



Product Specification For TFT Module

Model Name	XF123WHD02A-ILHL
Customer	
Note	

☒ Preliminary Specification

☐ Final Specification

☐ CUSTOMER'S APPROVAL
BY:
DATE:
Comment

PRESENTED BY



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1. General Description

1.1 Introduction

XINSUN Display model XF123WHD02A-ILHL is a color active matrix thin film transistor (TFT) liquid crystal display (LCD) that uses amorphous silicon TFT as a switching device. This model is composed of a TFT LCD panel, a driving circuit and a back light system. This TFT LCD has a 12.28" (8:3) inch diagonally measured active display area with 5760 x 720 dot (1920 horizontal by 720 vertical pixel) resolution.

1.2 Features

- 12.28 (8:3 diagonal) inch configurations
- 16.7M
- ROHS / Halogen Free Compliance

1.3 Applications

Automotive

1.4 General Information

Item	Specification	Unit
Outline Dimension	308.1(H) x 130.0(V) x 7.6(Typ.)	mm
Display area	292.032(H) x 109.512(V)	mm
Number of Pixel	1920 RGB (H) x 720(V)	pixels
Pixel pitch	0.1521(H) x 0.1521 (V)	mm
Pixel arrangement	RGB Vertical stripe	
Display mode	Normally Black	
NTSC	70 (typ.)	%
Surface treatment	AG	
Back-light	Single LED (Side-Light type)	



1.5 Mechanical Information

Item		Min.	Typ.	Max.	Unit
ModuleSize	Horizontal (H)	307.6	308.1	308.6	mm
	Vertical (V)	129.5	130.0	130.5	mm
	Depth (D)	7.3	7.6	7.9	mm
Weight		—	515	540	g

2. Absolute Maximum Ratings

2.1 Electrical Absolute Rating

2.1.1 TFT LCD Module

Parameters	Symbol	Min.	Max.	Unit	Note
Power Logic	VCC	-0.3	3.6	V	

2.2 Environment Absolute Rating

Item	Symbol	Min.	Max.	Unit	Note
Operating Temperature	Topa	-30	85	°C	
Storage Temperature	Tstg	-40	90	°C	

3. Optical Characteristics

3.1 Optical Specification

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Contrast		CR	$\Theta=0$ Normal viewing angle	900	1100	—		(1)(2)
Response Time	Rising	T _R		—	—	14	msec	(1)(3)
	Falling	T _F		—	—	16		
White luminance (Center)		Y _L		650	850	—	cd/m ²	(1)(4) (I _L =280mA)
Color chromaticity (CIE1931)	White	W _x		0.256	0.296	0.336		(1)(4)
		W _y		0.284	0.324	0.364		
	Red	R _x		0.608	0.648	0.688		
		R _y		0.293	0.333	0.373		
	Green	G _x		0.251	0.291	0.331		
		G _y		0.569	0.609	0.649		
	Blue	B _x		0.106	0.146	0.186		
		B _y		0.020	0.060	0.100		
Viewing angle	Hor.	Θ _L	CR>10	80	85	—		
		Θ _R		80	85	—		
	Ver.	Θ _U		80	85	—		
		Θ _D		80	85	—		
Brightness uniformity		B _{UNI}	Θ=0	70	80	—	%	(5)

3.2 Measuring Condition

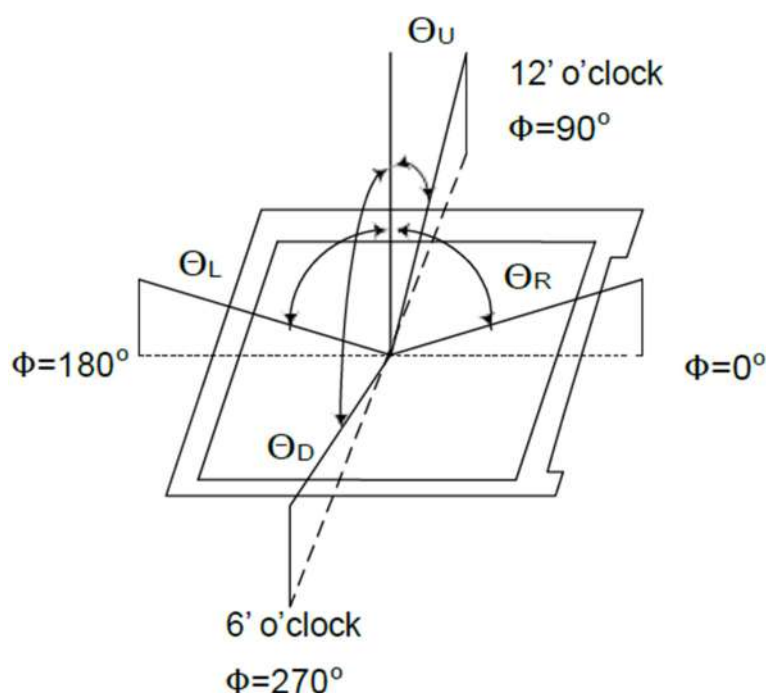
- Measuring surrounding : dark room
- LED current I_L : 280mA
- Ambient temperature : $25 \pm 2^\circ C$

3.3 Measuring Equipment

■ FPM520 of Westar Display technologies, INC., which utilized SR-3 for Chromaticity and BM-7 for other optical characteristics.

■ Measuring spot size : 20 ~ 21 mm

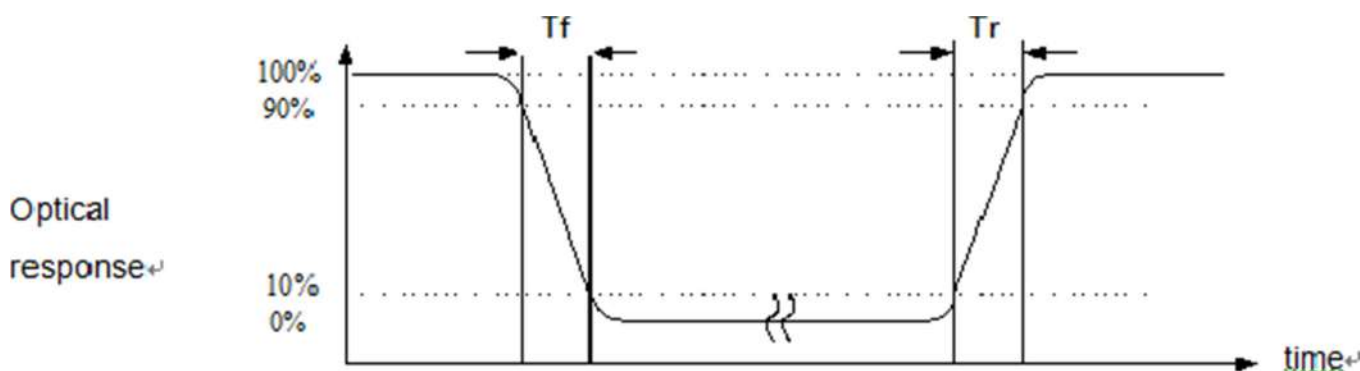
Note (1) Definition of Viewing Angle:



