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**晶采光電科技股份有限公司**  
**AMPIRE CO., LTD.**

## **SPECIFICATIONS FOR LCD MODULE**

<b>CUSTOMER</b>	
<b>CUSTOMER PART NO.</b>	
<b>AMPIRE PART NO.</b>	<b>AM-1024768P5TMQW-00H</b>
<b>APPROVED BY</b>	
<b>DATE</b>	

**Approved For Specifications**

**Approved For Specifications & Sample**

**AMPIRE CO., LTD.**

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**RECORD OF REVISION**

<b>Revision Date</b>	<b>Page</b>	<b>Contents</b>	<b>Editor</b>
2015/10/28	--	New Release	Lawlite

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**1. INTRODUCTION**

9.7 inch TFT Liquid Crystal Display module is a color active matrix thin film transistor (TFT) liquid crystal display (LCD) that uses amorphous silicon TFT as a switching device. It is composed of a TFT LCD panel, a timing controller IC on TFT Panel, PCBA, White LED Back-light . This TFT LCD has a 9.7ch diagonally measured active display area with 1024 horizontal by 768 vertical pixel array resolutions.

**2. PHYSICAL SPECIFICATIONS**

Item	Specifications	Remark
LCD size	9.7 inch(Diagonal)	
Driver element	Active matrix TFT in a-Si technology	
Display resolution	1024 (W) × 3 (RGB) x 768 (H) dots	
Display mode	Normally White, Transmissive	
Gray Scale Inversion	6 o'clock	
Viewing Direction	12 o'clock	
Pixel Pitch	0.192 (W) x0.192 (H) mm	
Active area	196.61 (W) x 147.46 (H) mm	
LCM Outline Dimension	210.2(W) x 166.3(H) x 3.55(D) mm	
Color arrangement	R.G.B Vertical stripe	
Interface	6Bit LVDS	
Color Depth	262K	
LED numbers	36 LEDs	

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**3. ABSOLUTE MAX. RATINGS**

Item	Symbol	Min.	Max.	Unit	Note
Supply voltage range	VCC	-0.5	3.6	V	(1)
Voltage range at any terminal	VI	-0.3	VDD + 0.3	V	
Operating Temperature	Top	-20	+70	°C	
Storage Temperature	Tstg	-30	+80	°C	

Note : All voltage values are with respect to the GND terminals unless otherwise noted.

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**4. ELECTRICAL CHARACTERISTICS****4.1. Power Specification**

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Logic Supply Voltage	VCC	3.0	3.3	3.6	V	
VCC Current	ICC	--	(271)	--	mA	(1)
<b>Power Consumption</b>						
Panel + Gamma Circuit			894.3		mW	
LED Back-light			2.304		W	
Total			3.198		W	

Note1: Ta=25°C , VCC=3.3V, Display pattern : All Black

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## 4.2. LED BACKLIGHT DRIVER UNIT

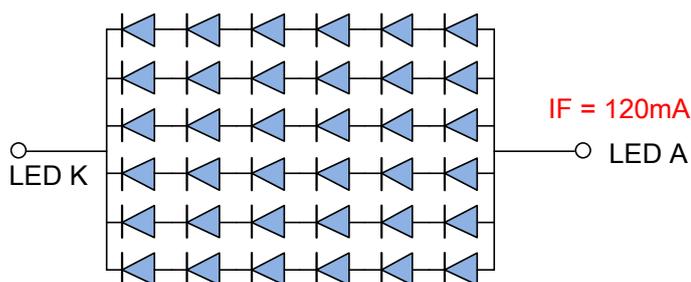
Item	Symbol	Min.	Typ.	Max.	Unit	Note
LED Forward Current	IF	--	120	--	mA	Ta=25°C
LED Forward Voltage	VF		19.2		V	IF=120mA, Ta=25°C
LED Life time			30000		Hours	IF=120mA, Ta=25°C

Note 1: Ta means ambient temperature of TFT-LCD module.

Note 2: If the module is driven by high current or at high ambient temperature & humidity condition. The operating life will be reduced.

Note 3: the structure of LED B/L shows as below.

( 36 LEDs 6 LED Serial x 6 LED Parallel)



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**5. Optical Specifications**

