SHENZHEN APTUS TECHNOLOGY CO., LIMITED

PRODUCT SPECIFICATION

10.3" TFT-LCD MODULE

MODEL NAME: DBC103HXN20L050A

DOC VERSION: 1.0

TOTAL PAGES: 20

DATE: 2024.10.20

FOR CUSTOMER	
CUSTOMER **APPROVED**	

NOTE: THE CONTENT OF THIS SPECIFICATION IS SUBJECT TO CHANGE WITHOUT NOTICE.

Record of Revisions

Version	Revise Date	Description	Page
1.1	2024-10-20	First Release	-

Contents

1. General Specifications

1.1 LCM General Information

Item	Specification	Unit
LCD Size	10.3	inch
Number of Pixels	768 (H) x RGB x 768 (V)	pixels
Display Mode	Normally Black	-
Viewing Direction	Free	o' clock
Interface	LVDS	-
Display Colors	16.7M	colors
Outline Dimension	204.00 (H) x 204.00 (V) x 10.50 (D)	mm
Active Area	184.32 (H) x 184.32 (V)	mm
Pixel Pitch	0.2400 (H) x 0.2400 (V)	mm
Driver IC	JD9168S	-
Operation Temperature	-30~80	℃
Storage Temperature	-30~85	℃

Note1:Requirements on environmental protection RoHS compliant.

2. Absolute Maximum Ratings

Item	Symbol	MIN.	MAX.	Unit	Note
Analog Supply voltage	VDD	-0.3	3.6	V	Note 1

Note 1:Permanent damage may occur to the LCD module if beyond this specification.
Functional operation should be restricted to the conditions described under normal operating conditions.

3. Elecrical Characteristics

3.1 Recommended Operating Condition for TFT LCD

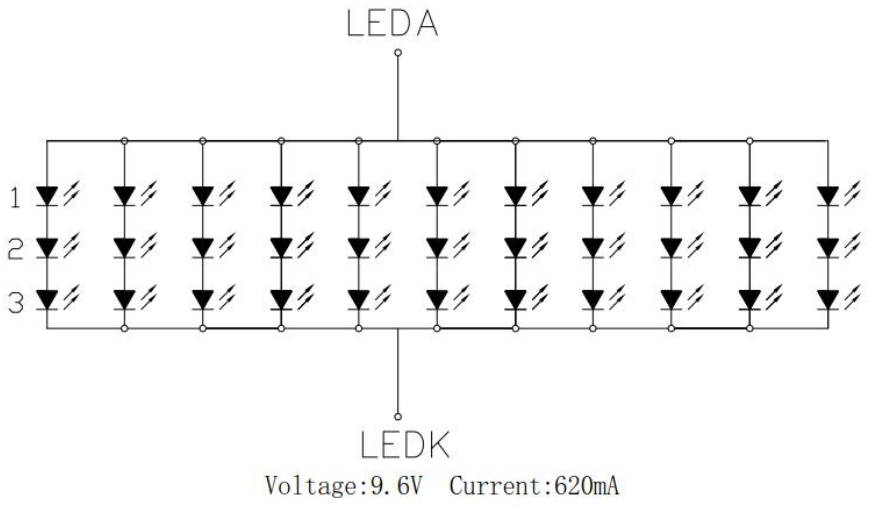
Item	Symbol	Min.	Typ.	Max.	Unit	Note
Analog Supply voltage	VDD	3.0	3.3	3.6	V	
Analog supply current	I_{VDD}	-	TBD	-	mA	VDD=3.3V
Logic input voltage	VIH	0.7*VDD	-	VDD	V	
	VIL	GND	-	0.3*VDD	V	

3.2 Recommended Driving Condition for Backlight

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Driving Current	I_F	590	620	640	mA	
Driving Voltage	V_F	9	9.6	10.2	V	
Power consumption	W_{BL}	-	5.952	-	W	
LED Life-Time	N/A	30,000	-	-	Hours	Ta=25℃ Note 1

Note 1:LED lifetime is defined as the module brightness decay 50% of original brightness at Ta=25 degree, typical current.