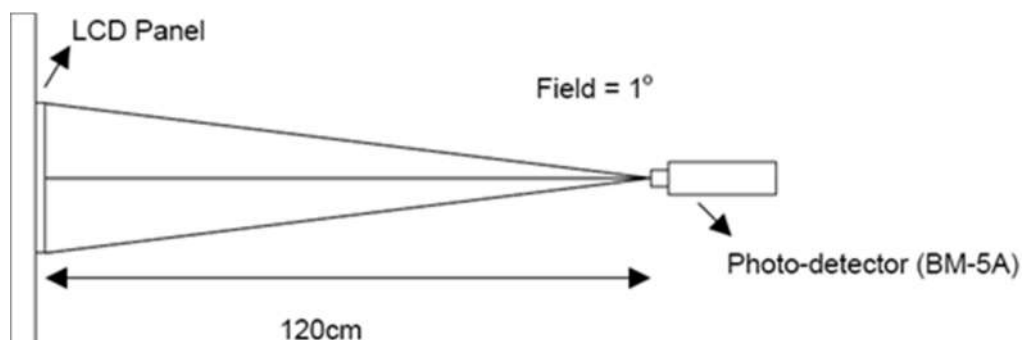
Note (2) Definition of Contrast Ratio (CR) : measured at the center point of panel

$$CR = \frac{\text{Luminance with all pixels white}}{\text{Luminance with all pixels black}}$$

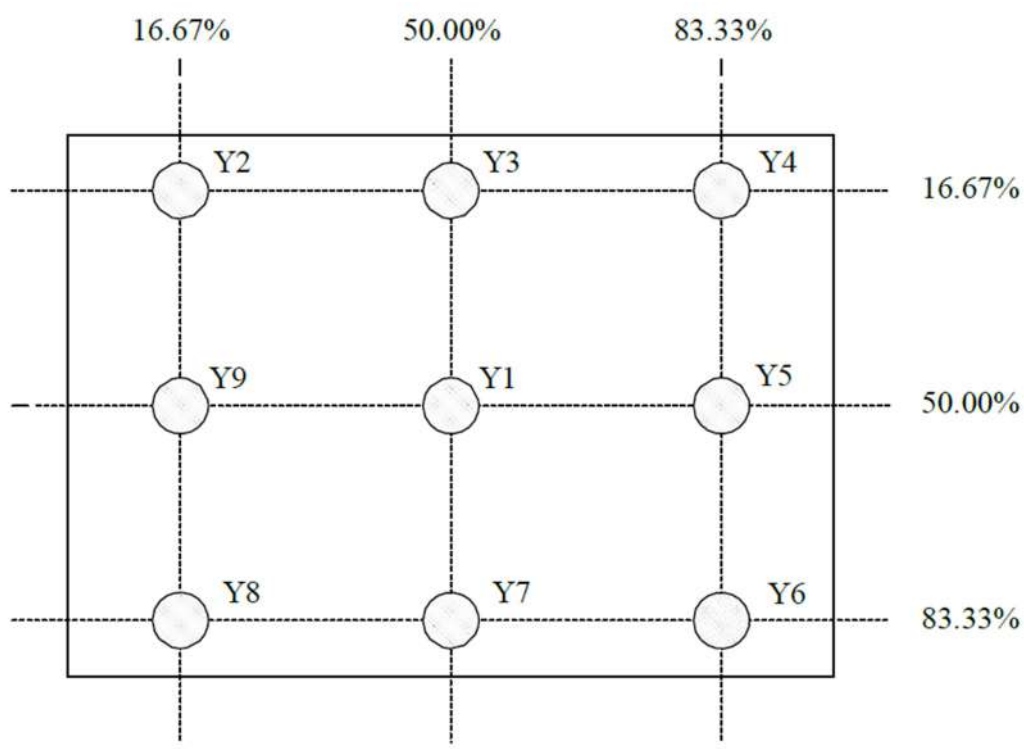
Note (3) Definition of Response Time : Sum of TR and TF



Note (4) Definition of optical measurement setup



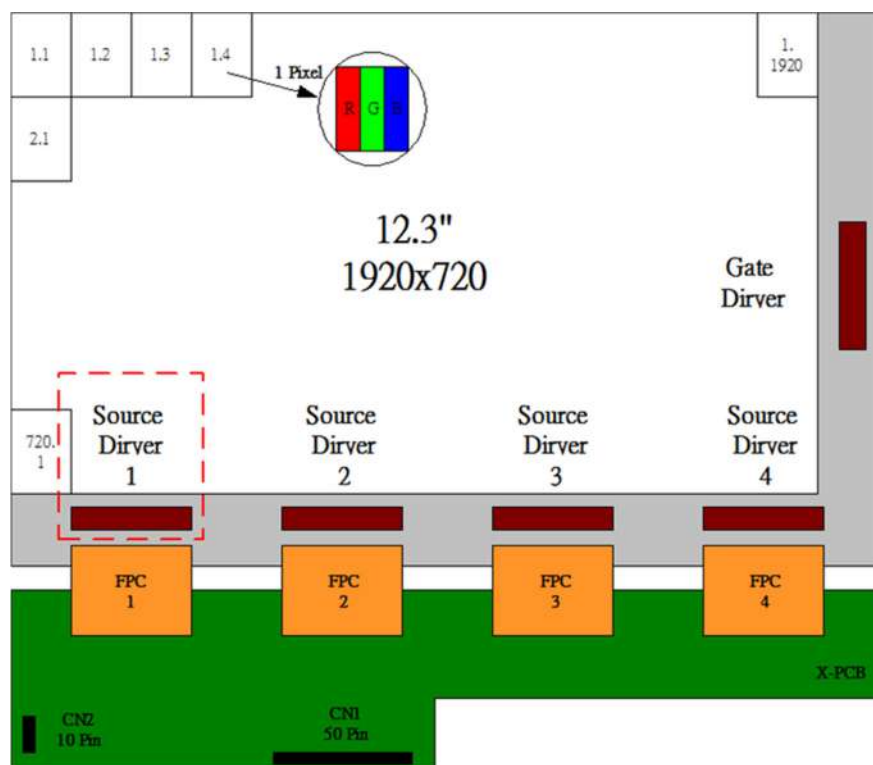
Note (5) Definition of brightness uniformity