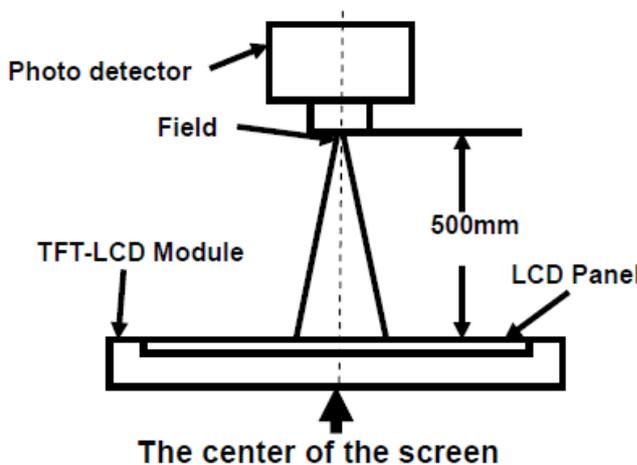
Item	Symbol	Condition	Values			Unit	Remark	
			Min	Typ	Max			
Viewing angle (CR≥ 10)	$\theta_L$	CR ≥ 10	60	70	-	degree	Note 2	
	$\theta_R$		60	70	-			
	$\theta_T$		50	60	-			
	$\theta_B$		60	70	-			
Response time	T <sub>ON</sub>	Normal $\theta = \phi = 0^\circ$	-	20	25	Msec	Note 1 Note 4	
	T <sub>OFF</sub>			20	25			
Contrast ratio	CR		400	500	-	-	Note 1 Note 3	
Color chromaticity	W <sub>X</sub>		0.258	0.308	0.358	-	Note 1 Note 5	
	W <sub>Y</sub>		0.269	0.319	0.369	-		
Luminance	L		280	350		cd/m <sup>2</sup>	Note 1 Note 7	
Luminance uniformity	Y <sub>U</sub>		-	75	-	%	Note 1 Note 6	
NTSC	-		-	45	50	-	%	Note 5

Test Conditions:

1. IF= 120mA, VF=19.2 V and the ambient temperature is 25°C. , the ambient temperature is 25 °C.
2. The test systems refer to Note 1 and Note 2.

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 screen. All input terminals LCD panel must be ground when measuring the center area of the panel.



Item	Photo detector	
Contrast Ratio	BM-5A	1°
Luminance		
Lum Uniformity		
Chromaticity	SR-3A	
Response Time	TRD100	-

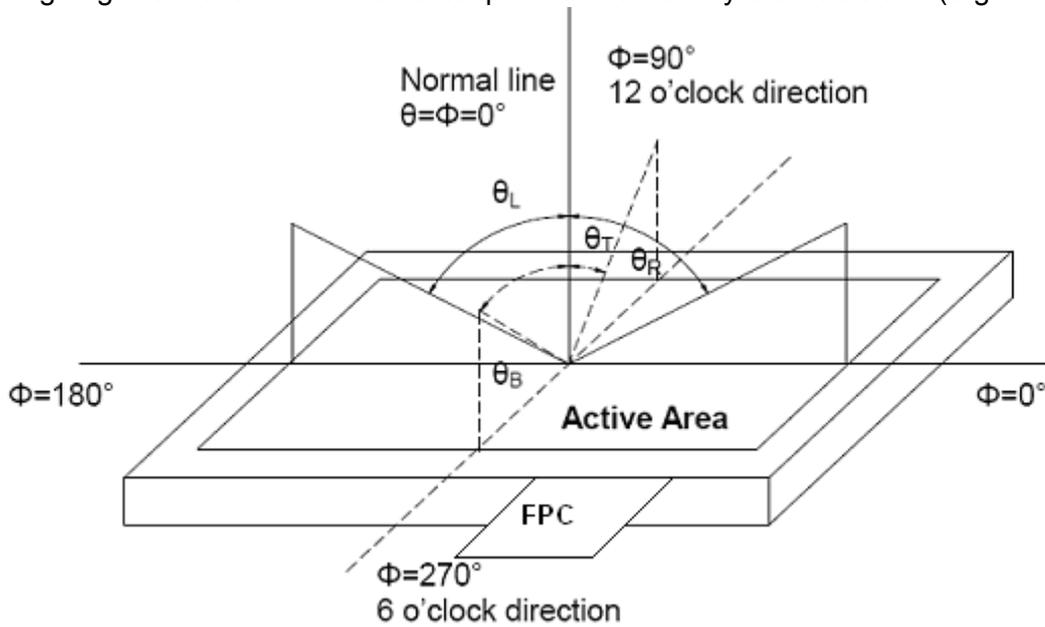
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Note 2: Definition of viewing angle range and measurement system.

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 drive by  $V_{white}$ .

“Black state”: The state is that the LCD should drive by  $V_{black}$ .

$V_{white}$ : To be determined     $V_{black}$ : To be determined.

