TIANMA

SPECIFICATION
FOR LCD MODULE

MODEL NO:	TM201XDHP02-01
CUSTOMER:	
CUSTOMER P/N.	
VERSION	V1.0
CUSTOMER APPROVED	

□Target specification
■Preliminary specification
□ Final specification

PREPARED BY	CHECKED BY	VERIFIED BY QA DEPT.	APPROVED BY

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Record of Revision

Version	Page	Revision Items	Name	Date
V1.0		Preliminary Release	陈晔	20170731

1 General Specifications

Feature		Spec
Display Spec.	Size	20.1 inch
	Resolution	1600RGB x 1200
	Interface	LVDS
	Color Depth	8 bit
	Technology Type	a-Si TFT LCD
	Pixel Pitch (mm)	0.255X0.255
	Pixel Configuration	RGB vertical stripe
	Display Mode	TM with Normally Black
	Surface Treatment(Up Polarizer)	AG(3H)
	Viewing Direction	All Direction
	Gray Scale Inversion Direction	NA
Mechanical Characteristics	LCM (W x H x D) (mm)	432X331.5X25
	Active Area(mm)	408(H) X 306(V)
	With /Without TSP	Without TSP
	Weight (g)	TBD

Note 1: Viewing direction for best image quality is different from TFT definition, there is a 180 degree shift.

Note 2 : Requirements on Environmental Protection: Q/S0002

Note 3 : LCM weight tolerance : +/- 5%

2 Input/Output Terminals

2.1 CN1 OR CN2 Pin Assignment

Matching connector: MDF76-30P-1C(Hirose)

Pin	Symbol	I/O	Description	Remark
1	VCC	P	voltage for analog circuit(12V)	
2	VCC	P	voltage for analog circuit(12V)	
3	VCC	P	voltage for analog circuit(12V)	
4	VCC	P	voltage for analog circuit(12V)	
5	VSS	P	ground	
6	VSS	P	ground	
7	E_R3+	I	LVDS input pair 3-Even	
8	E_R3-	I	LVDS input pair 3-Even	
9	E_CLK+	I	LVDS input clock-Even	
10	E_CLK-	I	LVDS input clock-Even	
11	E_R2+	I	LVDS input pair 2-Even	
12	E_R2-	I	LVDS input pair 2-Even	
13	E_R1+	I	LVDS input pair 1-Even	
14	E_R1-	I	LVDS input pair 1-Even	
15	E_R0+	I	LVDS input pair 0-Even	
16	E_R0-	I	LVDS input pair 0-Even	
17	VSS	P	ground	
18	VSS	P	ground	
19	O_R3+	I	LVDS input pair 3-Odd	
20	O_R3-	I	LVDS input pair 3-Odd	
21	O_CLK+	1	LVDS input clock-Odd	
22	O_CLK-	1	LVDS input clock-Odd	
23	O_R2+	P	LVDS input pair 2-Odd	
24	O_R2-	I	LVDS input pair 2-Odd	
25	O_R1+	I	LVDS input pair 1-Odd	
26	O_R1-	I	LVDS input pair 1-Odd	
27	O_R0+	I	LVDS input pair 0-Odd	
28	O_R0-	I	LVDS input pair 0-Odd	
29	VSS	P	ground	
30	NC		Reserve	

2.2 CN3 Pin Assignment

Connector: 3707K-Q08N-01L

No.	Symbol	Functions	Remark
1	LED_A1	Anode for LED Bar	
2	LED_K1	Cathode for LED Bar	
3	LED_K2	Cathode for LED Bar	
4	LED_K3	Cathode for LED Bar	
5	LED_K4	Cathode for LED Bar	
6	LED_K5	Cathode for LED Bar	

3 Absolute Maximum Ratings

3.1 Driving TFT LCD Panel

AVSS=GND=0V,Ta =25°C

Parameter		Symbol	Rating	Unit	Remark
Input voltage for signals	Digital input voltage	VID	-0.3 to 3.6	V	Note 2
Storage temperature		Tst	-40 to +80	℃	Note 3
Operating temperature	Front surface	TopF	-20 to +70	℃	Note 3
	Rear surface	TopR		℃	
Relative humidity	Ta <40℃	RH	90	%	Note 3 Note 4
	40 < Ta< 50℃		85	%	
	50 < Ta< 60℃		55	%	
	60 < Ta <70℃		20	%	
Absolute humidity	Ta > 70℃	AH	40	g/m3	Note 3 Note 4 Note 5

Note 1: Stresses above these listed under Absolute Maximum Ratings may cause permanent damage to LCD.

Note 2: CMOS logical input signal, such as R/G/B data signal, STV,CLK etc.

Note 3: Measured the front or rear surface of LCD panel (including self-heat of LCD module).

Note 4: No condensation

Note 5: Water amount at Ta=55°C and RH=70%. Ta is ambient temperature.