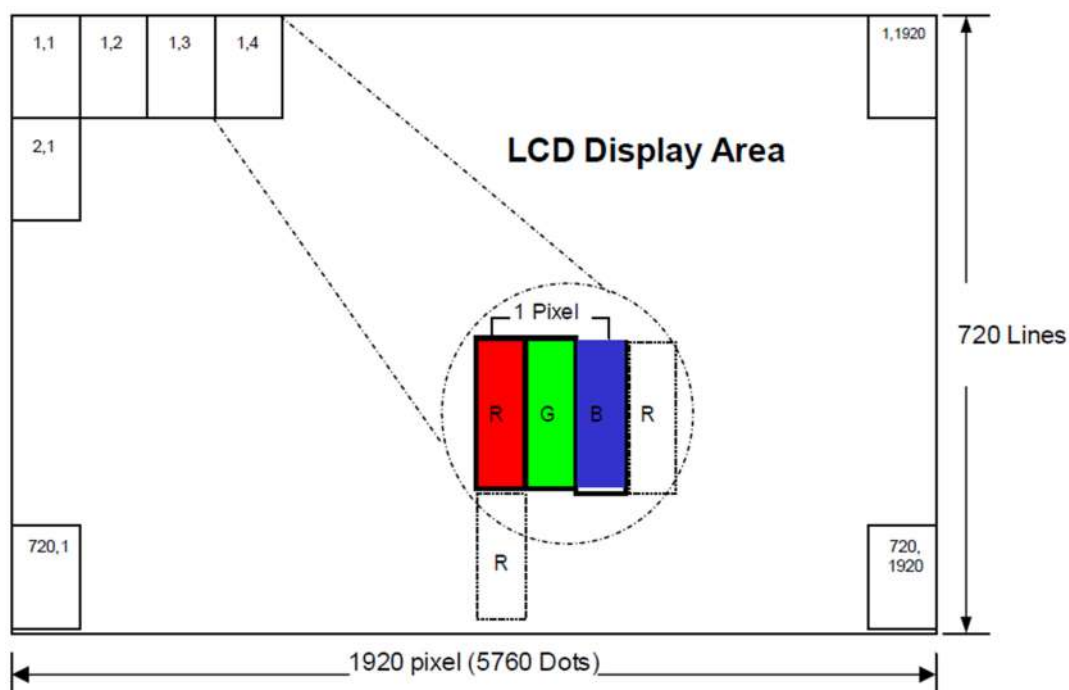
$$\text{Luminance uniformity} = \frac{(\text{Min Luminance of 9 points})}{(\text{Max Luminance of 9 points})} \times 100\%$$

4. Block Diagram

4.1 TFT LCD Module



4.2 Pixel Format





4.3 Relationship Between Displayed Color and Input

	Display	MSB	LSB								MSB	LSB								MSB	LSB								Gray scale
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0	Level			
Basic color	Black	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	-			
	Blue	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	H	H	H	H	-			
	Green	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	-			
	Light Blue	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	H	H	H	H	-			
	Red	H	H	H	H	H	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	-			
	Purple	H	H	H	H	H	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	-			
	Yellow	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	L	L	L	L	L	L	L	L	-			
	White	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	-			
Gray scale of Red	Black	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L0			
	Dark	L	L	L	L	L	L	L	L	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L1		
		L	L	L	L	L	L	L	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L2		
		↑								:	:								:								L3...L251		
		L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L252		
	Light	L	L	L	L	L	L	L	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L253		
		L	L	L	L	L	L	L	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L254		
	Red	H	H	H	H	H	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	Red L255			
	Gray scale of Green	Black	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L0		
Dark		L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	L	L	L	L	L	L	L	L	L	L1		
		L	L	L	L	L	L	L	L	L	L	L	L	L	H	L	L	L	L	L	L	L	L	L	L	L	L2		
		↑								:	:								:								L3...L251		
		L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L252		
Light		L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L253		
		L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L254		
Green		L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	Green L255			
Gray scale of Blue		Black	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L0		
	Dark	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	L	L1			
		L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	L	L	L	L2			
		↑								:	:								:								L3...L251		
		L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L252			
	Light	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L253			
		L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L254			



Gray scale of White &Black	Light	L L L L L L L L	L L L L L L L L	H H H H H H H L	L254
	Blue	L L L L L L L L	L L L L L L L L	H H H H H H H H	Blue L255
	Black	L L L L L L L L	L L L L L L L L	L L L L L L L L	L0
	Dark ↑ ↓ Light	L L L L L L L H	L L L L L L L H	L L L L L L L H	L1
		L L L L L L H L	L L L L L L H L	L L L L L L H L	L2
		:	:	:	L3...L251
		H H H H H H L L	H H H H H H L L	H H H H H H L L	L252
	Light	H H H H H H L H	H H H H H H L H	H H H H H H L H	L253
		H H H H H H H L	H H H H H H H L	H H H H H H H L	L254
		H H H H H H H H	H H H H H H H H	H H H H H H H H	White L255

5. Interface Pin Connection

CN1 FPC connector is used for electronics interface.

AORORA F31L-1A7H1-21050, 50PIN

No.	Symbol	Function
1	GND	Ground
2	NC	No connect
3	VCC	Panel Power
4	VCC	Panel Power
5	GND	Ground
6	GND	Ground
7	NC	No connect
8	NC	No connect
9	GND	Ground
10	O_IN0-	Odd pixel negative LVDS differential clock input
11	O_IN0+	Odd pixel positive LVDS differential clock input
12	O_IN1-	Odd pixel negative LVDS differential clock input
13	O_IN1+	Odd pixel positive LVDS differential clock input
14	O_IN2-	Odd pixel negative LVDS differential clock input
15	O_IN2+	Odd pixel positive LVDS differential clock input
16	O_IN3-	Odd pixel negative LVDS differential clock input
17	O_IN3+	Odd pixel positive LVDS differential clock input
18	O_IN4-	Odd pixel negative LVDS differential clock input
19	O_IN4+	Odd pixel positive LVDS differential clock input
20	E_IN0-	Even pixel negative LVDS differential clock input
21	E_IN0+	Even pixel positive LVDS differential clock input
22	E_IN1-	Even pixel negative LVDS differential clock input
23	E_IN1+	Even pixel positive LVDS differential clock input
24	E_IN2-	Even pixel negative LVDS differential clock input
25	E_IN2+	Even pixel positive LVDS differential clock input
26	E_IN3-	Even pixel negative LVDS differential clock input