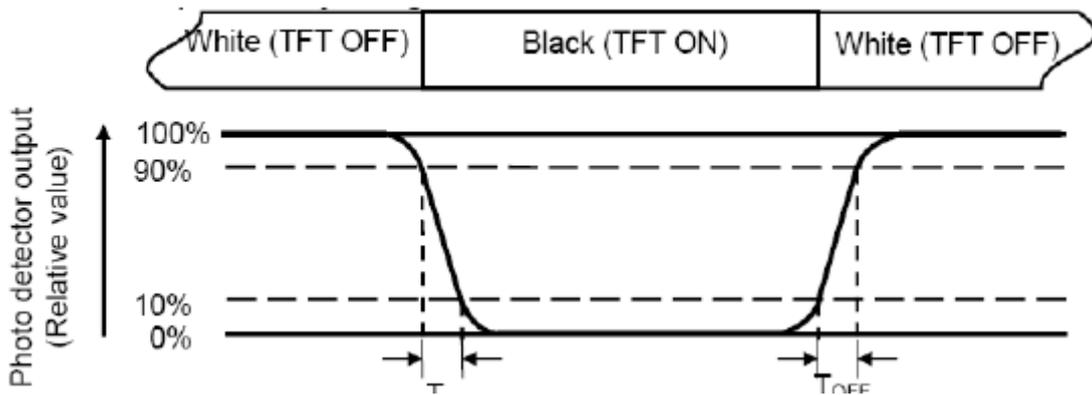
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**Note 4: Definition of Response time**

The response time is defined as the LCD optical switching time interval between “White” state and “Black” state. Rise time ( $T_{ON}$ ) is the time between photo detector output intensity changed from 90% to 10%. And fall time ( $T_{OFF}$ ) is the time between photo detector output intensity changed from 10% to 90%.



**Note 5: Definition of color chromaticity (CIE1931)**

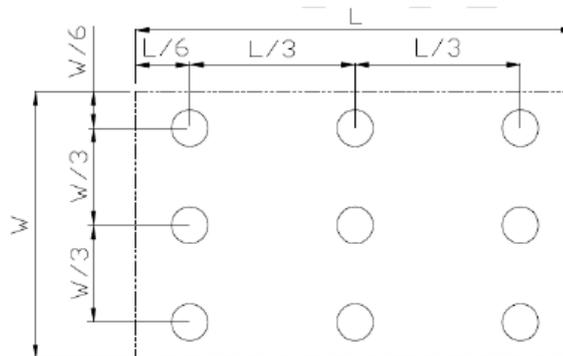
Color coordinates measured at center point of LCD.

**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.

$$\text{Luminance Uniformity (U)} = L_{\min} / L_{\max}$$

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



$L_{\max}$ : The measured Maximum luminance of all measurement position.

$L_{\min}$ : The measured Minimum luminance of all measurement position.

**Note 7: Definition of Luminance:**

Measure the luminance of white state at center point.

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## 6. INTERFACE

### 6.1 CN1:

Pin No.	Symbol	I/O	Description	Note
1	GND	P	Power ground	
2	VCC	P	Power supply (3.3V)	
3	VCC	P	Power supply (3.3V)	
4	V EDID	P	DDC 3.3V	
5	GSP	-	GSP	
6	CLK_EDID		DDC Clock	
7	Data_EDID		DDC Data	
8	RIN0-	I	LVDS receiver negative signal channel 0	
9	RIN0+	I	LVDS receiver positive signal channel 0	
10	GND	P	Power ground	
11	RIN1-	I	LVDS receiver negative signal channel 1	
12	RIN1+	I	LVDS receiver positive signal channel 1	
13	GND	P	Ground	
14	RIN2-	I	LVDS receiver negative signal channel 2	
15	RIN2+	I	LVDS receiver positive signal channel 2	
16	GND	P	Power ground	
17	CLKIN-	I	LVDS receiver negative signal clock	
18	CLKIN+	I	LVDS receiver positive signal clock	
19	GND	P	Ground	
20	NC	-	No connection	
21	VDC	P	LED Anode(Positive)	
22	VDC	P	LED Anode (Positive)	
23	NC	-	No connection	
24	VDC1	P	LED Cathode (Negative)	
25	VDC2	P	LED Cathode (Negative)	
26	VDC3	P	LED Cathode (Negative)	
27	VDC4	P	LED Cathode (Negative)	
28	VDC5	P	LED Cathode (Negative)	
29	VDC6	P	LED Cathode (Negative)	
30	NC	-	No connection	

Note: I/O definition.

