产品名称：21.5寸商用高亮液晶显示模组

MODEL：HZ2150NG01-V1.0

发布日期	制定	版本
2019-12-20	cui	V1.0

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1. GENERAL DESCRIPTION

1.1 Introduction

HZ2150TX01-V1.0 is a diagonal 21.5" color active matrix LCD open cell with2ch-LVDS interface. This open cell is a transmissive type display operating in the normally black mode. It supports 1920*1080 FHD resolution and can display up to 16.7M colors(8bit) Each pixel is divided into Red .Green and Blue sub-pixels which are arranged in vertical stripe.

1.2 Features

- LCM brightness 450 nits

- contrast ratio. 3000:1

- response time 6.5ms.

- High color saturation.

- FHDTV (1920*1080 pixels) resolution.

- DE (Data Enable) only mode.

- LVDS (Low Voltage Differential Signaling) interface.

- Aspect ratio: 16:9

Item	Specification	Unit
Bezel Opening Area	509.9(H)*303.55(V)	mm
Display area	477.3 (H) * 268.95 (V)	mm
Number of Pixel	1920x3(RGB) x1080	pixel
Pixel pitch	0.08275(H) x 0.24825(V)	mm
Pixel arrangement	RGB Vertical Stripe	
Display mode	Transmissive Mode / Normally Black	
Surface treatment	Mirror face（可选AG）	
Backlight	LED	
Interface	LCD:lvds	
Class	3mm	
TP Supply Voltage	5V	
Operating（Storage）temperature &Humidity	0℃~50℃；60%RH -20℃~60℃；60%RH	
Front Protection level	IP65	

2. ABSOKUTE MAXIMUM RATINGS

2.1 ABSOLUTE RATINGS OF ENVIRONMENT

The followings are maximum values which, if exceeded, may cause damage to the unit.

Item	Symbol	Value		Unit
		Min.	Max.	
Power Supply Voltage	V_{CC}	-0.3	5.5	V
Input Signal Voltage	V_{IN}	-0.3	3.6	V

2.2 Environment Requirement

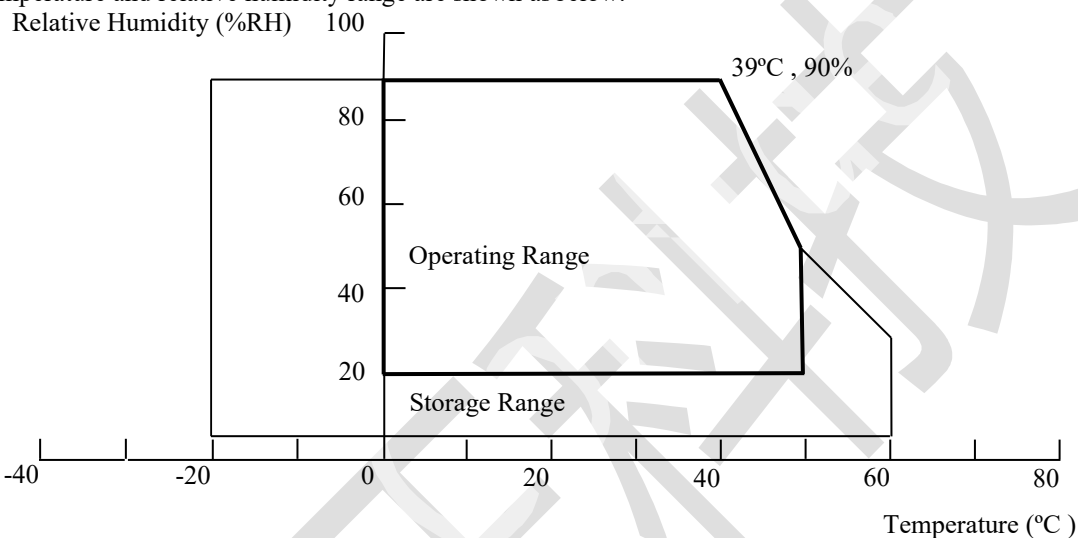(1) Temperature and relative humidity range are shown as below.

Fig. 2.1 Operating and storage environment

(a) 90%RH maximum (TA ≤ 39 ℃).

(b) Wet-bulb temperature should be 39℃ maximum (TA > 39℃).

(c) No condensation.

(2) The storage temperature is between - 20 ℃ to 60 ℃, and the operating ambient temperature is between 0 ℃ to 50 ℃

The maximum operating temperature is based on the test condition that the surface temperature of display area is less than or equal to 65℃ with LCD module in a temperature controlled chamber alone. Thermal management should be considered in final product design to prevent the surface temperature of display area from being over 65℃. The range of operating temperature may degrade in case of improper thermal management in the end product design.

(3) The rating of environment is based on LCD module. Leave LCD cell alone, this environment condition can't be guaranteed. Except LCD cell, the customer has to consider the ability of other parts of LCD module and LCD module process.

2.3 Absolute Ratings of Environment

When storing open cell as spares for a long time, please follow the precaution instructions:

(1) Do not store the module in high temperature and high humidity for a long time. It is highly recommended to store th

module with temperature from 20ºC to 30ºC in normal humidity (50 ± 10%RH) with shipping package.

(2) The open cell should be keep within one month shelf life.

3. OPTICAL CHARACTERISTICS

3.1 Optical specification

Item		symbol	condition	Min	Typ	Max	Unit	Note
Contrast ratio		CR		-	3000	-		(1)(2)
Response Time		Gray to gray		-	6.5	12	ms	(3)
Center Luminance of White		LC			450		cd/㎡	
Crosstalk		CT-2D	θ X=0	-	-	4	%	(2)(5)
Luminous Uniformity			θ y=0	80	85	-	%	
Color chromaticity	Red	RX	Viewing Angle At normal Direction	Typ -0.03	0.652	Typ +0.03	-	(2)(6)
		RY			0.336		-	
	Green	GX			0.317		-	
		GY			0.618		-	
	Blue	BX			0.153		-	
		BY			0.050		-	
	White	WX			0.285		-	
		WY			0.293		-	
Color gamut		CG		68	72	-	%	
Viewing angle	Horizontal	θ X+	CR≥10	-	89	-	deg	(7)
		θ X-		-	89	-		
	Vertical	θ y+		-	89	-		
		θ y-		-	89	-		

To measure the module, it is suggested to set up the standard measurement system as Fig. 6.1. The measuring area S should contain at least 500 pixels of the LCD cell as illustrated in Fig.6.2 (A means the area allocated to one pixel). In this model, for example, the minimum measuring distance Z is 370mm when θ is 2 degree. Hence, 500mm is the typical measuring distance. This measuring condition is referred to 301-2H of VESA FPDM 2.0 about viewing distance, angle, and angular field of view definition.
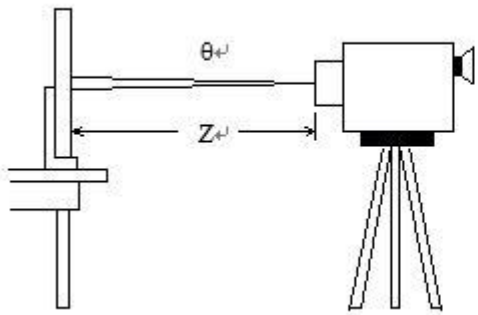
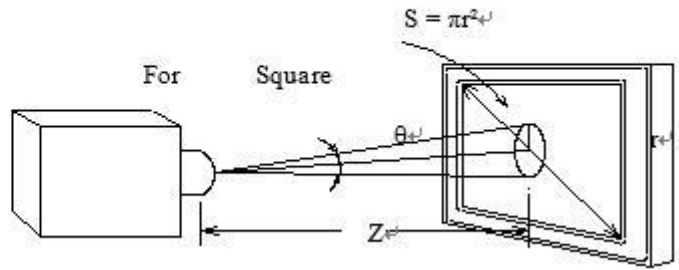Fig. 3.1 The standard set-up system of measurement

Fig. 3.2 The area S contains at least 500 pixels to be measured

N= S/A ≥500 pixels

N means the actual number of the pixels in the area S.