27	E_CK+	Even pixel positive LVDS differential clock input
28	E_IN3-	Even pixel negative LVDS differential clock input
29	E_IN3+	Even pixel positive LVDS differential clock input
30	GND	Ground
31	NC	No connect
32	RESET	Global reset pin, active low.
33	STBYB	Standby mode, active low.
34	CA3	Output signal to indicate self-protection mode, when DE,HS,VS,DCLK, any of these signals is missing,it will become High. If using this pin, CA3 need to pulled low by an resistor, else, let it floating.
35	SCL	Serial interface clock input. (User floating)
36	SDA	Serial interface data input/output.(User floating)
37	CSB	Serial interface chip enable.(User floating)
38	GND	Ground
39	GND	Ground
40	NC	No connect
41	LEDA	LED power (Anode)
42	LEDA	LED power (Anode)
43	LEDA	LED power (Anode)
44	NC	No connect
45	LEDK1	Cathode 1
46	LEDK2	Cathode 2
47	LEDK3	Cathode 3
48	LEDK4	Cathode 4
49	NTC_A	NTC_Anode
50	NTC_K	NTC_Cathode



CN2 HIROSE FH52-10S-0.5SH 10PIN

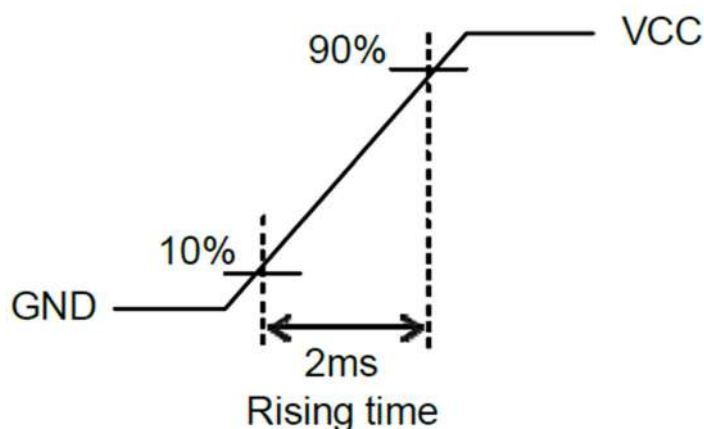
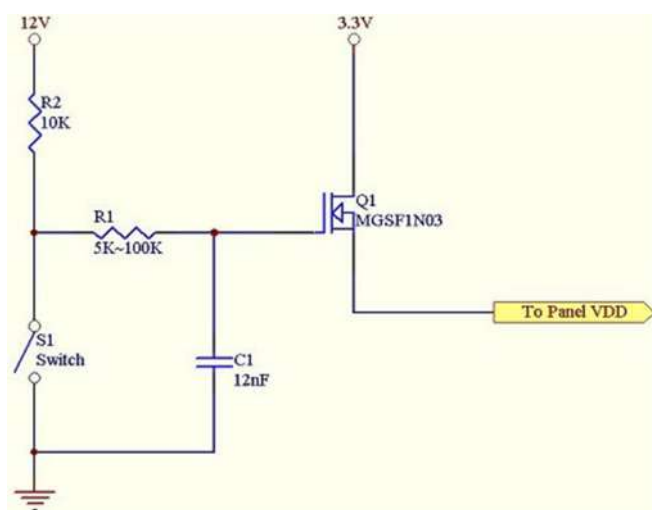
No.	Symbol	Function
1	LEDA	LED power (Anode)
2	LEDA	LED power (Anode)
3	LEDA	LED power (Anode)
4	NC	No connect
5	LEDK1	Cathode 1
6	LEDK2	Cathode 2
7	LEDK3	Cathode 3
8	LEDK4	Cathode 4
9	NTC_A	NTC_Anode
10	NTC_K	NTC_Cathode

6. Electrical Characteristics

6.1 TFT LCD Module

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Supply Voltage	VCC	3	3.3	3.6	V	
Input signal voltage	ViH	VCC*0.7	-	VCC	V	
	ViL	0	-	VCC*0.3	V	
Current of power supply	IDD	--	--	500	mA	VCC =3.3V White pattern
Inrush current	IRUSH	—	—	2.0	A	Note*

Note* : Inrush current test circuit and rising time setting (power on)



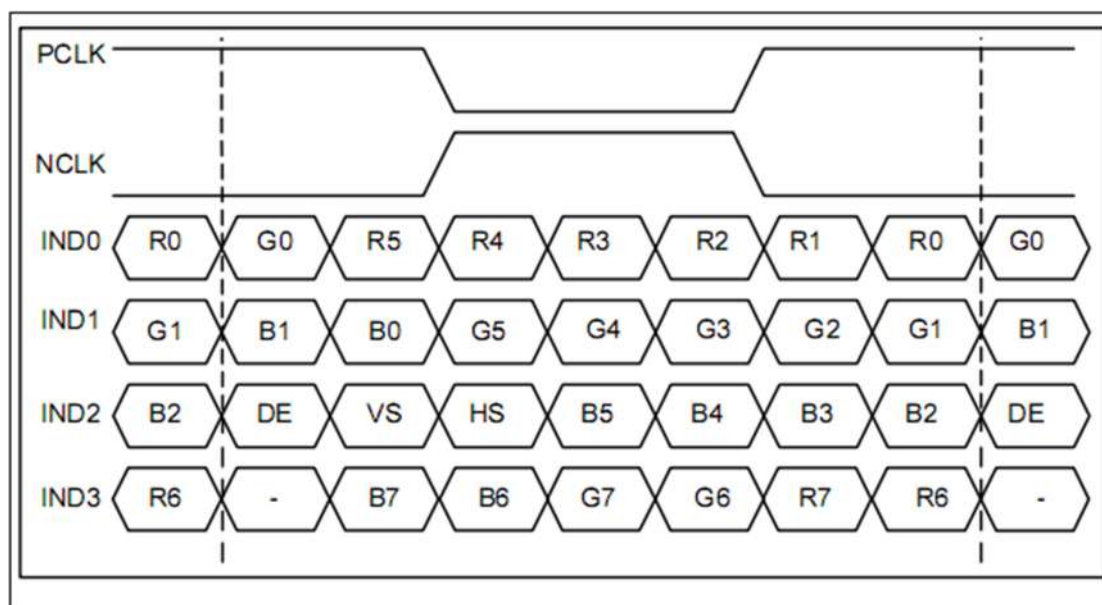
Test circuit

6.2 Switching Characteristics for LVDS Receiver

Item	Symbol	Min.	Typ.	Max.	Unit	Conditions
Differential Input High Threshold	Vth		—	100	mV	V _{CM} =1.2V
Differential Input Low Threshold	Vtl	-100	—		mV	
Input Current Differential input Voltage	I _{IN}	-10	—	+10	uA	
	V _{ID}	0.1	—	0.6	V	
Common Mode Voltage Offset	V _{CM}	1	1.2	1.7-(V _{ID} /2)	V	