4 Electrical Characteristics

4.1 Driving TFT LCD Panel

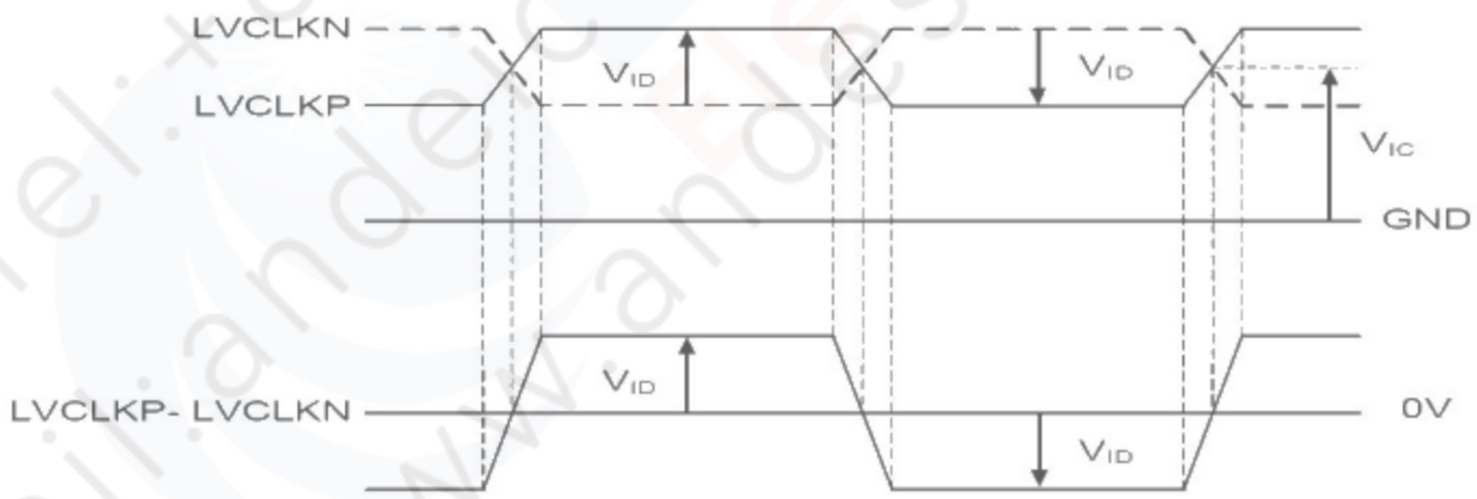
GND=0V, Ta = 25℃

Item		Symbol	MIN	TYP	MAX	Unit	Remark
Supply Voltage		VCC	11.5	12	12.5	V	
Input Signal Voltage	Low Level	VIL	GND	-	0.2*VCC	V	
	High Level	VIH	0.8*VCC	-	VCC	V	
Output Signal Voltage	Low Level	VOL	GND	-	0.3*VCC	V	
	High Level	VOH	0.7*VCC	-	-	V	
LVDS	Differential Input high threshold	V_{TH}	-	-	+100	mV	Note 3
	Differential Input high threshold	V_{TL}	-100	-	-	mV	
	Common mode voltage	V_{IC}	0.7	1.2	1.6	V	
	Swing voltage	V_{ID}	±100	-	±600	mV	
Current of logical supply voltage		IVCC		350	600	mA	Note 2

Note1: These parameters should be optimized based on different LCD, different luminance of LCD panel or different surface temperature of LCD panel.

Note2: To test the current dissipation, use “all Black Pattern”.

Note3: LVDS input condition.



4.2 Recommended Driving Condition for Backlight

Item	Symbol	Min	Typ	Max	Unit	Remark
Forward Current	I_F	-	120	-	mA	50 LEDs (10 LED Serial, 5 LED Parallel)
Forward Voltage	V_F	-	3.3	-	V	
Operating Life Time	-	30000		-	Hrs	

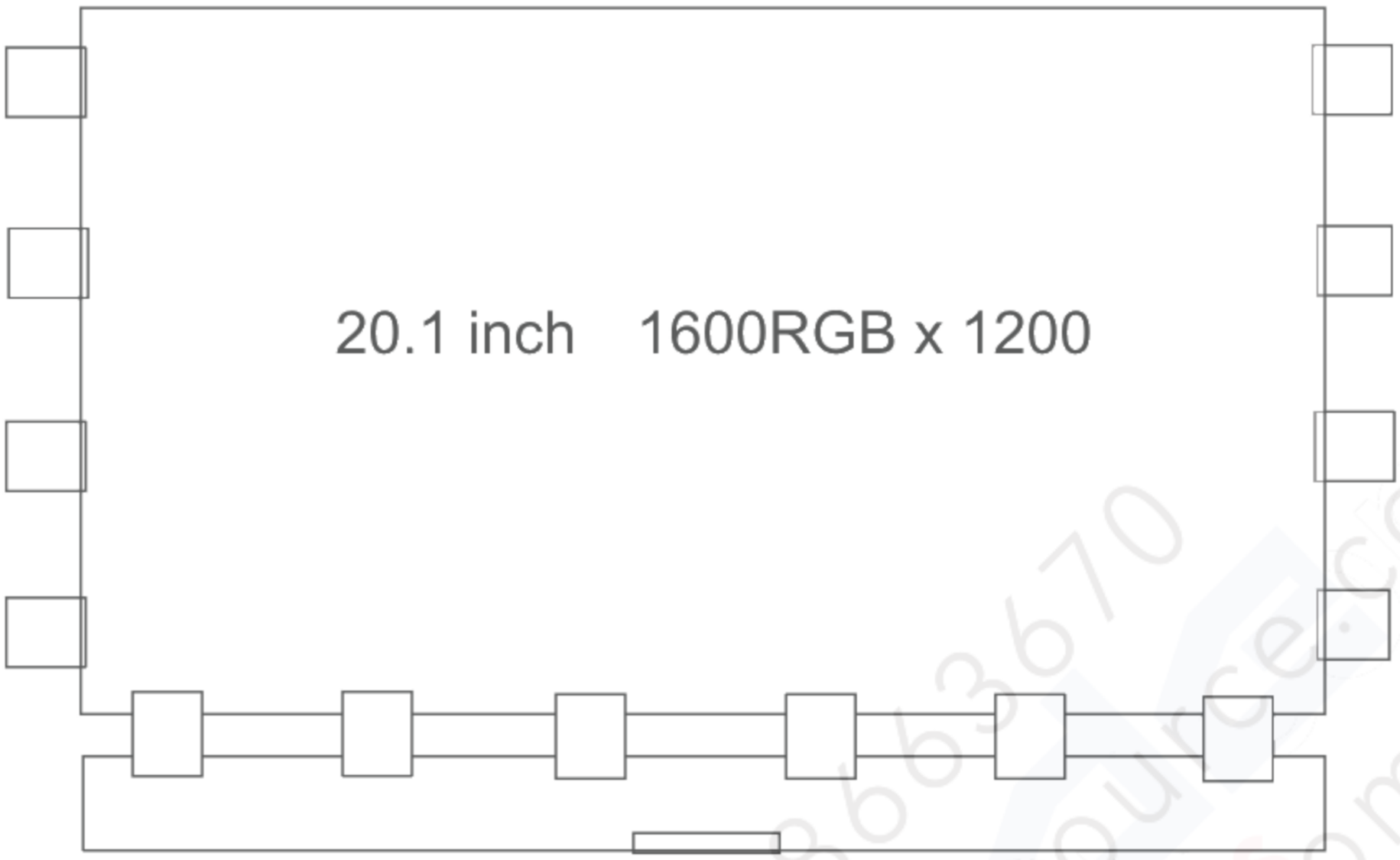
Note1: For each LED: IF (1/6) =120mA, VF (1/10) =3.3V.