Note:

(1) Definition of static contrast ratio (CR):

It's necessary to switch off all the dynamic and dimming function when measuring the static contrast ratio.

$$\text{Static Contrast Ratio (CR)} = \frac{\text{CR - W}}{\text{CR - D}}$$

CR-W is the luminance measured by LMD (light-measuring device) at the center point of the LCD module with full-screen displaying white. The standard setup of measurement is illustrated in Fig. 6.3; CR-D is the luminance measured by LMD at the center point of the LCD module with full-screen displaying black. The LMD in this item is CS2000.

(2) The LMD in the item could be a spectroradiometer such as (KONICA MINOLTA) CS2000, CS1000 (TOPCON), SR-UL2 or the same level spectroradiometer. Other display color analyzer (KONICA MINOLTA) CA210, CA310 or (TOPCON) BM-7 could be involved after being calibrated with a spectroradiometer on each stage of a product.
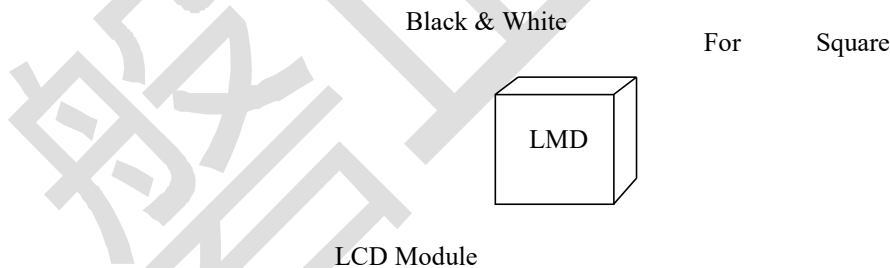
Black & White

For   Square

LMD

LCD Module

Fig. 3.3 The standard setup of CR measurement

(3) ponse time T_L is defined as the average transition time in the response time matrix. The table below is the response time matrix in which each element $t_{X \text{ to } Y}$ is the transition time from luminance ratio X to Y. X and Y are two different luminance ratios among 0%, 25%, 50%, 75%, and 100% luminance. The transition time $t_{X \text{ to } Y}$ is defined as the time taken rom 10% to 90% of the luminance difference between X and Y (X < Y) as illustrated in Fig.6.4. When X > Y, the definition of $t_{X \text{ to } Y}$ is the time taken from 90% to 10% of the luminance difference between X and Y. The response time is optimized on refresh rate $F_r = 60$Hz.

(4)

Measured Transition Time		Luminance Ratio of Previous Frame				
		0%	25%	50%	75%	100%
Luminance Ratio of Current Frame	0%		$t_{25\% \text{ to } 0\%}$	$t_{50\% \text{ to } 0\%}$	$t_{75\% \text{ to } 0\%}$	$t_{100\% \text{ to } 0\%}$
	25%	$t_{0\% \text{ to } 25\%}$		$t_{50\% \text{ to } 25\%}$	$t_{75\% \text{ to } 25\%}$	$t_{100\% \text{ to } 25\%}$
	50%	$t_{0\% \text{ to } 50\%}$	$t_{25\% \text{ to } 50\%}$		$t_{75\% \text{ to } 50\%}$	$t_{100\% \text{ to } 50\%}$
	75%	$t_{0\% \text{ to } 75\%}$	$t_{25\% \text{ to } 75\%}$	$t_{50\% \text{ to } 75\%}$		$t_{100\% \text{ to } 75\%}$
	100%	$t_{0\% \text{ to } 100\%}$	$t_{25\% \text{ to } 100\%}$	$t_{50\% \text{ to } 100\%}$	$t_{75\% \text{ to } 100\%}$	

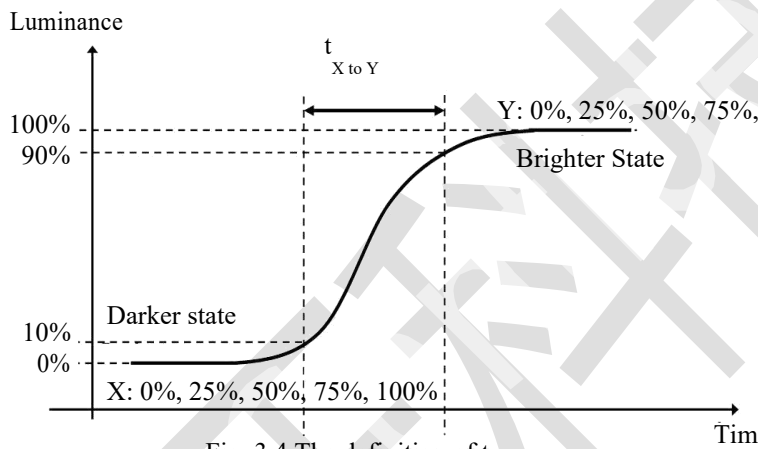$t_{X \text{ to } Y}$ means the transition time from luminance ratio X to Y.

Fig. 3.4 The definition of $t_{X \text{ to } Y}$

All the transition time is measured at the center point of the LCD module by ELDIM OPTI Scope-SA.

4) Definition of center Transmittance (T %):

The transmittance is measured with full white pattern (Gray 255)

$$\text{Static Contrast Ratio (CR)} = \frac{\text{Luminance of LCD module}}{\text{Luminance of backlight}}$$

(5) Definition of the crosstalk(CT-2D):

YA = Luminance of measured location without gray level 255 pattern (cd/m^2)

YB = Luminance of measured location with gray level 255 pattern(cd/m^2)

Definition of the crosstalk: $\quad CT = \dfrac{YB-YA}{YA}$

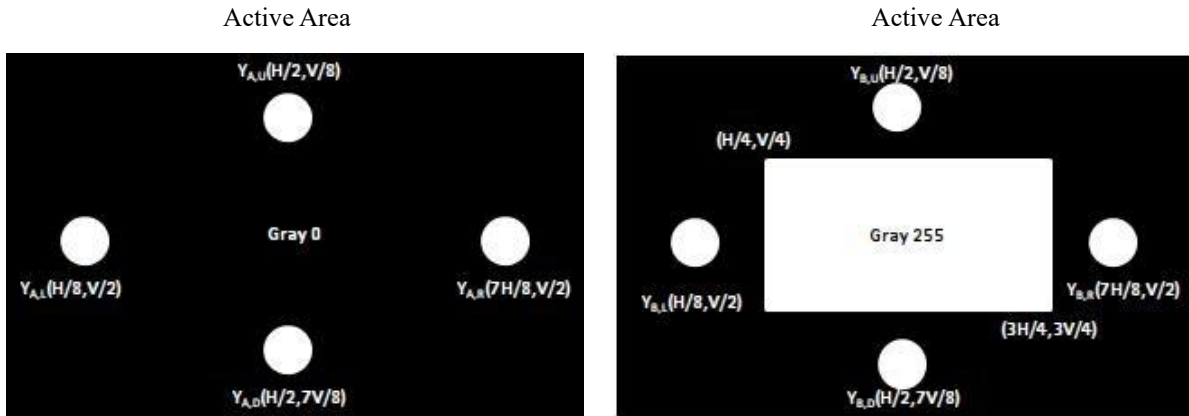Active Area   Active Area

Fig. 3.5 The definition of 2D mode crosstalk

(6) Definition of color chromaticity:

Each chromaticity coordinates (x, y) are measured in CIE1931 color space when full-screen displaying primary color R, G, B and white. The color gamut is defined as the fraction in percent of the area of the triangle bounded by R, G, B coordinates and the area is defined by NTSC 1953 color standard in the CIE color space. Chromaticity coordinates are measured by CS2000 and the standard setup of measurement is shown in Fig. 6.6.
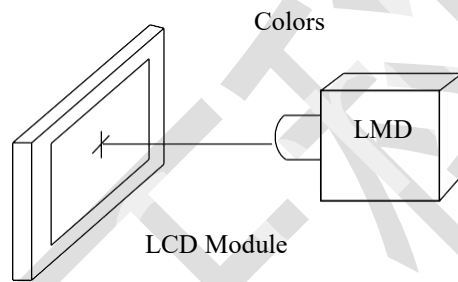
Fig. 3.6 The standard setup of color chromaticity measurement

(7) Definition of viewing angle coordinate system (θ_H, θ_V):

The contrast ratio is measured at the center point of the LCD module. The viewing angles are defined at the angle that the contrast ratio is larger than 10 at four directions relative to the perpendicular direction of the LCD module (two vertical angles: up θ_{V+} and down θ_{V-}; and two horizontal angles: right θ_{H+} and left θ_{H-}) as illustrated in Fig. 6.7. The contrast ratio is measured by ELDIM EZ Contrast.
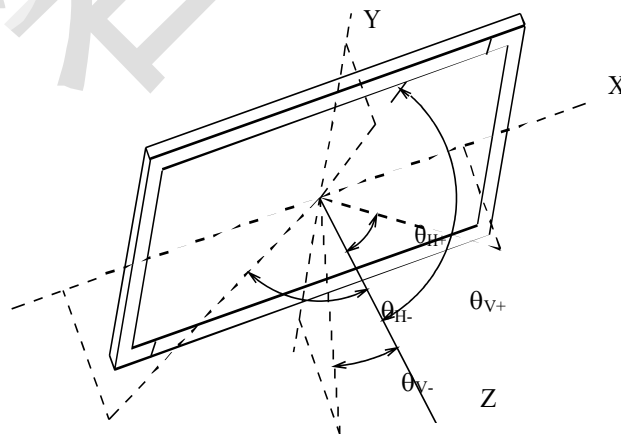

Fig. 3.7 Viewing angle coordination system

4. INTERFACE PIN CONNECTION

4.1 Interface pin assignment

CN1: equivalent (see Note (1))

Pin No.	Symbol	Description	Note
1	RO[0]N	Odd LVDS Signal -	
2	RO[0]P	Odd LVDS Signal +	
3	RO[1]N	Odd LVDS Signal -	
4	RO[1]P	Odd LVDS Signal +	
5	RO[2]N	Odd LVDS Signal -	
6	RO[2]P	Odd LVDS Signal +	
7	GND	Ground	
8	ROCLK-	Odd LVDS Clock -	
9	ROCLK+	Odd LVDS Clock +	
10	RO[3]N	Odd LVDS Signal -	
11	RO[3]P	Odd LVDS Signal +	
12	RE[0]N	Even LVDS Signal -	
13	RE[0]P	Even LVDS Signal +	
14	GND	Ground	
15	RE[1]N	Even LVDS Signal -	
16	RE[1]P	Even LVDS Signal +	
17	GND	Ground	
18	RE[2]N	Even LVDS Signal -	
19	RE[2]P	Even LVDS Signal +	
20	RECLK-	Even LVDS Clock -	
21	RECLK+	Even LVDS Clock +	
22	RE[3]N	Even LVDS Signal -	
23	RE[3]P	Even LVDS Signal +	
24	GND	Ground	
25	WP	Write Protect (High: Write Enable, Low or Open: Write Disable)	(2)
26	SCL	I2C Serial Clock (for adjust VCOM)	(2)
27	SDA	I2C Serial Data (for adjust VCOM)	(2)
28	5V	DC power supply	
29	5V	DC power supply	
30	5V	DC power supply	

Note:

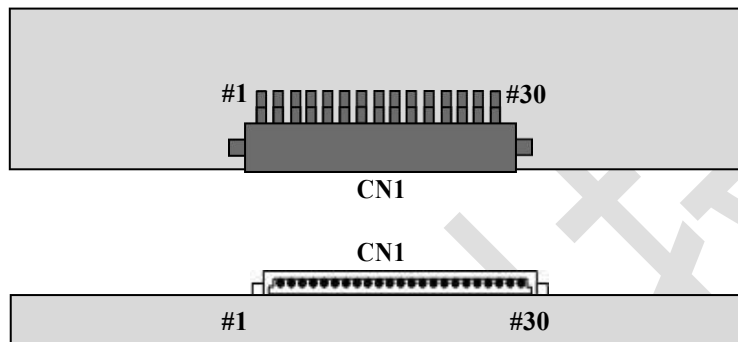(1) The direction of pin assignment is shown as below:

TCON接口：

Fig. 4.1 LVDS connector direction sketch map

(2) a. Please let it open (Do not line out from PCBA connector) if it do not used.(for example：TV set)
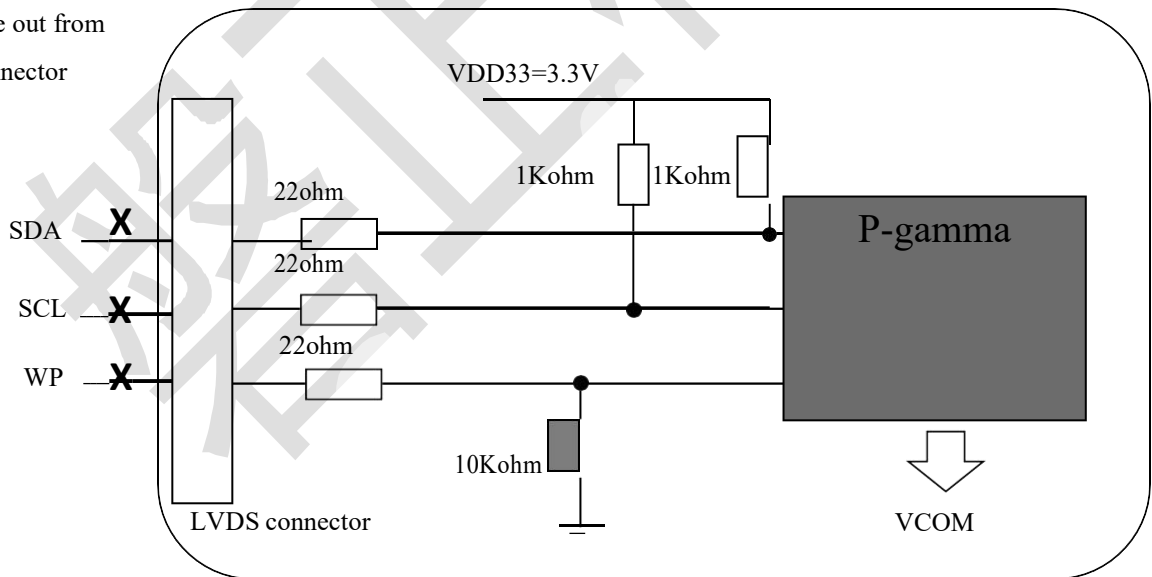