6.3 Bit LVDS input

6.3.1 8Bit LVDS input

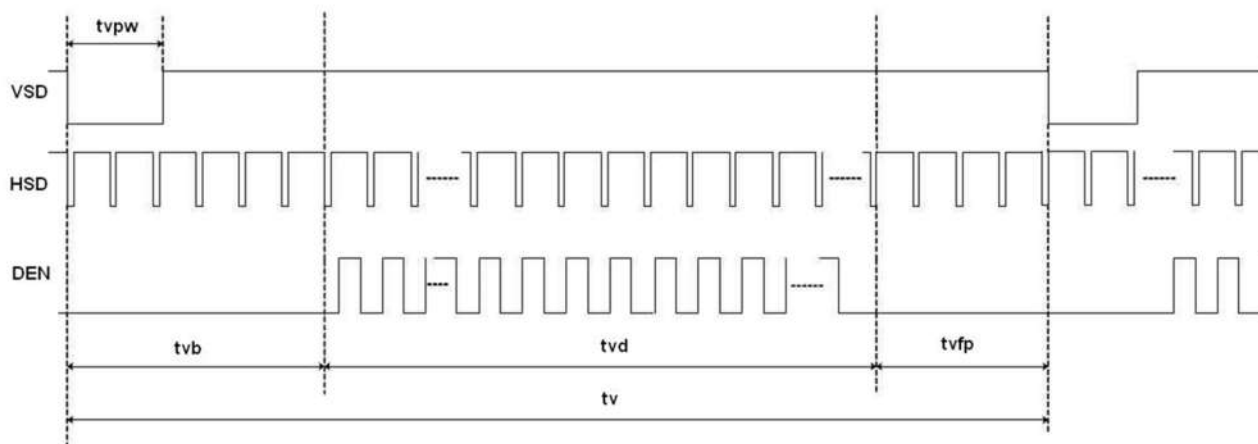


6.4 Interface Timing (DE mode)

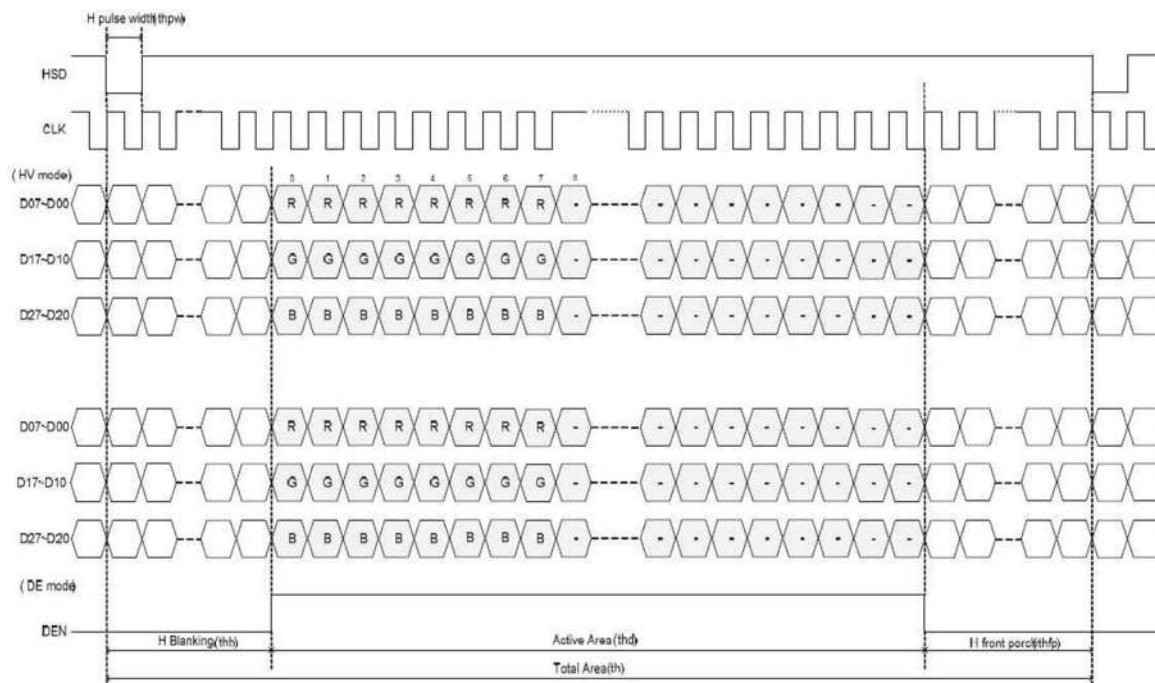
Interface Timing (DE mode)					
Two Port LVDS Timing.(1920xRGBx720)					
Item	Symbol	Min.	Typ.	Max.	Unit
Frame Rate	FR	55	60	65	Hz
Frame Period	T _v	730	792	864	line
Vertical Display Time	T _{vd}	720	720	720	line
Vertical Blanking Time	T _{vb}	10	72	144	line
1 Line Scanning Time	T _h	984	992	1104	clock
Horizontal Display Time	T _{hd}	960	960	960	clock
Horizontal Blanking Time	T _{hb}	24	32	144	clock
Clock Rate	F _{DCLK}	45	47.5	50	MHz

Timing Diagram of Interface Signal (DE mode)