Note2: Under LCM operating, the stable forward current should be inputted. And forward voltage is for reference only.

Note3: I_F is defined for one channel LED. V_F is defined for one LED. Optical performance should be evaluated at Ta=25℃ 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% initial brightness. Typical operating life time is estimated data.

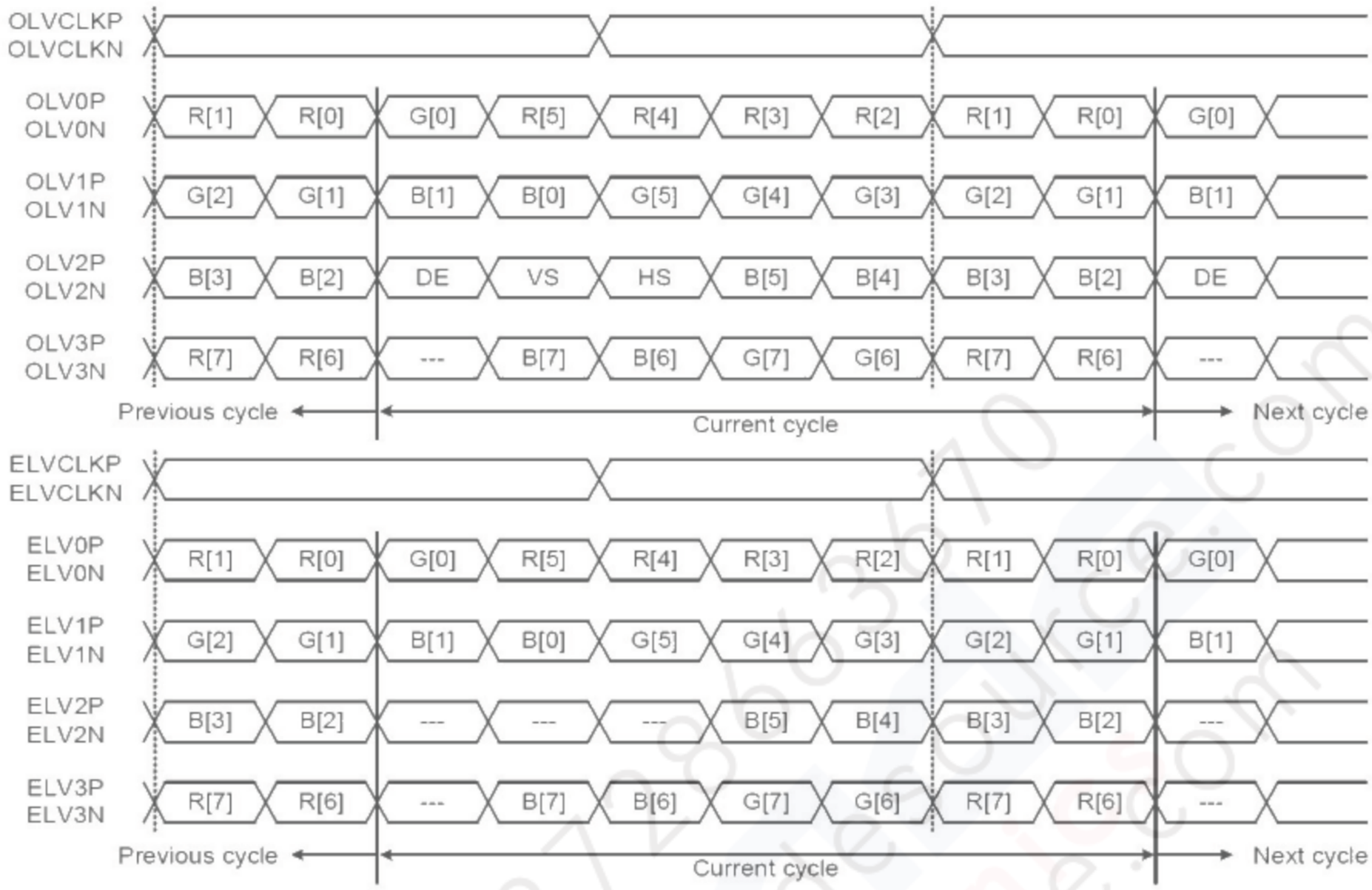
Note4: The LED driving condition is defined for each LED module.