Fig. 4.2 WP/SDA/SCL PCBA set

b. For the VCOM (Flicker) regulation and control, SDA and SCL must pull high in the flicker set, and the flicker set's VDD must ready before the input power (VCC5V)
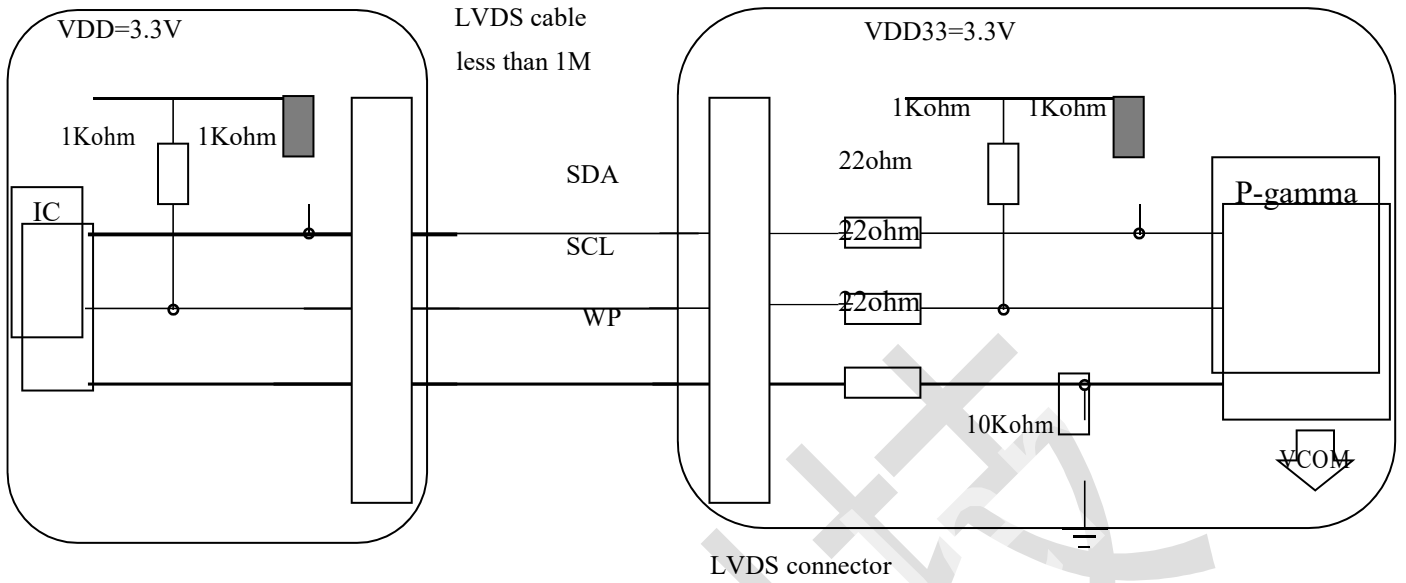
Flicker adjustment

XC/C PCBA

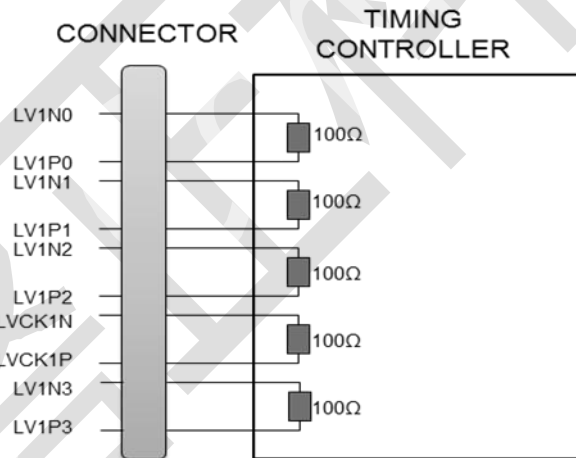Fig. 4.3 WP/SDA/SCL flicker set

4.2 Block Diagram of Interface

Fig. 4.4 Block diagram of interface

Attention:

(1) This open cell uses a 100 ohms (Ω) resistor between positive and negative lines of each receiver input.

(2) LVDS cable impedance shall be 50 ohms per signal line or about 100 ohms per twist-pair line respectively.
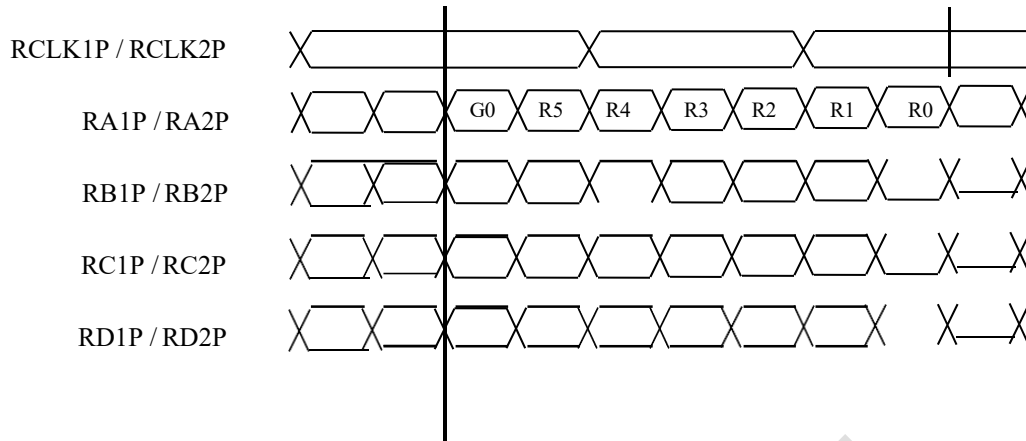
4.3 LVDS Interface

Fig. 4.5 VESA format

4.4 V-com Adjustment

(a) Flicker should be adjusted by optimizing the Vcom value in customer LCM line through the I2C interface.(Master & Slave = I2C communication)

Pin. NO.	Symbol	Function	Remark
1	WP	EN	Default:0V Vcom tunning:3.3V (Shouldn't be communicated with I2C device as output level "5V")
2	SCL_I	I2C Interface	I2C Interface
3	SDA_I	I2C Interface	

(b) Flicker should be tuned by correct method according to gamma IC type of each model.

Type	Flicker data saving position	Slave Address							
		B7	B6	B5	B4	B3	B2	B1	B0
Genie Type	Gamma IC memory	1	1	1	0	1	0	0	R/W-

