	Backlight is on	TBD	(0.299)	TBD		Note 1,5
		y		TBD	(0.315)	TBD		
	Red	x		TBD	TBD	TBD		Note 1,5
		y		TBD	TBD	TBD		
	Green	x		TBD	TBD	TBD		Note 1,5
		y		TBD	TBD	TBD		
	Blue	x		TBD	TBD	TBD		Note 1,5
		y		TBD	TBD	TBD		
Uniformity		U		80	85		%	Note 6
NTSC		-		75	80		%	Note 5
Luminance		L		670	800		cd/m ²	Note 7

Table 7.1 Optical Parameters

Test Conditions:

1. PWM duty = 100%, 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 10 Minutes operation, the optical characteristics are measured at the center point of the LCD screen.

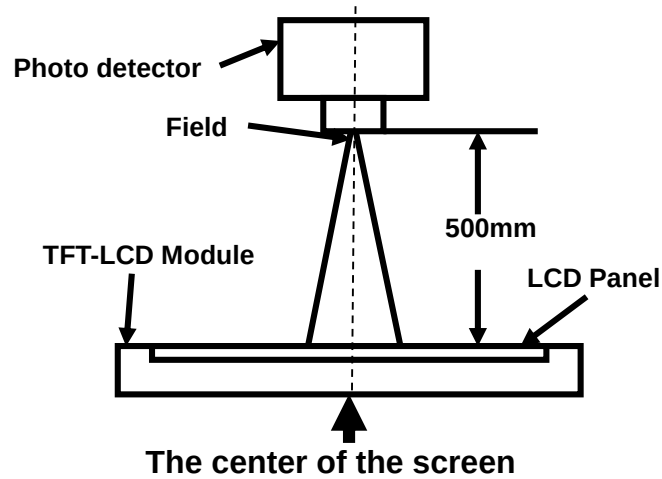


Fig1. Measurement Set Up

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

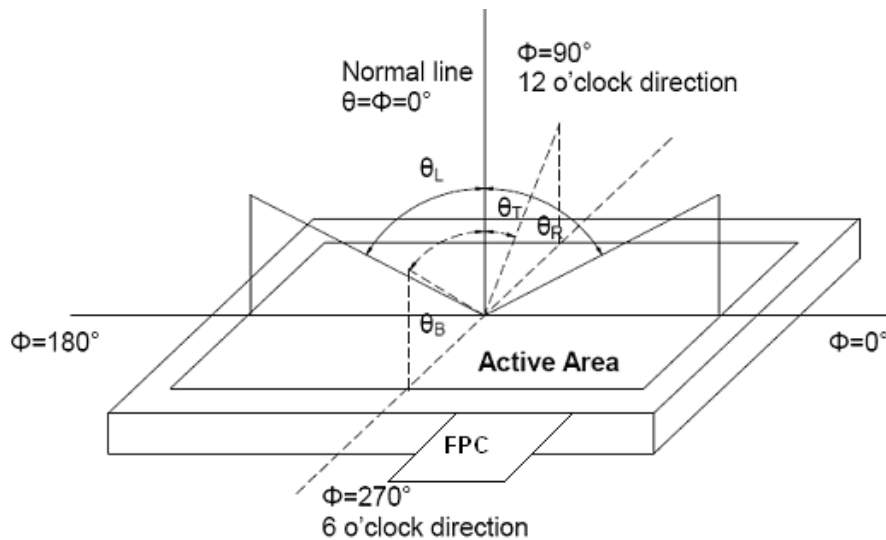


Fig2. Measurement viewing angle

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 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%.

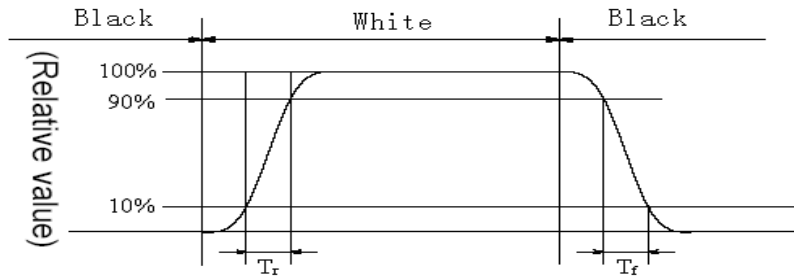


Fig4. Response Time Testing(SFT)

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

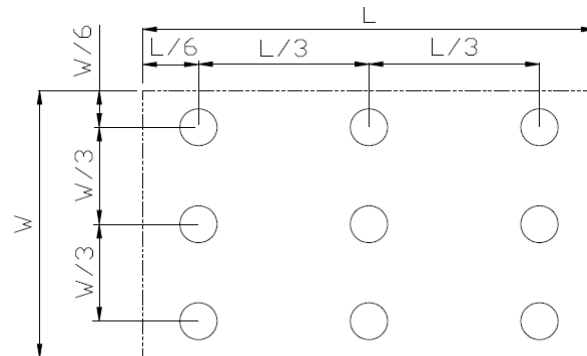


Fig5. Luminance Uniformity Measurement Locations(9 points)