(1) Vertical input timing

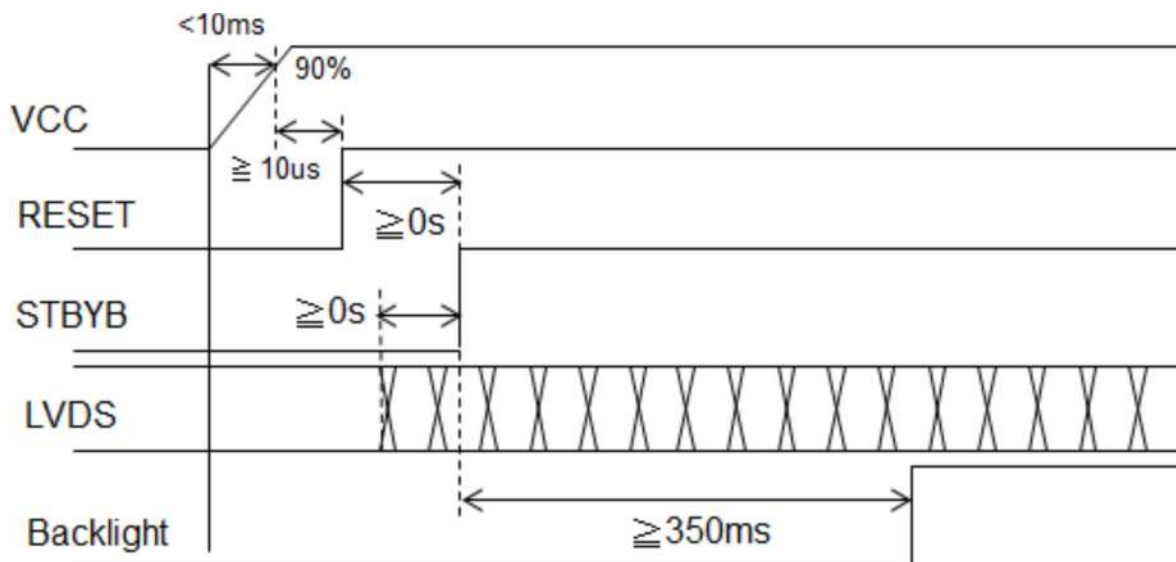


(2) Horizontal Vertical input timing

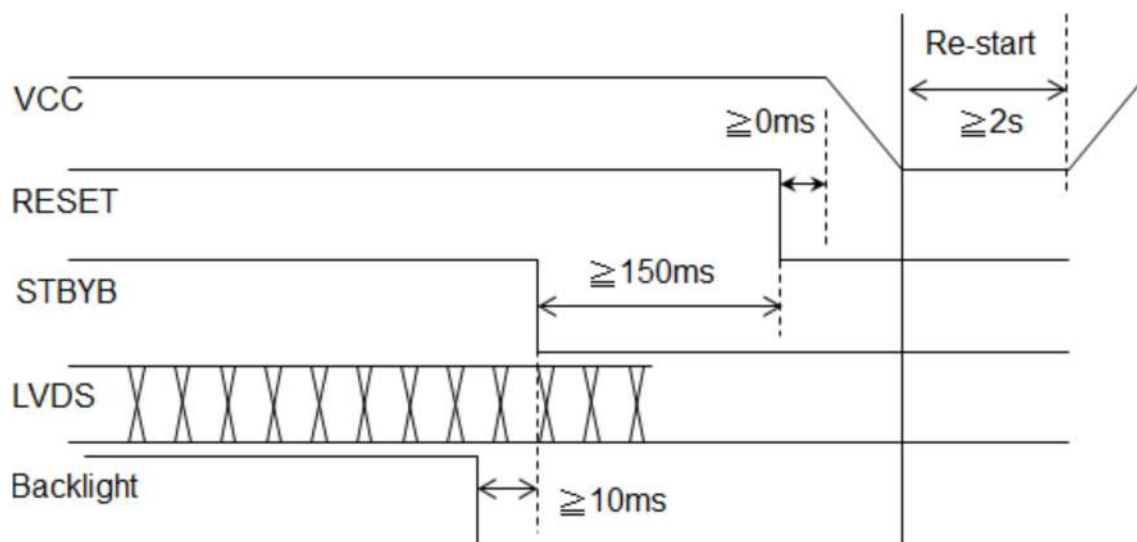


6.5 Power On / Off Sequence

Power ON



Power OFF



6.6 Backlight Unit

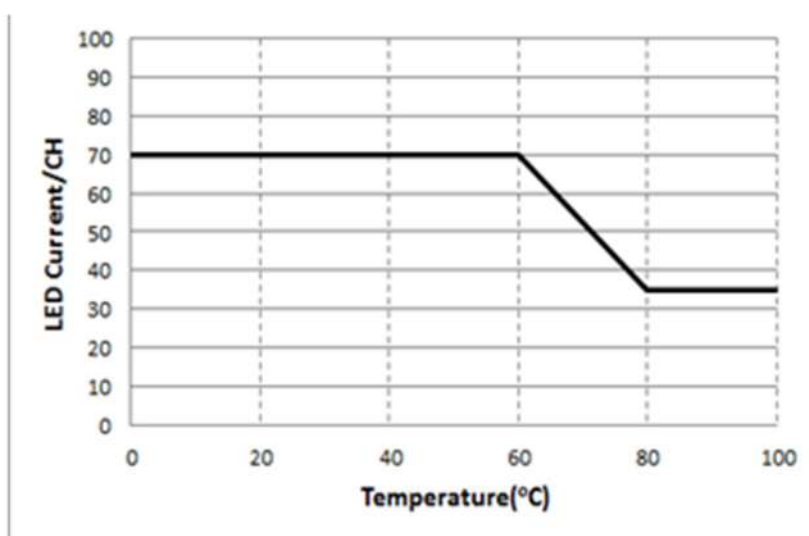
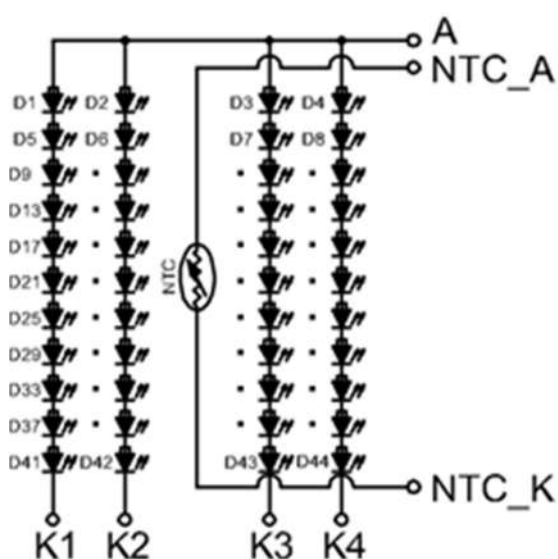
Parameter	Symbol	Min	Typ	Max	Units	Condition
LED Current	I_F	--	280	--	mA	$T_a=25^{\circ}\text{C}$
LED Voltage	V_F	--	--	37.4	Volt	$T_a=25^{\circ}\text{C}$
LED Life-Time	N/A	30,000	--	--	Hour	$T_a=25^{\circ}\text{C}$ $I_F=70\text{mA}$ Note (2)

Note (1) LED life time (Hr) can be defined as the time in which it continues to operate under the condition: $T_a=25\pm 3^{\circ}\text{C}$, typical IL value indicated in the above table until the brightness becomes less than 50%.

Note (2) The “LED life time” is defined as the module brightness decrease to 50% original brightness at $T_a=25^{\circ}\text{C}$ and $I_L=280\text{mA}$. The LED lifetime could be decreased if operating I_L is larger than 300 mA. The constant current driving method is suggested.

Note (3) LED Light Bar Circuit 11S4P =44pcs LED

Note (4) LED temperature current curve, The temperature at 60 degrees before the output 70mA / CH, 60 degrees to 80 degrees when the linear drop to 35mA.