(c)Flicker Should be adjusted by the Dot on/off pattern

Dot on/off pattern

Frame N   Frame N+1
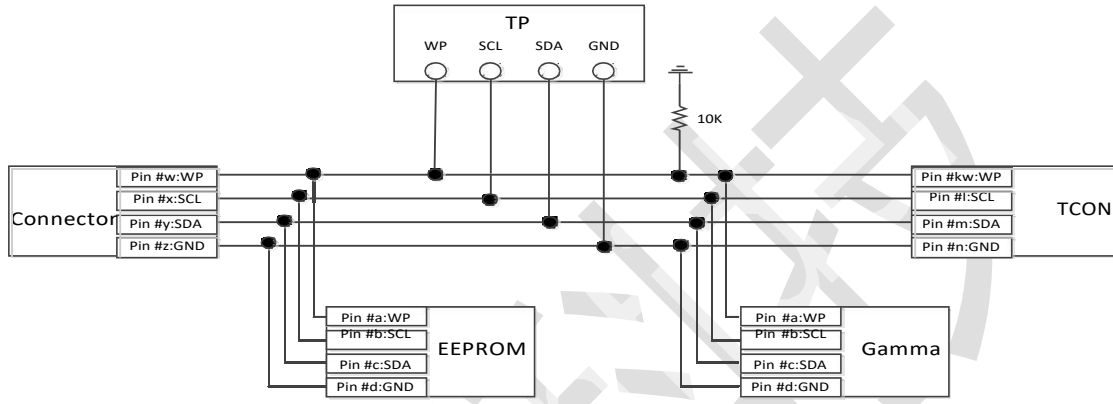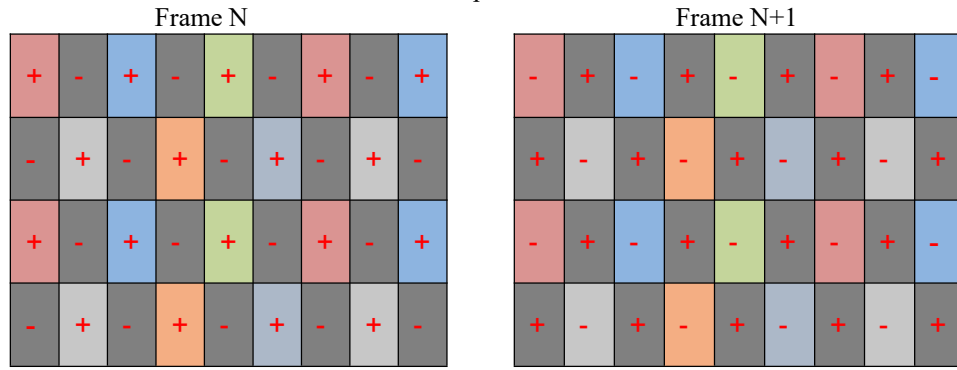
Flicker Adjust Circuit Block Diagram

5. Electrical Specifications

5.1 Open Cell Power Consumption (TA = 25 ± 2 °C)

Parameter		Symbol	Value			Unit	Note
			Min.	Typ.	Max.		
Power Supply Voltage		V_{CC}	4.5	5	5.5	V	(1)
Rush Current		I_{RUSH}	-	-	3	A	(2)
Power Supply Current	White Pattern	-	0.86	1.12	1.25	A	(3)
	Horizontal Stripe	-	1.24	1.61	1.66	A	
	Black Pattern	-	0.78	1.02	0.98	A	

Note:
(1) The ripple voltage should be controlled less than 10% of V_{CC}.
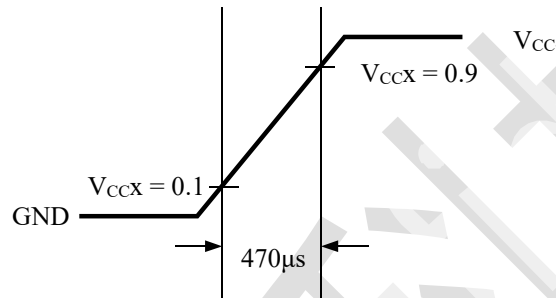(2) Measurement condition: V_{CC} =5V, Rising time =470μs.

Fig. 3.1 V_{CC} rising time condition

(3) Measurement condition: V_{CC} = 5V, Ta = 25 ± 2ºC, F = 75 Hz. The test patterns are shown as below.
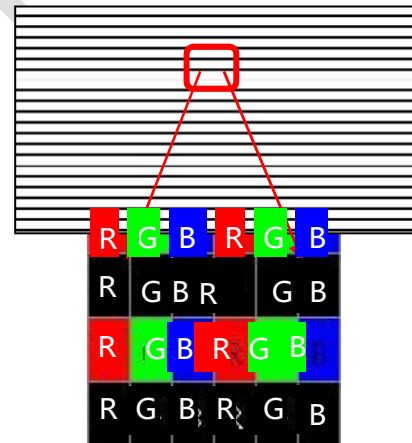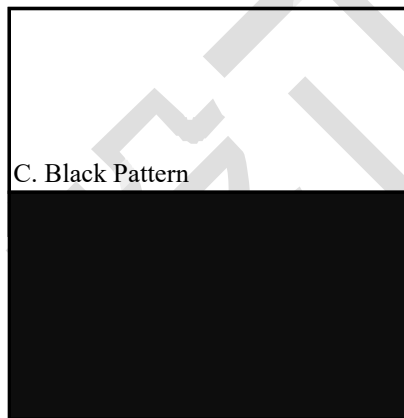
A. White Pattern
B. Horizontal Pattern

C. Black Pattern

Fig. 3.2 Test

5.2 LVDS Characteristics

| Parameter		Symbol	Value			Unit	Note
			Min.	Typ.	Max.		
LVDS Interface	Differential Input High Threshold Voltage	V_{TH}	+100	-	-	mV	(1)
	Differential Input Low Threshold Voltage	V_{TL}	-	-	-100	mV	
	Common Input Voltage	V_{CM}	1.0	1.2	1.4	V	
	Differential Input Voltage	$|V_{ID}|$	100	-	600	mV	
	Terminating Resistor	R_T	87.5	100	112.5	ohm	
CMOS Interface	Input High Threshold Voltage	VIH	2.7	-	3.3	V	
	Input Low Threshold Voltage	VIL	0	-	0.7	V	

Note:

(1) The product should be always operated within above ranges.

(2) The LVDS input signal has been defined as follows:

Single end Signals

V_{CM}

$|V_{ID}|$

GND

Differential Signal
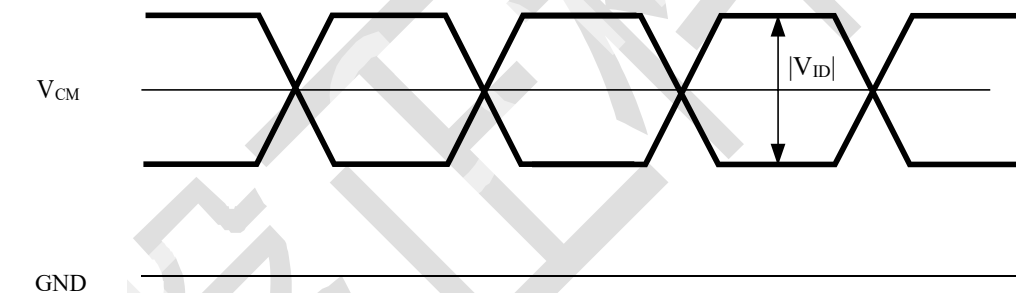
V_{TH}
V_{TL}
0V(differential)
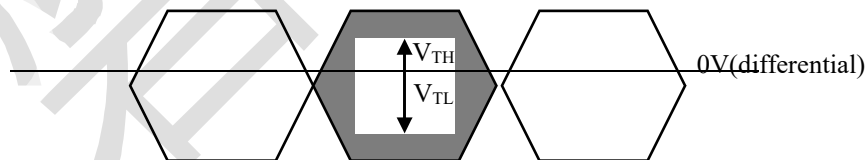
5.3 Temperature Specifications

Parameter	Symbol	Specification			Unit	Recommend test pattern	Note
		Min.	Typ.	Max.			
Surface Temperature	T_{TCON}	–	–	105	℃	Horizontal Pattern	(1)
	T_{Driver}	–	–	115		Horizontal Pattern	(1)

Note:

(1) Any point on the IC surface must be less than Max. specification under any condition ,If the surface temperature is out of the specification, thermal solutions should be applied to avoid be damaged;
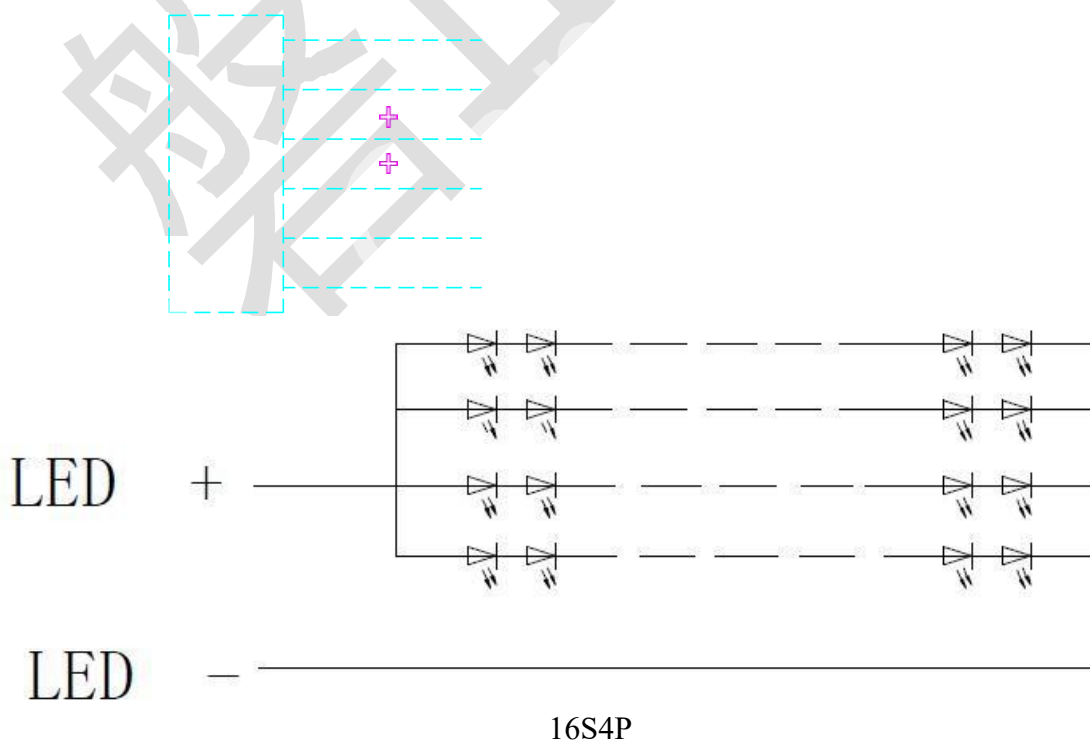
5.4 Driver IC ESD Specification

The Electro-Static Discharge tolerance of Source COF IC and Gate COF IC is +-2KV tested by ESD Gun. Especially if the LCD module is designed with the Plastic Bezel, we suggest ESD protection solutions should be applied to avoid be damaged

6. Backlight Unit

Parameter	Symbol	Value			Unit	Note
		Min	Typ	Max		
LED Light Bar Input Voltage	Vo	40	48	52	VDC	If=360mA
LED Light Bar Input Current 1	Io1	-	360		mADC	If=360mA TA=25℃
Power Consumption	Po	14.4	17.28	18.72	W	
Luminous Uniformity		80	85		%	
LED Life Time	LLED	30000	-		H	Tj=120℃，L70

Produck Connector work conditions schemes

Type：A1009AWRR(H)-06

16S4P

6.1 Timing Table (DE Only Mode)

Signal	Item	Symbol	Min.	Typ.	Max.	Unit	Note
LVDS Receiver Clock	Frequency	Fclkin $(=1/T_{Clk})$	65	74.25	96	MHz	(1) (2)
	Input cycle to cycle jitter	Trcl	—	—	200	ps	(3)
	Spread spectrum modulation range	Fclkin_mod	Fclkin-2%	—	Fclkin+2%	MHz	
	Spread spectrum modulation frequency	F_{SSM}	60	—	200	KHz	(4)
LVDS Receiver Data	Receiver Skew Margin	T_{RSM}	-400	—	400	ps	(5)
Vertical Active Display Term	Frame Rate	F	48	60	75	Hz	
	Total	T_V	1092	1125	1380	T_H	$T_V = T_{VD} + T_{VB}$
	Display	T_{VD}		1080			
	Blank	T_{VB}	12	45	300	T_H	
Horizontal Active Display Term	Total	T_H	1046	1100	1174	T_{CLK}	$T_H = T_{HD} + T_{HB}$
	Display	T_{HD}		960			
	Blank	T_{HB}	86	140	214	T_{CLK}	

Note:

(1) The TFT LCD open cell is operated in DE only mode, H sync and V sync input signal have no effect on normal operation.

(2) Please make sure the range of pixel clock follows the following equations:

Fclkin(max) ≥ Fmax × Tv × Th   Fmin × Tv × Th ≥ Fclkin(min)

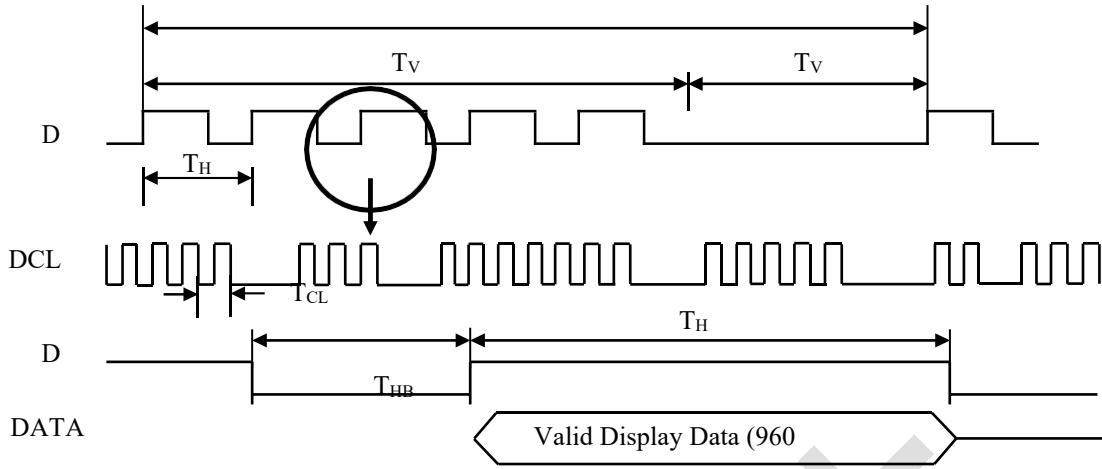Main frequency Max is 96Mhz without spread spectru

Fig. 6.1 Interface signal timing diagram

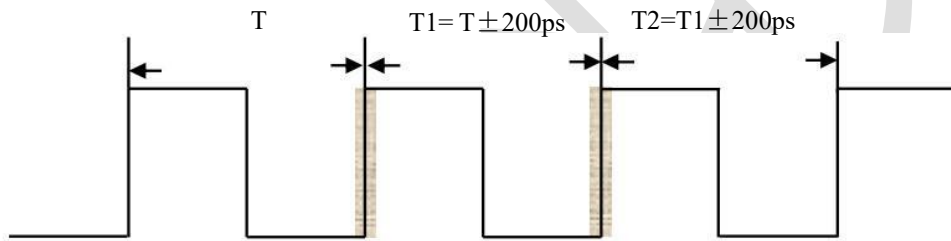(3)The input clock cycle-to-cycle is defined as below figures.