I---Input pin, O---Output pin, P---Power/Ground, N---No Connection

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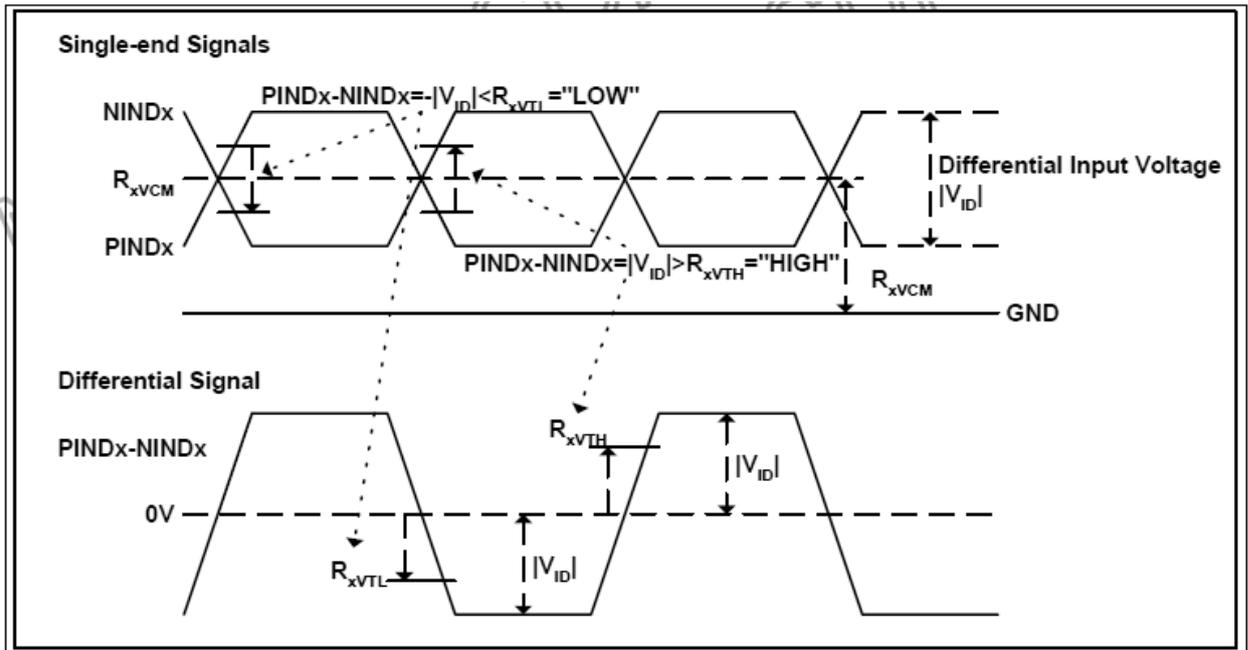
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## 7. Timing Chart

### 7.1 TFT-LCD Input Timing

**DC specification**

Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition
Differential input high threshold voltage	$R_{xVTH}$			+0.1	V	$R_{xVCM} = 1.2V$
Differential input low threshold voltage	$R_{xVTL}$	-0.1			V	
Input voltage range (singled-end)	$R_{xVIN}$	0		2.4	V	
Differential input common mode voltage	$R_{xVCM}$	$ V_{ID} /2$		$2.4 -  V_{ID} /2$	V	
Differential input voltage	$ V_{ID} $	0.2		0.6	V	
Differential input leakage current	$R_{V_{xIIZ}}$	-10		+10	$\mu A$	
LVDS Digital Operating Current	$I_{ddLVDS}$	-	40	50	mA	Fclk=65 MHz, VDD=3.3V
LVDS Digital Stand-by Current	$I_{stLVDS}$	-	10	50	$\mu A$	Clock & all Functions are stopped

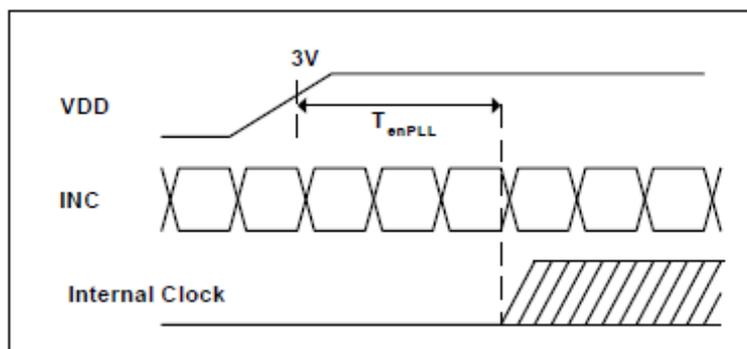
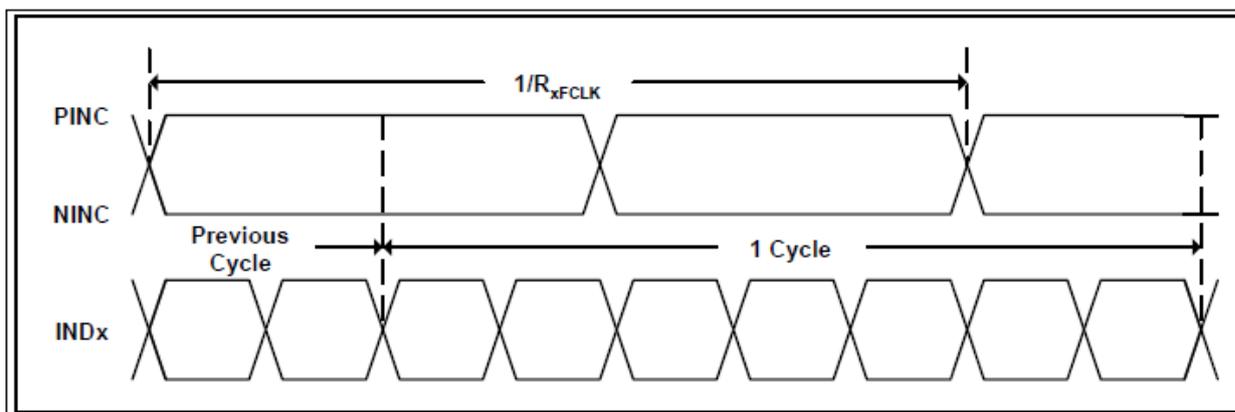