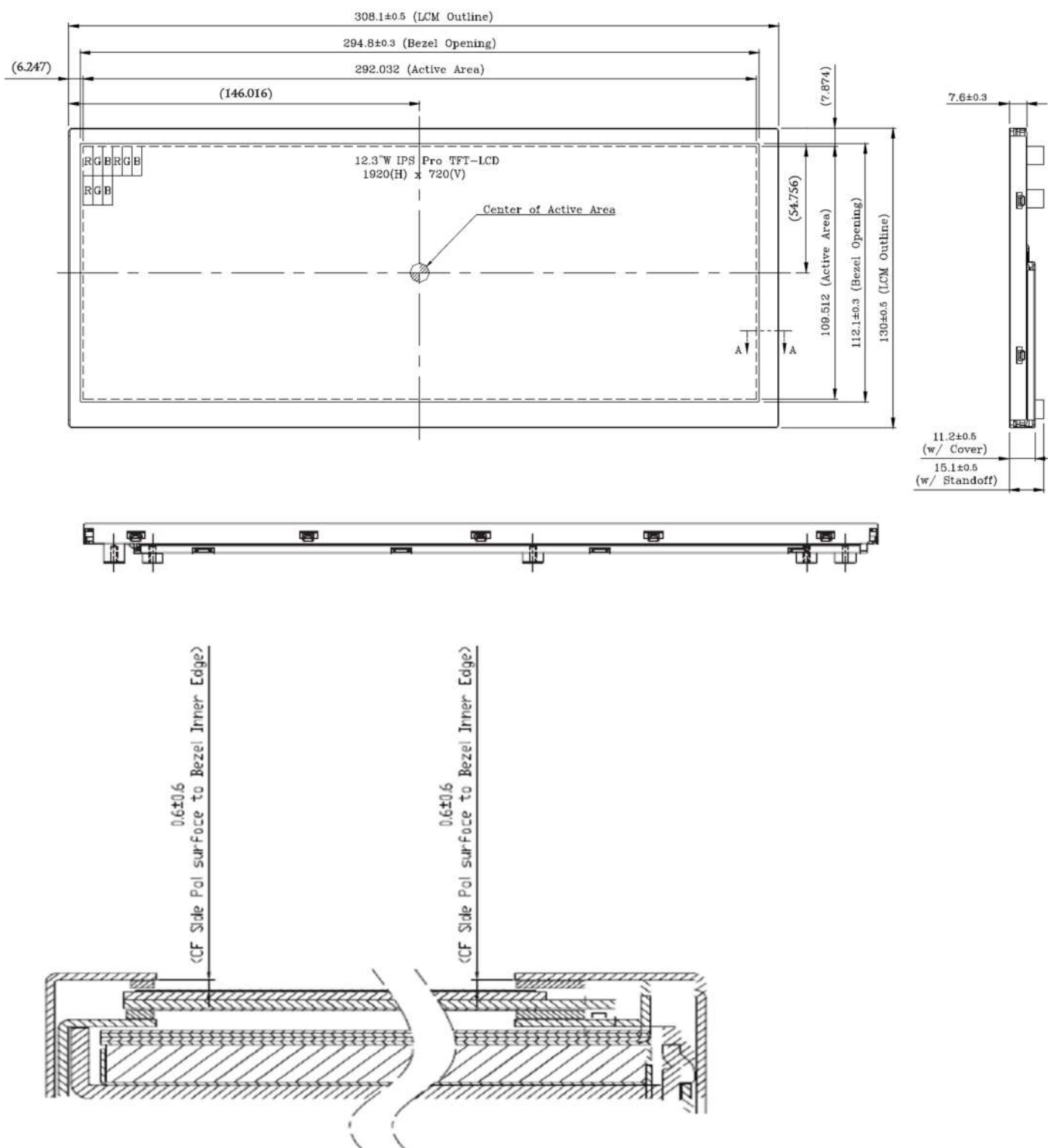


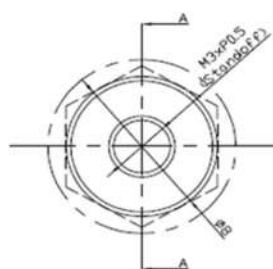
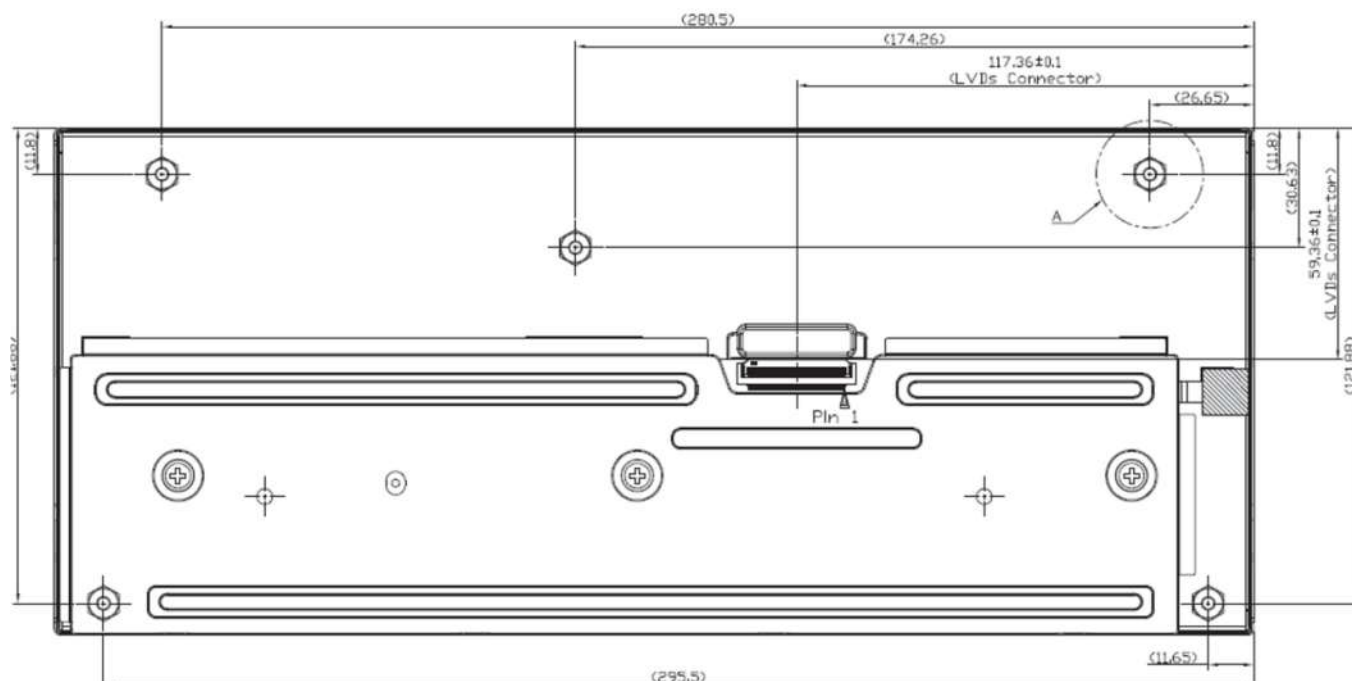
7. Reliability Test Items