Fig. 6.2 Jitter

(4) The SSCG (Spread Spectrum Clock Generator) is defined as the following figure.
The LVDS SSM's suggestion is off by default, SOC board must test all validation if SOC board open the LVDS SSM.
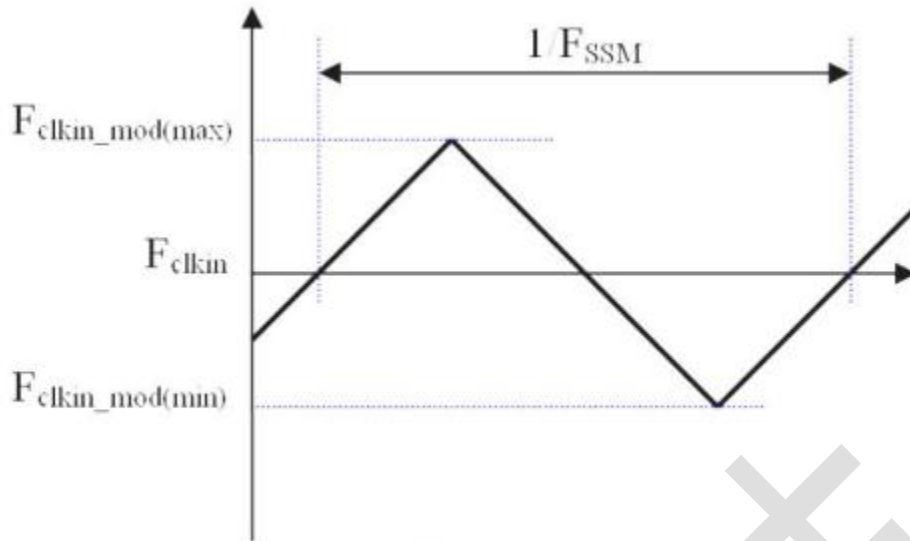
Fig. 6.3 SSCG

(5) The LVDS timing diagram and setup/hold time is defined and showed as the following figure.
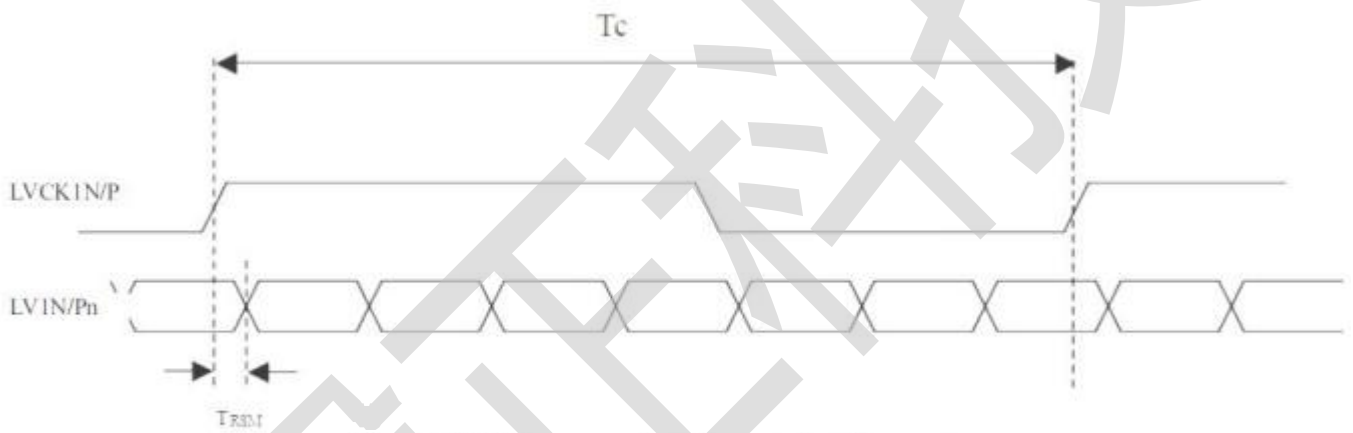

Fig.6.4 LVDS receive interface timing diagram

6.2 Power On/Off Sequence

To prevent a latch-up on DC operation of the Open cell, the power on/off sequence should be as the diagram below.
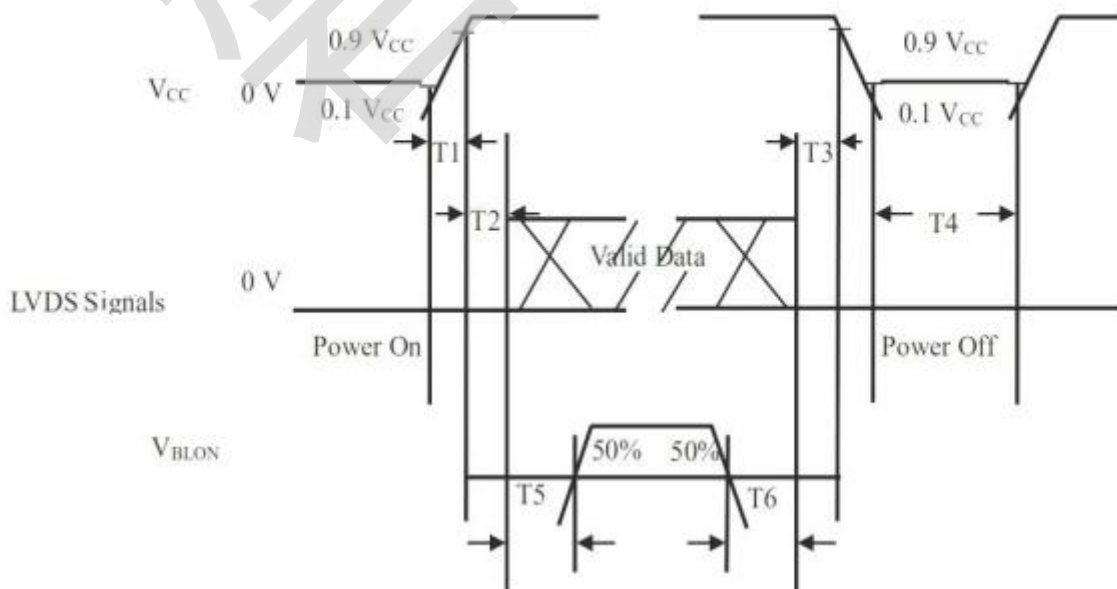
Fig.6.5 Power on/off sequence

| Parameter	Values			Unit Min.
	Min.	Typ.	Max.	
T1	0.5	-	10.0	ms
T2	0.0	-	50	ms
T3	0.0	-	50	ms
T4	1000.0	-	-	ms
T5	500.0	-	-	ms
T6	100.0	-	-	ms

Attention:

(1) The supply voltage of the external system for the open cell input should follow the definition of VCC.

(2) When the customer's backlight turns on before the LCD operation or the LCD turns off before the backlight turns off, the display may momentarily become abnormal screen.

(3) In case that VCC is in off level, please keep the level of input signals on the low or high impedance. If $T2 < 0$, that may cause electrical overstress.

(4) T4 should be measured after the module has been fully discharged between power off and on period.

(5) Interface signal shall not be kept at high impedance when the power is on.