4.3 Block Diagram



5 Timing Chart

5.1 LVDS Data Mapping (VESA mode)

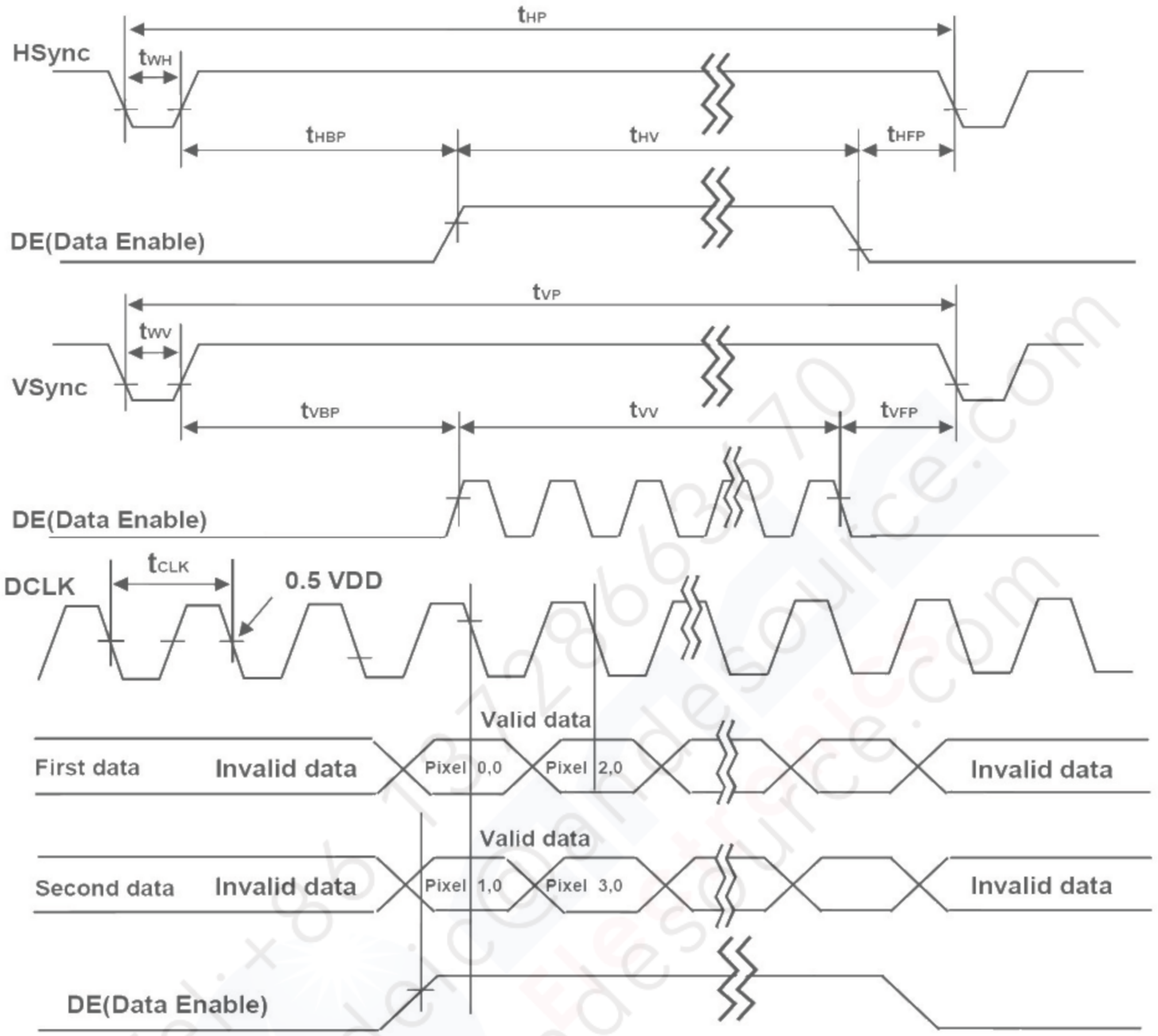


5.2 LVDS Timing (VESA mode)

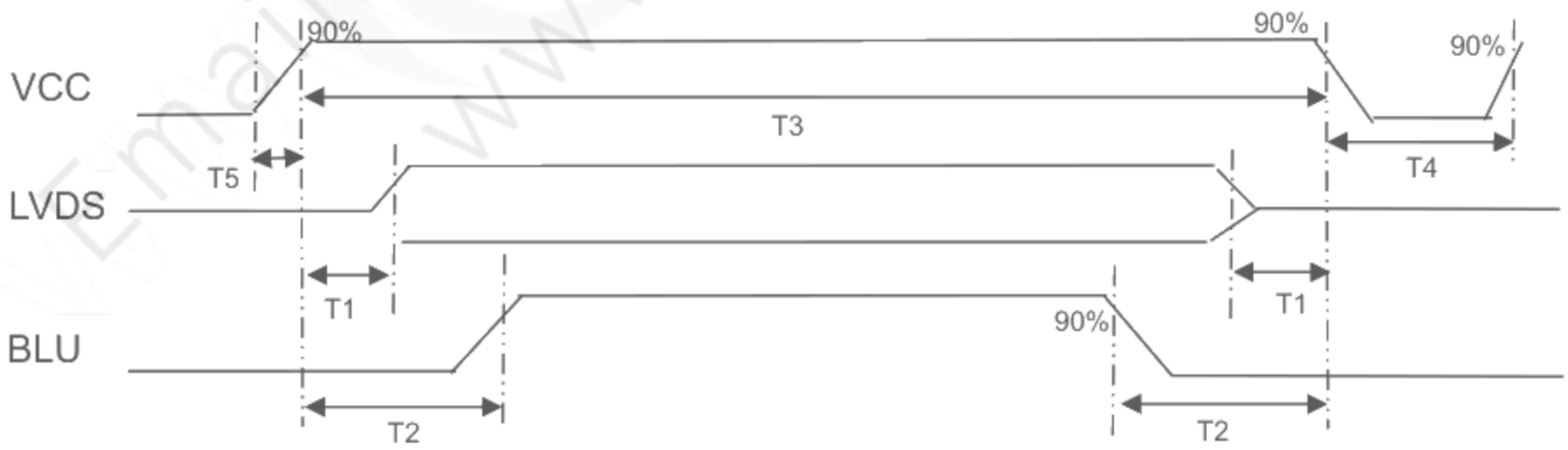
AVSS=GND=0V, Ta=25℃

Parameter	Symbol	Min	Typ	Max	Unit	Remark
DCLK	FCLK		81		MHz	Tclk=1/Fclk
Hsync	tHP		1080		Tclk	
	tHV		800		Tclk	
	tWH		56		Tclk	
	tHBP		152		Tclk	
	tHFP		32		Tclk	
	tHB		280		Tclk	tHB=tWH+tHBP+tHFP
Vsync	tVP		1250		th	
	tVV		1200		th	
	tWV		3		th	
	tVBP		46		th	
	tVFP		1		th	
	tVB		50		th	tVB=tWV+tVBP+tVFP