No.	Item	Conditions
1	High Temperature Storage	Ta=+90°C, 240hrs
2	Low Temperature Storage	Ta=-40°C, 240hrs
3	High Temperature Operation	Ta=+85°C, 240hrs
4	Low Temperature Operation	Ta=-30°C, 240hrs
5	High Temperature and High Humidity (operation)	Ta=+65°C, 90%RH, 240hrs
6	Thermal Cycling Test (non-operation)	-30°C(30min)→+80°C(30min),100 cycles
7	Electrostatic Discharge	Contact = ± 8 kV, class B; (R=330Ω,C=150pF); Air = ± 15 kV, class B (R=330Ω,C=150pF); 1 time for each point.
8	Vibration	1.Random: 1.04G, 10~500Hz, XYZ, 30min/each direction 2.Sine: Freq.1.5G, 8~33.3Hz, Stoke: 1.3mmhz Sweep: 2.9G, 33.3~400 X/Z: 2hrs, Y:4hrs
9	Shock	Half-Sine, 100G, 6ms, ±XYZ, 1time
10	Vibration (with carton)	Random: 0.015G ² /Hz, 5~200Hz -6dB/Octave, 200~400Hz XYZ each direction 2hrs
11	Drop (with carton)	Drop height condition, basis on the product weight and Follw QB100-0027 1 corner, 3 edges, 6 surfaces

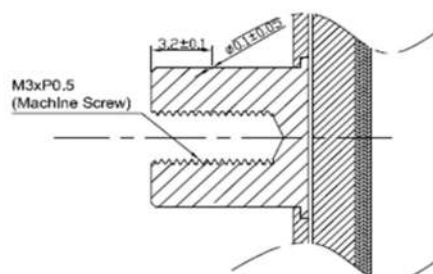
8. Outline Dimension

Unit: mm





DETAIL A
SCALE 5:1
TOTAL 5



SECTION A-A
SCALE 5:1
TOTAL 5

Note: General tolerance: +/- 0.3mm



9. General Precaution

9.1 Use Restriction

This product is not authorized for use in life supporting systems, aircraft navigation control systems, military systems and any other application where performance failure could be life-threatening or otherwise catastrophic.

9.2 Disassembling or Modification

Do not disassemble or modify the module. It may damage sensitive parts inside LCD module, and may cause scratches or dust on the display. HannStar does not warrant the module, if customers disassemble or modify the module.

9.3 Breakage of LCD Panel

- 9.3.1** If LCD panel is broken and liquid crystal spills out, do not ingest or inhale liquid crystal, and do not contact liquid crystal with skin.
- 9.3.2** If liquid crystal contacts mouth or eyes, rinse out with water immediately.
- 9.3.3** If liquid crystal contacts skin or cloths, wash it off immediately with alcohol and rinse thoroughly with water.
- 9.3.4** Handle carefully with chips of glass that may cause injury, when the glass is broken.

9.4 Electric Shock

- 9.4.1** Disconnect power supply before handling LCD module.
- 9.4.2** Do not pull or fold the LED cable.
- 9.4.3** Do not touch the parts inside LCD modules and the fluorescent LED's connector or cables in order to prevent electric shock.

9.5 Absolute Maximum Ratings and Power Protection Circuit

- 9.5.1** Do not exceed the absolute maximum rating values, such as the supply voltage variation, input voltage variation, variation in parts' parameters, environmental temperature, etc., otherwise LCD module may be damaged.
- 9.5.2** Please do not leave LCD module in the environment of high humidity and high temperature for a long time.



9.5.3 It's recommended to employ protection circuit for power supply.

9.6 Operation

9.6.1 Do not touch, push or rub the polarizer with anything harder than HB pencil lead.

9.6.2 Use fingerstalls of soft gloves in order to keep clean display quality, when persons handle the LCD module for incoming inspection or assembly.

9.6.3 When the surface is dusty, please wipe gently with absorbent cotton or other soft material.

9.6.4 Wipe off saliva or water drops as soon as possible. If saliva or water drops contact with polarizer for a long time, they may causes deformation or color fading.

9.6.5 When cleaning the adhesives, please use absorbent cotton wetted with a little petroleum benzine or other adequate solvent.

9.7 Mechanism

Please mount LCD module by using mounting holes arranged in four corners tightly.

9.8 Static Electricity

9.8.1 Protection film must remove very slowly from the surface of LCD module to prevent from electrostatic occurrence.

9.8.2 Because LCD module use CMOS-IC on circuit board and TFT-LCD panel, it is very weak to electrostatic discharge. Please be careful with electrostatic discharge. Persons who handle the module should be grounded through adequate methods.

9.9 Strong Light Exposure

The module shall not be exposed under strong light such as direct sunlight. Otherwise, display characteristics may be changed.

9.10 Disposal

When disposing LCD module, obey the local environmental regulations.



10. Material List of Components for ROHS

XINSUN Display Integration Ltd. hereby declares that our company do not intentionally contain any of the substances listed in applicable EU directives and regulations and all our products will conform to content requirement of 6 substances (Pb, Cd, Hg, Cr⁶⁺, PBB, PBDE) of RoHS directive, and we will not use these 6 substances in the manufacturing process, and guarantee that the content of these substances in our products won't exceed the limit value of RoHS as followings:

Hazardous Substance	Limit value of RoHS (ppm, mg/kg)
Lead and its compounds (Pb)	< 1000
Cadmium and its compounds (Cd)	< 100
Mercury and its compounds (Hg)	< 1000
Chromium VI and its compounds (Cr ⁶⁺)	< 1000
Polybrominated Biphenyls (PBB)	< 1000
Polybromodiphenyl Ether (PBDE)	< 1000
Packaging: PB + Cd+Hg+Cr ⁶⁺	< 100

Remarks:

- (1) In addition to the basic restricted items in the above list, if any individual customers have any other special item requirement, please specify, so that we can specially try to conform.
- (2) If any individual customers really need to have RoHS compliant earlier than the above schedule, please specify on Purchase Order so that we can specially try to conform.