产品结构尺寸示意图：

产品结构尺寸示意图：
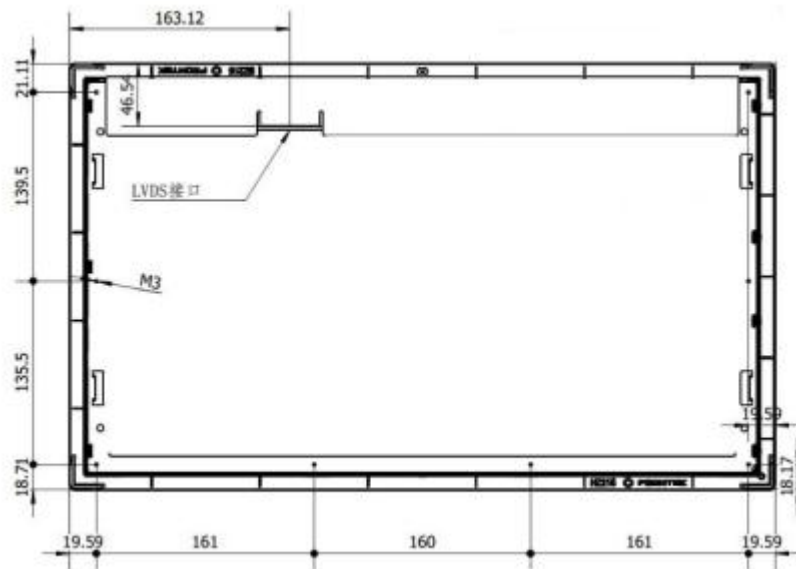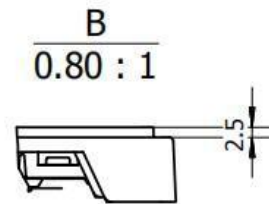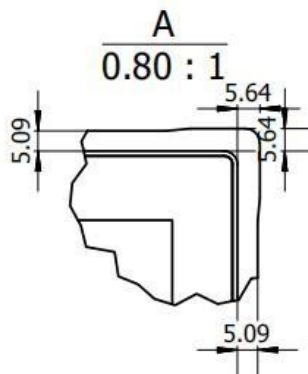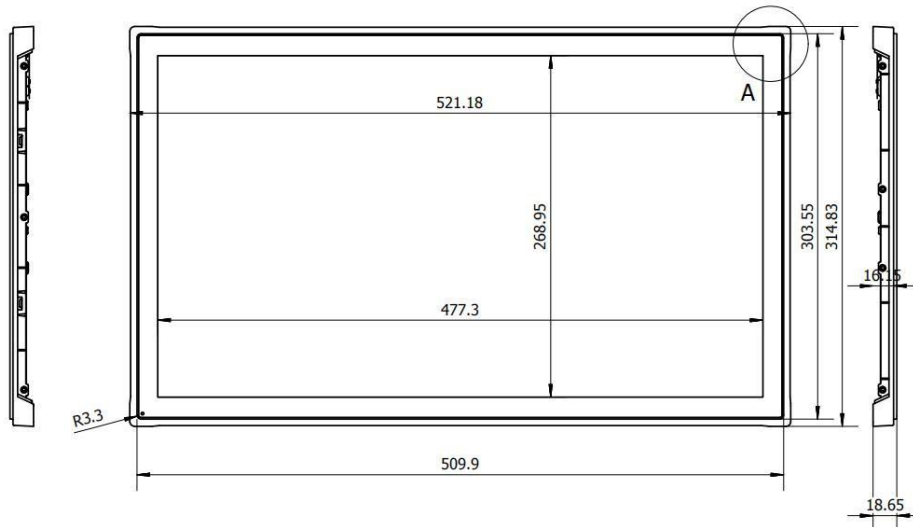
包装示意图：
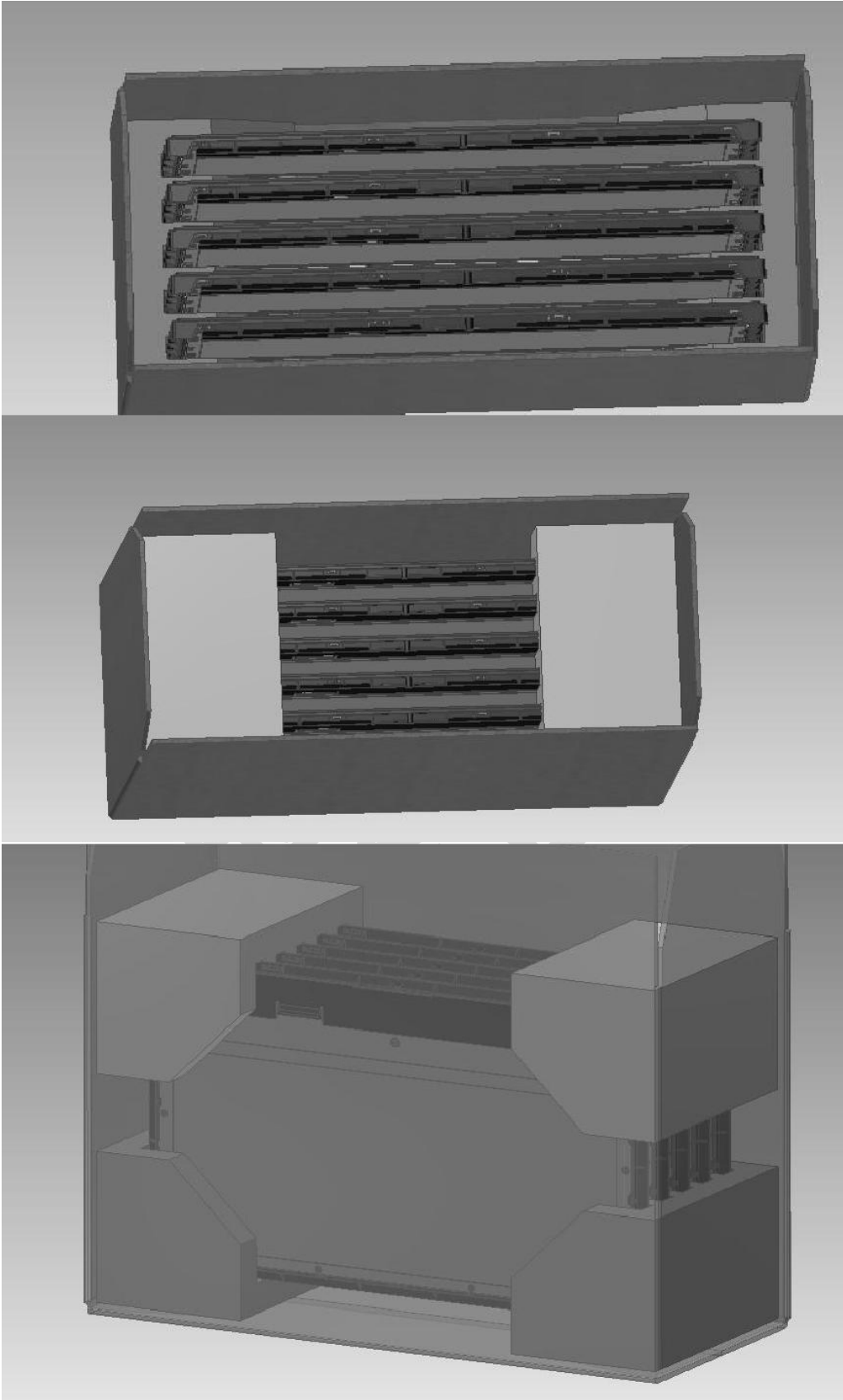
服务支持：

1. 保修标准期限

液晶触摸显示器整机保修 1年。（以合同签订为准）

2. 退换货

用户在收到物品后 7 个工作日内，用户在此时间内发现物品外观和硬件损伤、性能不良等缺陷，我司可提供免费更换服务。（不包括人为原因）

3. 维修事项

产品在保修期间，我司提供免费维修服务，自收到货物后的 7 个工作日内完成维修并将产品返回客户；超出保修期限的产品，我司提供售后维修服务，仅向客户收取更换零部件的成本价格。

4. 响应时间

我司承诺当客户反馈任何服务需求时，做到第一时间响应，并在第一时间给出解决方案。　5. 应急需求

我司将针对性的常备客户方购买型号产品之服务库存，以备客户方应急服务需求。　6. 服务时间

我司提供 5×8 小时座机服务，7×24 小时技术服务工程师电话服务；在特定情况下提供 24 小时内上门服务。

杭州/衡阳磐正科技有限公司

客服电话：4001038998

杭州地址：浙江省杭州市西湖区西园二路9号1幢
衡阳地址：湖南省衡阳市雁峰区衡山科学城A1栋

规格细节如有变更，恕不另行通知。