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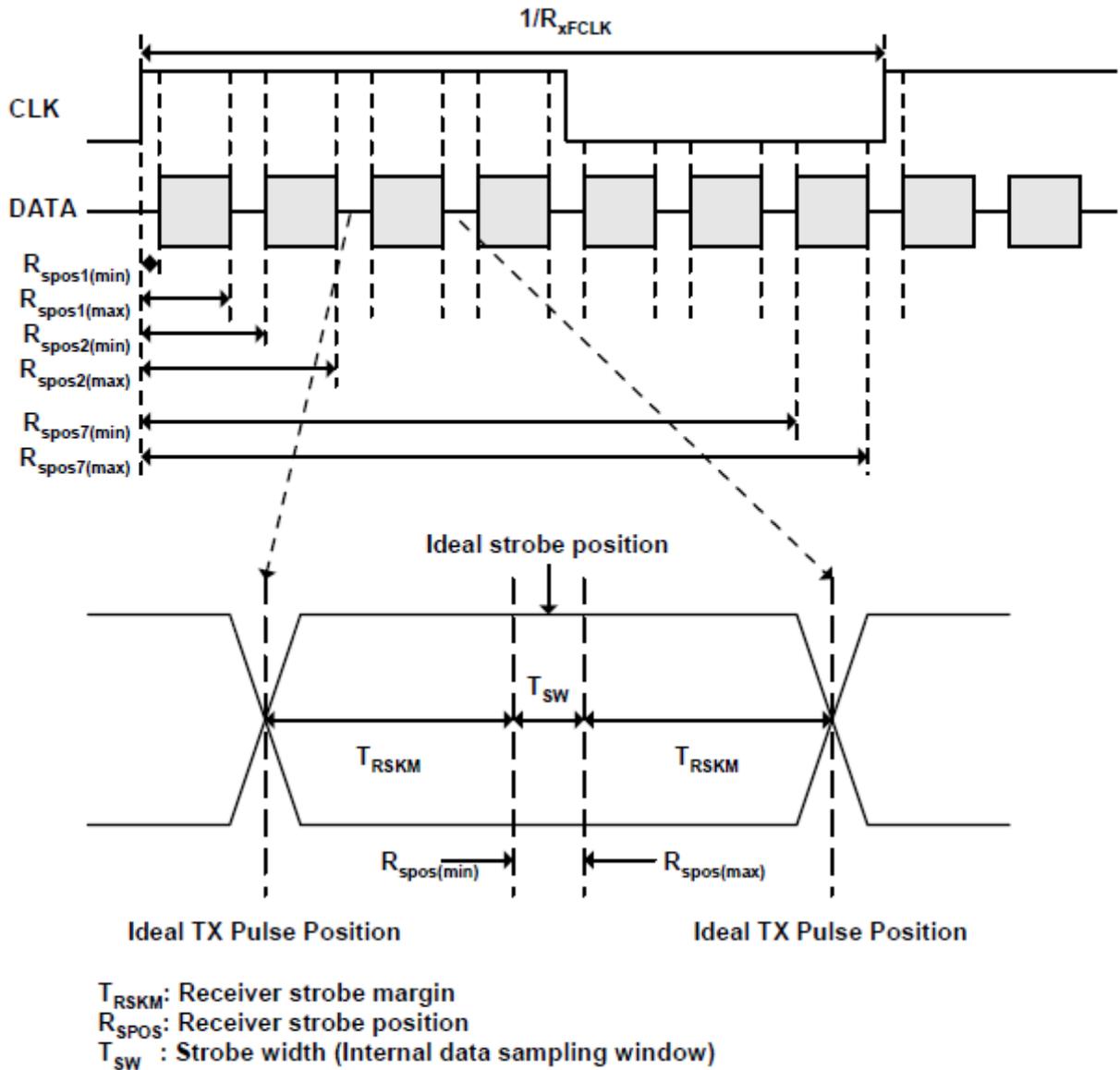
## AC specification

Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition
Clock frequency	$R_{x\text{FCLK}}$	20		71	MHz	
Input data skew margin	$T_{\text{RSKM}}$	500			pS	$ V_{\text{ID}}  = 400\text{mV}$ $R_{\text{xVCM}} = 1.2\text{V}$ $R_{\text{xFCLK}} = 71\text{MHz}$
Clock high time	$T_{\text{LVCH}}$		$4/(7 * R_{\text{xFCLK}})$		ns	
Clock low time	$T_{\text{LVCL}}$		$3/(7 * R_{\text{xFCLK}})$		ns	
PLL wake-up time	$T_{\text{enPLL}}$			150	uS	