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℃ , 240H	IEC60068-2-1:2007 GB/T 2423.2-2008
2	Low Temperature Operation	-20℃ , 240H	IEC60068-2-1:2007 GB/T 2423.1-2008
3	High Temperature Storage	+80℃ , 240H	IEC60068-2-1:2007 GB/T 2423.2-2008
4	Low Temperature Storage	-30℃ , 240H	IEC60068-2-1:2007 GB/T 2423.1-2008
5	Storage at High Temperature and Humidity	+60℃ , 90%RH , 240H	IEC60068-2-78 :2001 GB/T 2423.3—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 GB/T 2423.22-2002
7	ESD	C=150pF , R=330Ω , 5point/panel Air : ±15kv , 25times ; Contact : ±8kv , 25times ; (Environment : 15℃~35℃ , 30%~60% , 86Kpa~106Kpa)	IEC61000-4-2:2001 GB/T 17626.2-2006 Note4
8	Vibration Test(non-operation)	5~100HZ, 11.76m/s ² 1min/cycle,50times Per X/Y/Z	IEC60068-2-6:1982 GB/T 2423.10—1995 Note4
9	Mechanical Shock (non-operation)	50G, 11ms, 3 times for each direction ± X, ± Y, ± Z.	IEC60068-2-27:1987 GB/T 2423.5—1995 Note4
10	Package Vibration	5-20-200HZ , PSD : 0.01-0.01-0.001 Total:0.781g ² /HZ, x/y/z 30min)	
11	Package Drop Test	Height: 60 cm,1 corner, 3edges, 6 surfaces	IEC60068-2-32:1990 GB/T 2423.8—1995

Table 8.1 RA test condition

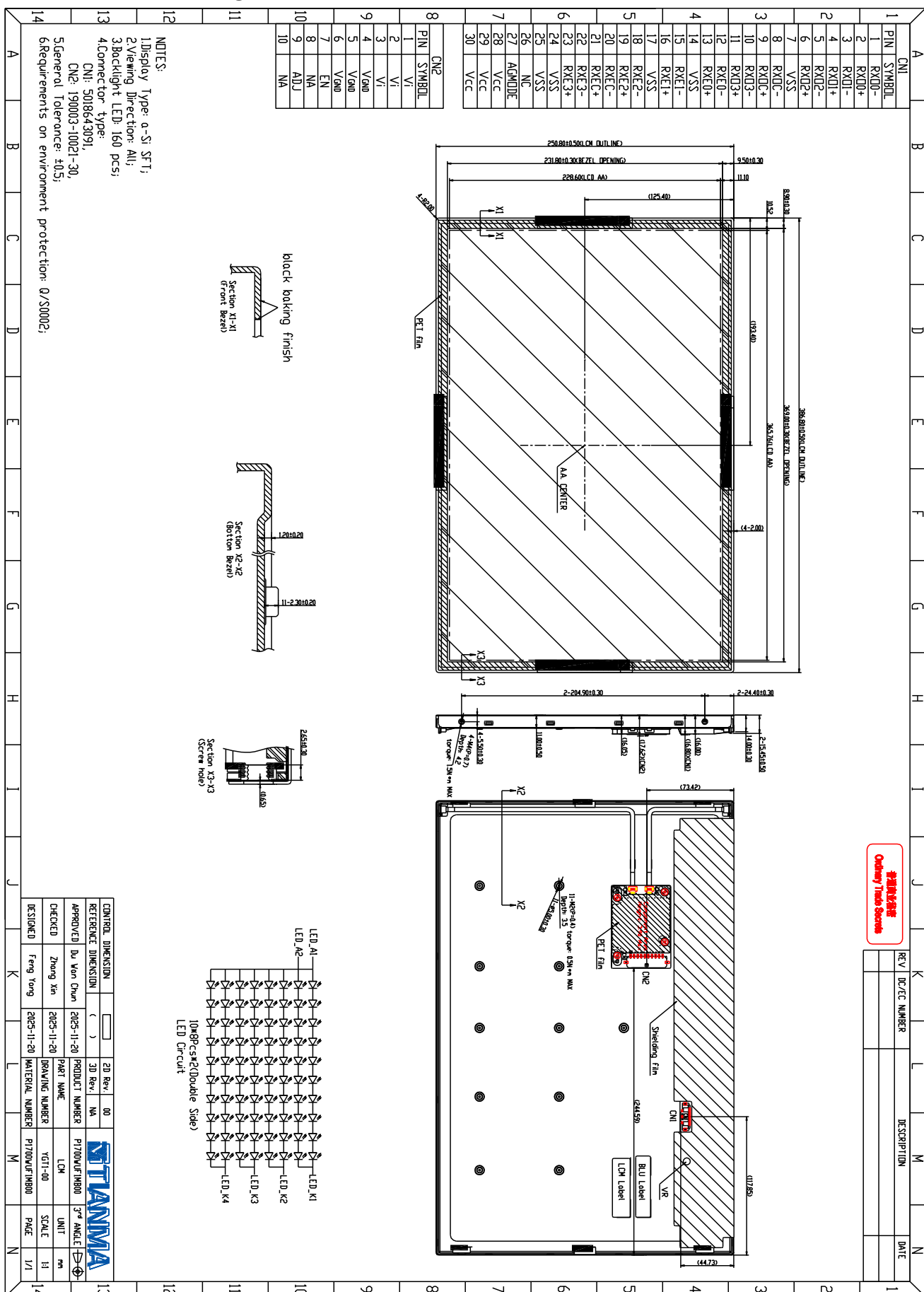
Note1: Temperature is the ambient temperature of sample

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.

Note4: Just for reference, it need to be test.

9. Mechanical Drawing



10. Packing Instruction

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.