5.3 Timing Chart



5.4 Power ON/OFF Sequence



备注： 0ms< T1<70ms； 300ms< T2<500ms; T5<2ms;

6 Optical Characteristics

6.1 Optical Specification

Item		Symbol	Condition	Min	Typ	Max	Unit	Remark
View Angles		θT	CR≧10	70	85	-	Degree	Note 2
		θB		70	85	-		
		θL		70	85	-		
		θR		70	85	-		
Contrast Ratio		CR	θ=0°	800	1000	-	-	Note1 Note3
Response Time		T_{ON}	25℃	-	25	40	ms	Note1 Note4
		T_{OFF}						
Chromaticity	White	x	Backlight is on	0.298	0.313	0.328	-	Note5 Note1
		y		0.313	0.328	0.343		
	Red	x			0.632			
		y			0.330			
	Green	x			0.303			
		y			0.619			
	Blue	x			0.147			
		y			0.084			
Uniformity		U	-	80	-	-	%	Note1 Note6
NTSC		-	-	65	70	-	%	Note 5
Luminance		L	-	800	1000	-	cd/m^2	Note1

Test Conditions:

1> The test sample of LCD panel should be placed in room temperature environment (Ta=23±2℃, Ts≤35℃, humidity=50±5%, atmospheric pressure=86~106KPa).

Note: Ts is measured the front or rear surface temperature of LCD panel (including self-heat of LCD module). Ta is ambient temperature.

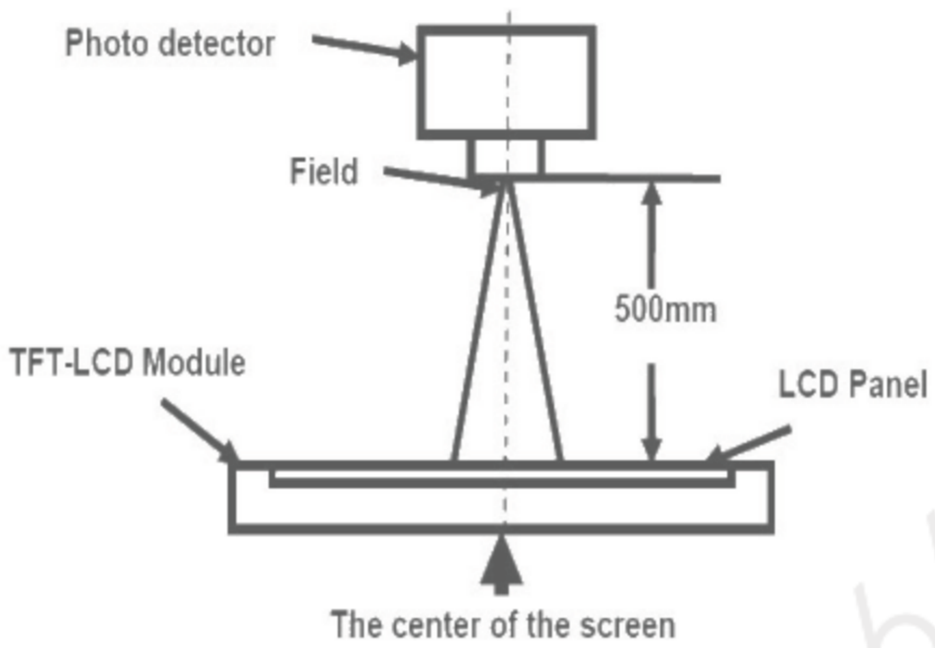
2> The optical characteristics should be measured at saturation luminance after 20 minutes from LCD module working in dark room(≤1 lux). The saturation luminance is defined when the "white state" luminance, its range is 1000cd/m2.

3>The optical characteristics should be measured under the optimization driving

conditions defined by TIANMA.

Note 1: Definition of optical measurement system.