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SSC tolerance of LVDS receiver						
Symbol	parameter	condition	Min.	Typ.	Max.	Units
SSCMF	Modulation Frequency		23		93	KHz
SSCMR	Modulation Rate	LVDS clock = 71MHz center spread			$\pm 3$	%

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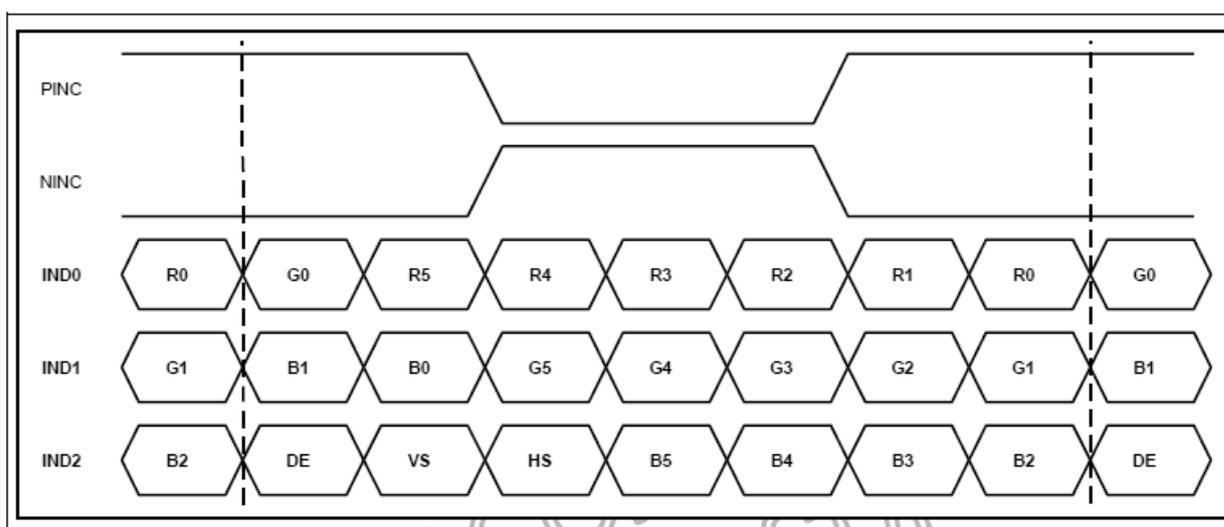
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**7.2 Timing Setting Of Signal**

**Input Timing Of Connector**

Parameter	Symbol	Min	Typ	Max	Unit	Remark
DCLK	fclk	52	65	71	MHZ	
Hsync	thd	1024			tclk	
	th	1114	1344	1400	tclk	
	thb+thfp	90	320	376	tclk	
Vsync	tvd	768			thp	
	tv	778	806	845	thp	
	tvbp+tvfp	10	38	77	thp	

**Date input:**



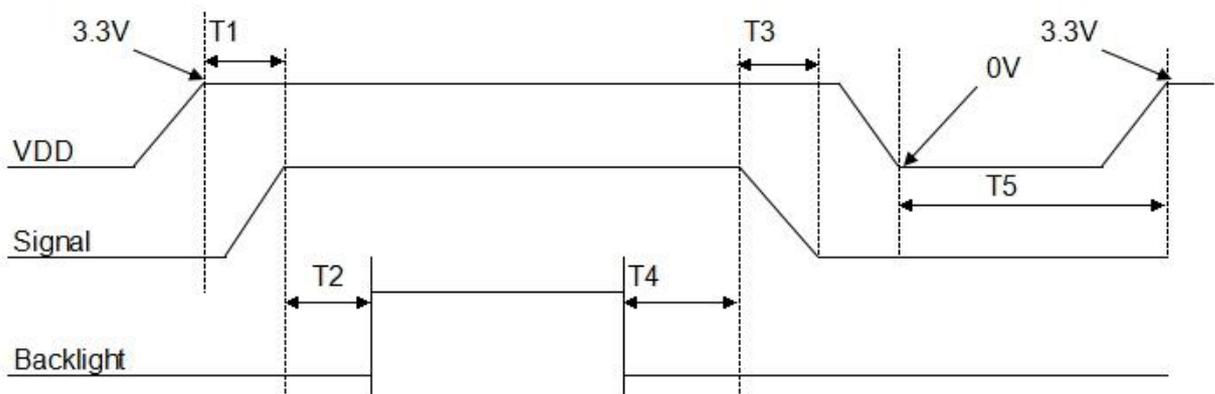
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## 7.3 POWER ON/OFF SEQUENCE

Item	Symbol	Min	Typ	Max	Unit	Remark
VDD to signal starting	T1	5	-	50	ms	
Signal starting to backlight starting	T2	150	-	-	ms	
Signal on to signal off	T3	5	-	50	ms	
Backlight on to backlight off	T4	150	-	-	ms	
VDD off to VDD 3.3V	T5	1000	-	-	ms	



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## 8. ELIABILITY TEST CONDITIONS

Test Item	Test Conditions	Note
High Temperature Operation	70±3°C ,Dry t=240 hrs	
Low Temperature Operation	-20±3°C , Dry t=240 hrs	
High Temperature Storage	80±3°C , Dry t=240 hrs	1,2
Low Temperature Storage	-30±3°C ,Dry t=240 hrs	1,2
Thermal Shock Test	-20°C ~ 25°C ~ 70°C 30 m in. 5 min. 30 min. ( 1 cycle ) Total 100 cycle(Dry)	1,2
Storage Humidity Test	60 °C, Humidity 90%, 240 hrs	1,2
Vibration Test (Packing)	Sweep frequency : 10 ~ 55 ~ 10 Hz/1min Amplitude : 1.5mm Test direction : X.Y.Z/3 axis Duration : 2 hour/each axis	2

Note 1 : Condensation of water is not permitted on the module.

Note 2 : The module should be inspected after 1 hour storage in normal conditions (15-35°C , 45-65%RH).

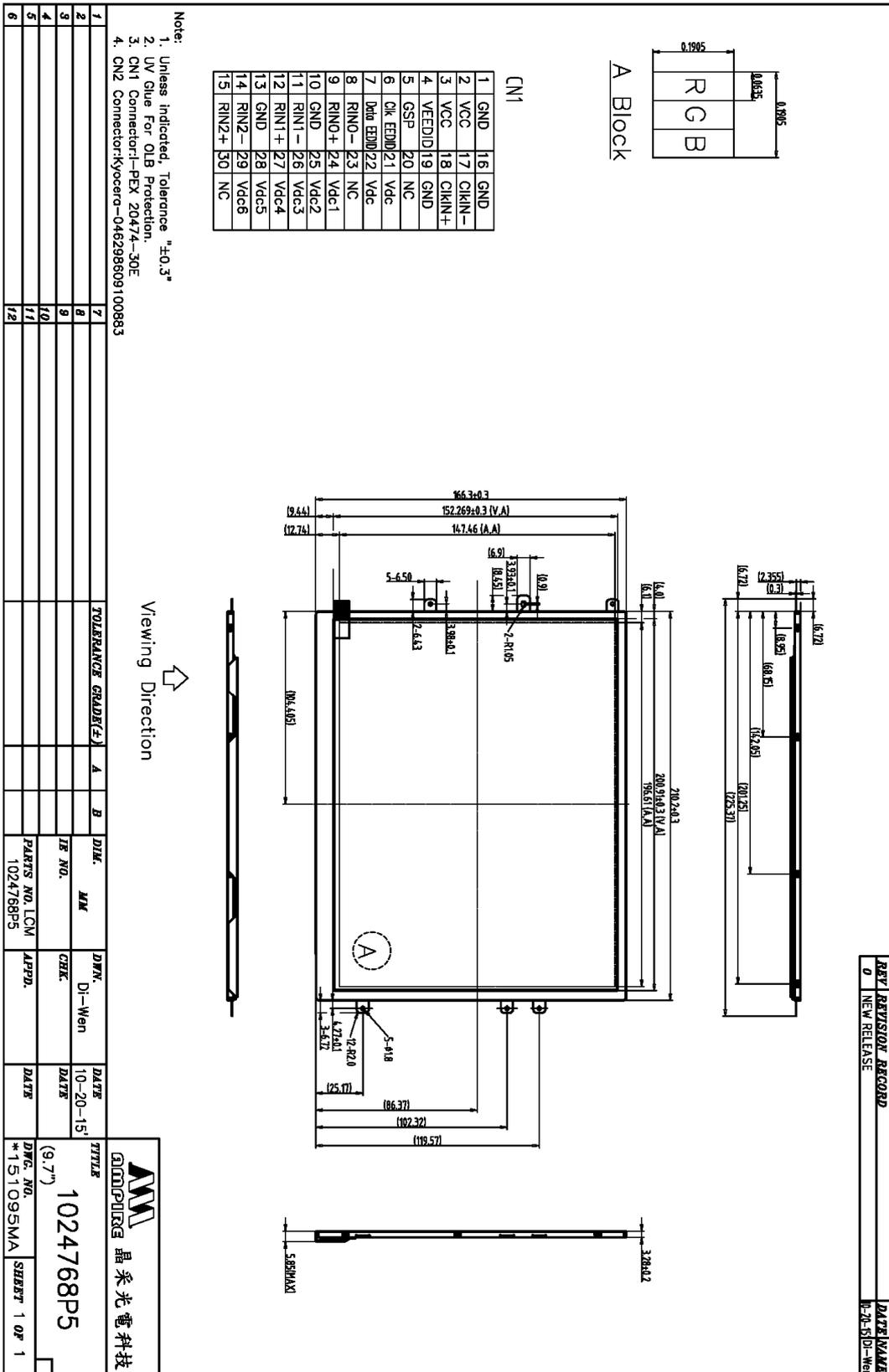
Definitions of life end point :

- Current drain should be smaller than the specific value.
- Function of the module should be maintained.
- Appearance and display quality should not have degraded noticeably.
- Contrast ratio should be greater than 50% of the initial value.