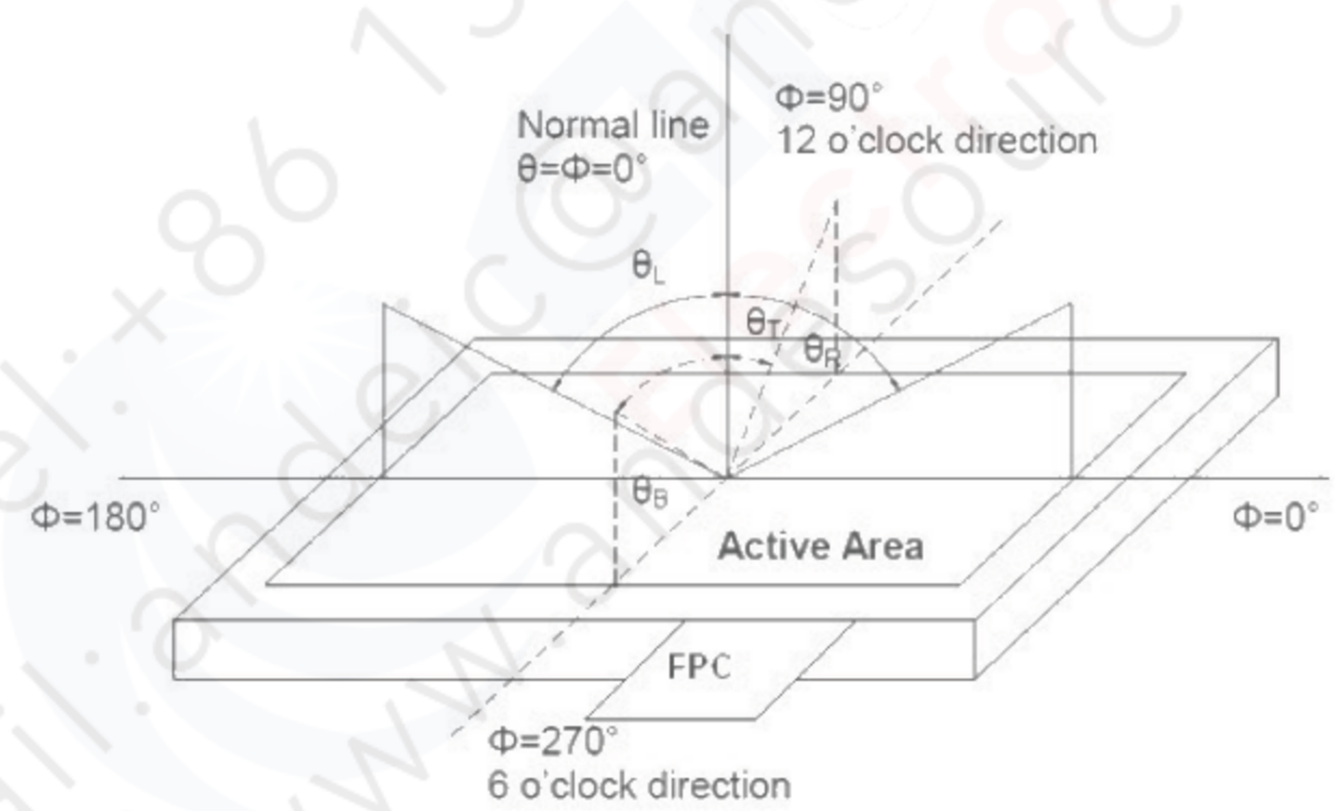
The optical characteristics should be measured in dark room. After 5 minutes operation, the optical properties are measured at the center point of the LCD left screen and right screen. All input terminals LCD panel must be ground when measuring the center area of the panel.



Item	Photo detector	Field
Contrast Ratio	SR-3A	0.2°
Luminance		
Chromaticity		
Luminance Uniformity		
Response Time	LCD5200	0.2°

Note 2: Definition of viewing angle range and measurement system.

viewing angle is measured at the center point of the LCD by CONOSCOPE(ergo-80)。



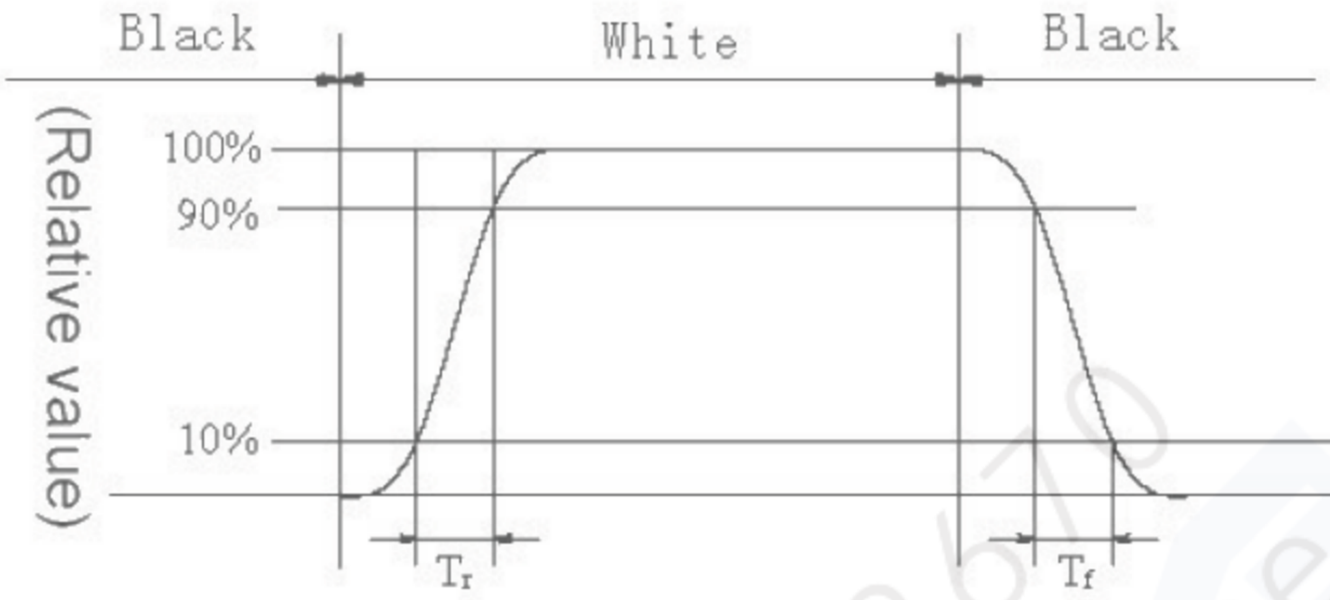
Note 3: Definition of contrast ratio

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

"White state ":The state is that the LCD should driven by Vwhite.
"Black state" : The state is that the LCD should driven by Vblack.
Vwhite: To be determined Vblack: To be determined.

Note 4: Definition of Response time

The response time is defined as the LCD optical switching time interval between "White" state and "Black" state. Rise time (TON) is the time between photo detector output intensity changed from 10% to 90%. And fall time (TOFF) is the time between photo detector output intensity changed from 90% to 10%.



Note 5: Definition of color chromaticity (CIE1931)

Color coordinates measured at center point of LCD.

Note 6: Definition of Luminance Uniformity

Active area is divided into 9 measuring areas (Refer Fig. 2). Every measuring point is placed at the center of each measuring area.