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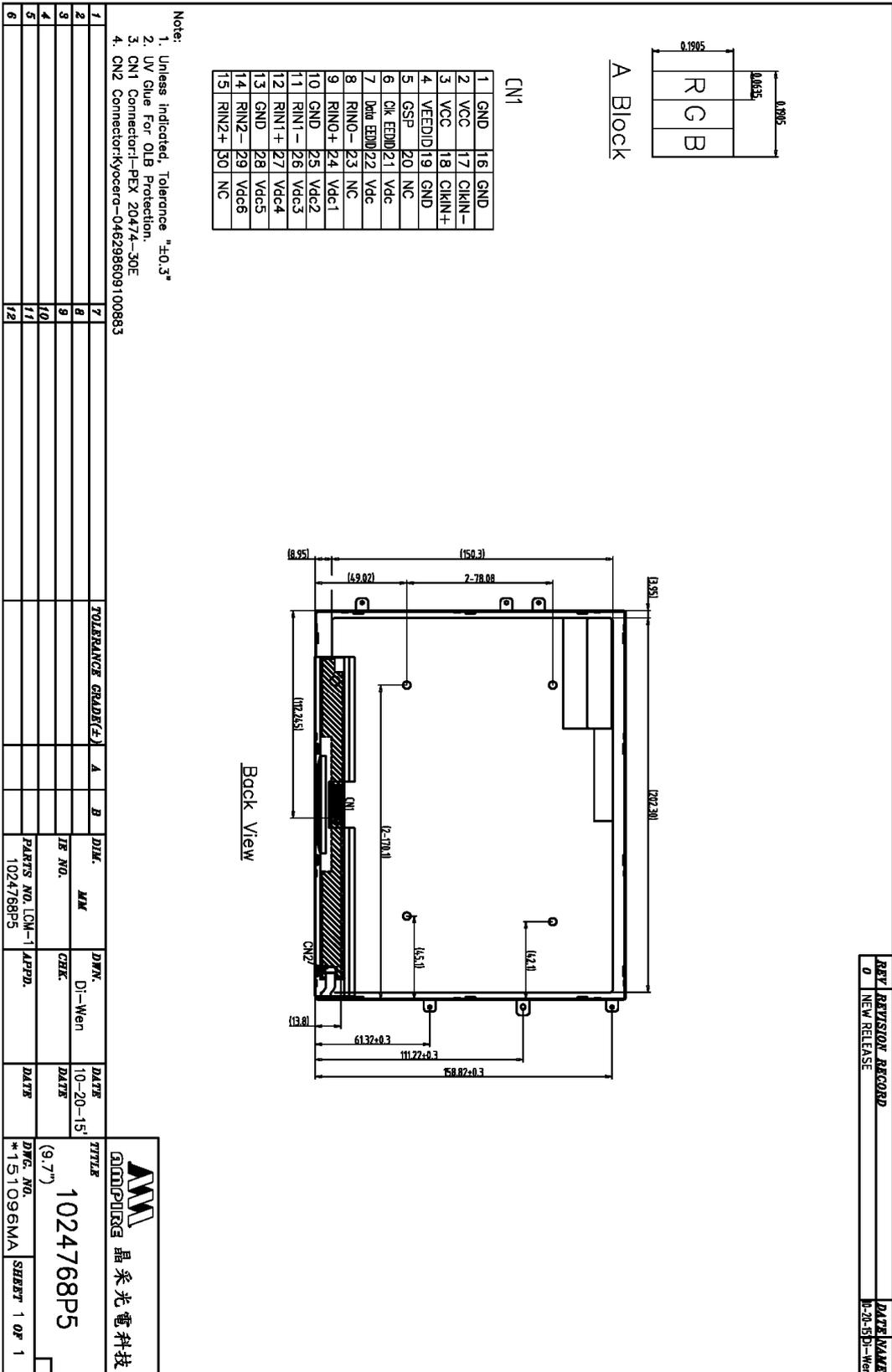
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**9. OUTLINE DIMENSION**



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# **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:

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Temperature : 0°C ~40°C      Relatively humidity: ≤80%

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

**10.3 Transportation Precautions**

10.3.1The LCD modules should be no falling and violent shocking during transportation, and also should avoid excessive press, water, damp and sunshine.