Luminance Uniformity(U) = Lmin/ Lmax

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

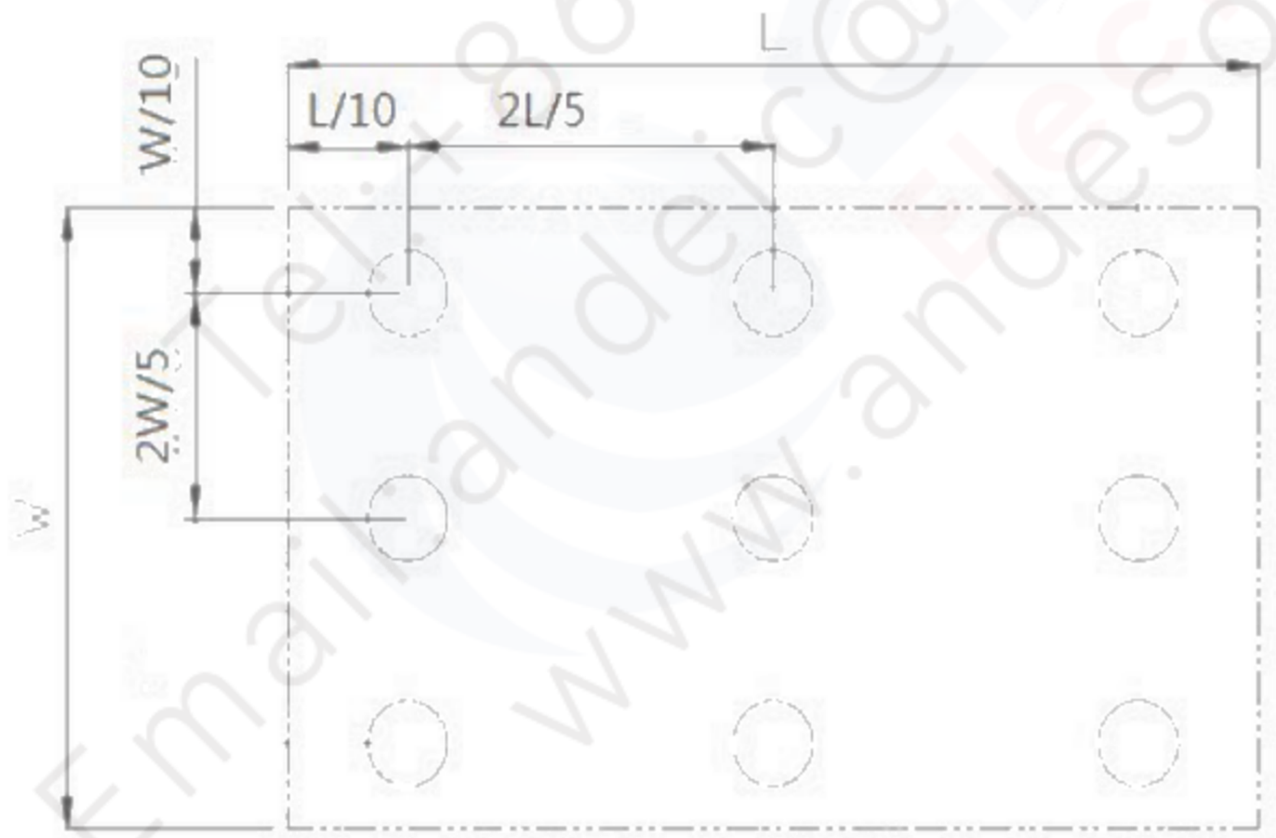


Fig. 2 Definition of uniformity

Lmax: The measured maximum luminance of all measurement position.

Lmin: The measured minimum luminance of all measurement position.

Luminance Uniformity base on Luminance Uniformity of BLU ≥ 95%.

7 Environmental / Reliability Test

No	Test Item	Condition	Remark
1	High Temperature Storage (non-operation)	Ts=+80℃, 48hrs	IEC60068-2-1 GB2423.2
2	Low Temperature Storage (non-operation)	Ts=-40℃, 48hrs	IEC60068-2-1 GB2423.1
3	Hign Temperature Operation	Ts=70℃, 24Hrs	IEC60068-2-1-2007 GB2423-2-2008
4	Low Temperature OPeration	Ts=-20℃, 4Hrs	IEC60068-2-1-2007 GB2423-2-2008
5	Storageat High Temperature and Humidity	Ts=60℃.90%RH 120Hours	IEC60068-2-1-2007 GB2423-2-2008
6	Vibration Test	Frequency range:5~16Hz Stroke:1.0mm 16~60Hz 1g; 60~160Hz 2.5g; 2 hours for each direction of X.Y.Z. (6 hours for total)	IEC60068-2-6:1982 GB/T2423.10—1995
7	Mechanical Shock (Non Op)	Half Sine Wave 50G 11ms, ±X,±Y,±Z 3times for each direction	IEC60068-2-27:1987 GB/T2423.5—1995

Note 1: Ts is measured the front or rear surface temperature of LCD panel (including self-heat of LCD module).

Note 2: All of reliability test items above become a combination-test, but for every LCD panels, only one combination-test is allowed to do.

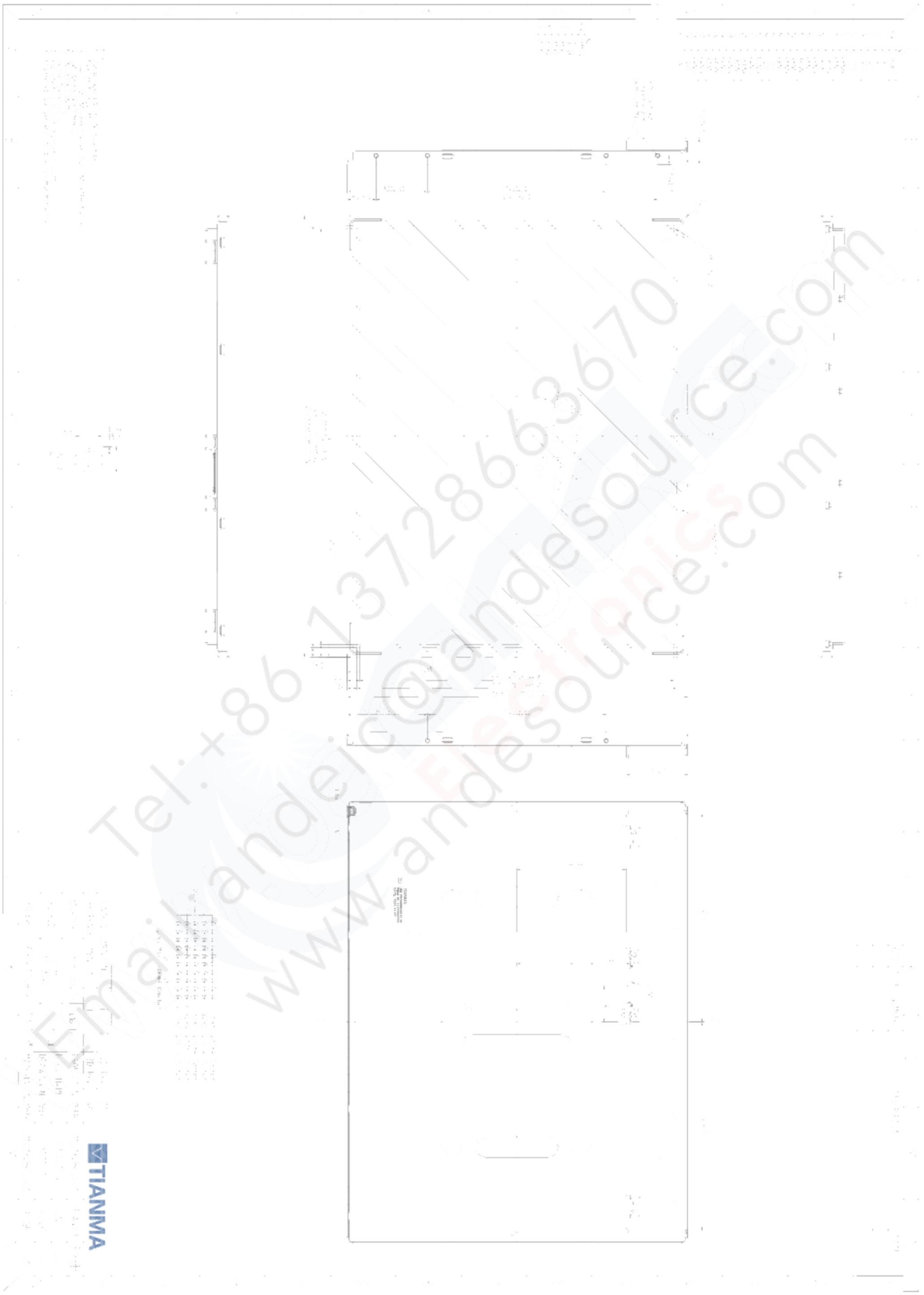
Note 3: Before reliability test, the visual inspection should be judged and the optical characteristics should be measured under the test conditions defined by this specification.

Note 4: During reliability test, the new functional defects are not allowed, such as no display, dot defect, bright line, LC bubble etc. , and other problems are ignored.

Note 5: After each reliability test, the LCD panel samples should be placed in room temperature environment(Ta=23 ± 2℃, Ts ≤ 35℃, humidity=50 ± 5%, atmospheric pressure=86~106KPa,) for 60 minutes before the visual inspection. The new

functional defects are not allowed, such as no display, dot defect, bright line, LC bubble etc. the MURA and small bright dot should not be visible under the inspection conditions defined by IIS(Income Inspection Standard), for example using 5% ND filter and view distance 50±5cm etc. ; and other problems are ignored.

8 Mechanical Drawing



9 Packing Drawing

--TBD

10 Precautions For Use of LCD Modules

10.1 Handling Precautions

10.1.1 The display panel is made of glass. Do not subject it to a mechanical shock by dropping it from a high place, etc.

10.1.2 If the display panel is damaged and the liquid crystal substance inside it leaks out, be sure not to get any in your mouth, if the substance comes into contact with your skin or clothes, promptly wash it off using soap and water.

10.1.3 Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary.

10.1.4 The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully.

10.1.5 If the display surface is contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If still not completely clear, moisten cloth with one of the following solvents:

- Isopropyl alcohol
- Ethyl alcohol

Solvents other than those mentioned above may damage the polarizer. Especially, do not use the following:

- Water
- Ketone
- Aromatic solvents

10.1.6 Do not attempt to disassemble the LCD Module.

10.1.7 If the logic circuit power is off, do not apply the input signals.

10.1.8 To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.

10.1.8.1 Be sure to ground the body when handling the LCD Modules.

10.1.8.2 Tools required for assembly, such as soldering irons, must be properly ground.

10.1.8.3 To reduce the amount of static electricity generated, do not conduct assembly and other work under dry conditions.

10.1.8.4 The LCD Module is coated with a film to protect the display surface. Be care when peeling off this protective film since static electricity may be generated.

10.2 Storage Precautions

10.2.1 When storing the LCD modules, avoid exposure to direct sunlight or to the light of fluorescent lamps.

10.2.2 The LCD modules should be stored under the storage temperature range. If the LCD modules will be stored for a long time, the recommend condition is:

Temperature : 0℃ ~ 40℃ Relatively humidity: ≤80%

10.2.3 The LCD modules should be stored in the room without acid, alkali and harmful gas.

10.3 Transportation Precautions

The LCD modules should be no falling and violent shocking during transportation, and also should avoid excessive press, water, damp and sunshine.