Note 2:LED circuit：



4. Interface Pin Assignment

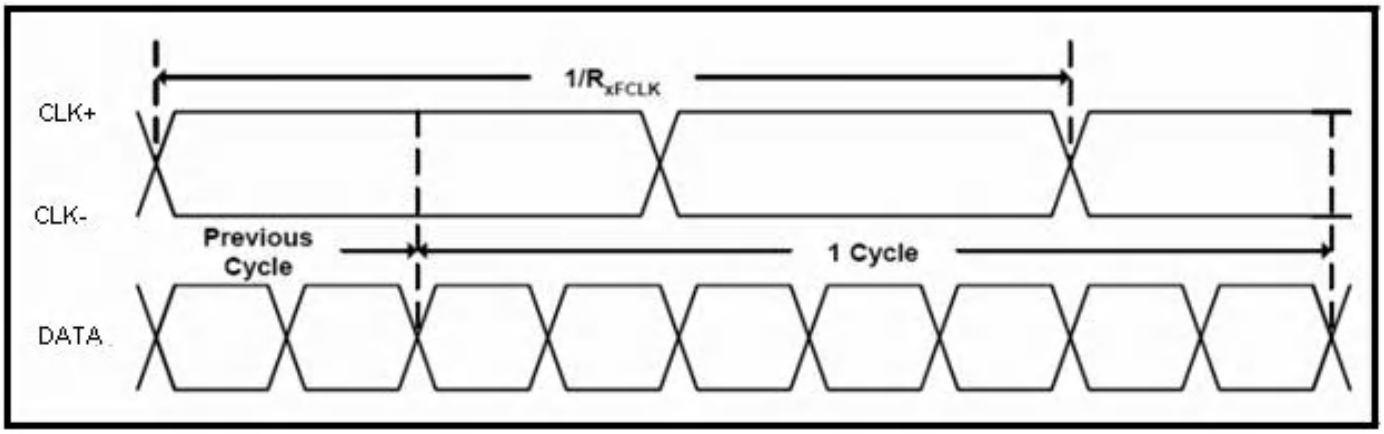
4.1 LCM Pin Assignment

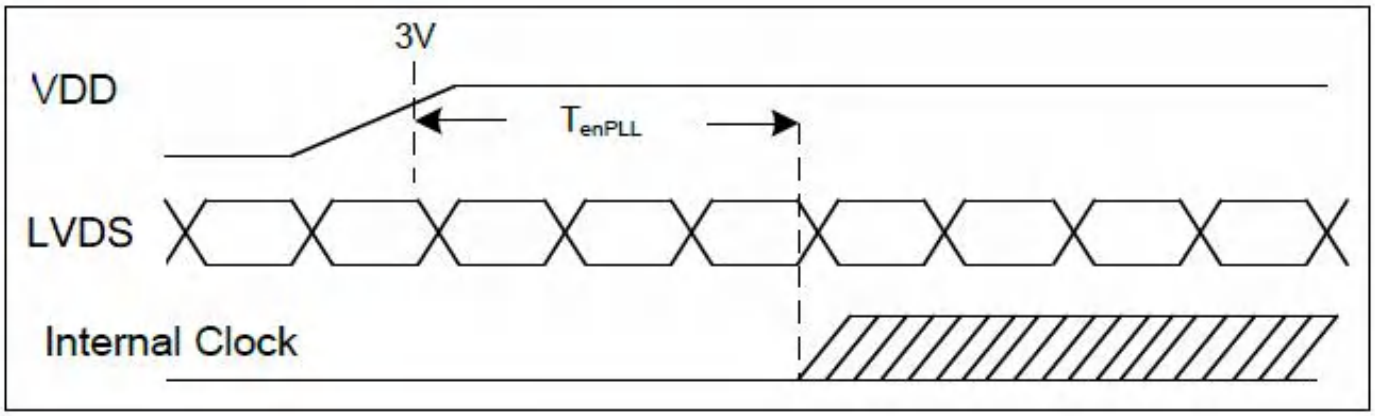
No.	Symbol	Description
1	LVDS_D3P	LVDS _D3_Pare differential small amplitude signals
2	LVDS_D3N	LVDS _D3_Nare differential small amplitude signals
3	NC	No connection
4	SELB	NC
5	GND	Ground
6	LVDS_ CLKP	LVDS _CLK_Pare differential small amplitude signals
7	LVDS_ CLKN	LVDS _CLK_Nare differential small amplitude signals
8	GND	Ground
9	LVDS_D2P	LVDS _D2_Pare differential small amplitude signals
10	LVDS_D2N	LVDS _D2_Nare differential small amplitude signals
11	GND	Ground
12	LVDS_D1P	LVDS _D1_Pare differential small amplitude signals
13	LVDS_D1N	LVDS _D1_Nare differential small amplitude signals
14	GND	Ground
15	LVDS_D0P	LVDS _D0_Pare differential small amplitude signals
16	LVDS_D0N	LVDS _D0_Nare differential small amplitude signals
17	UPDN	
18	SHLR	
19	VDD3V3	Power supply 3.0-3.6V，type：3.3V
20	VDD3V3	Power supply 3.0-3.6V，type：3.3V

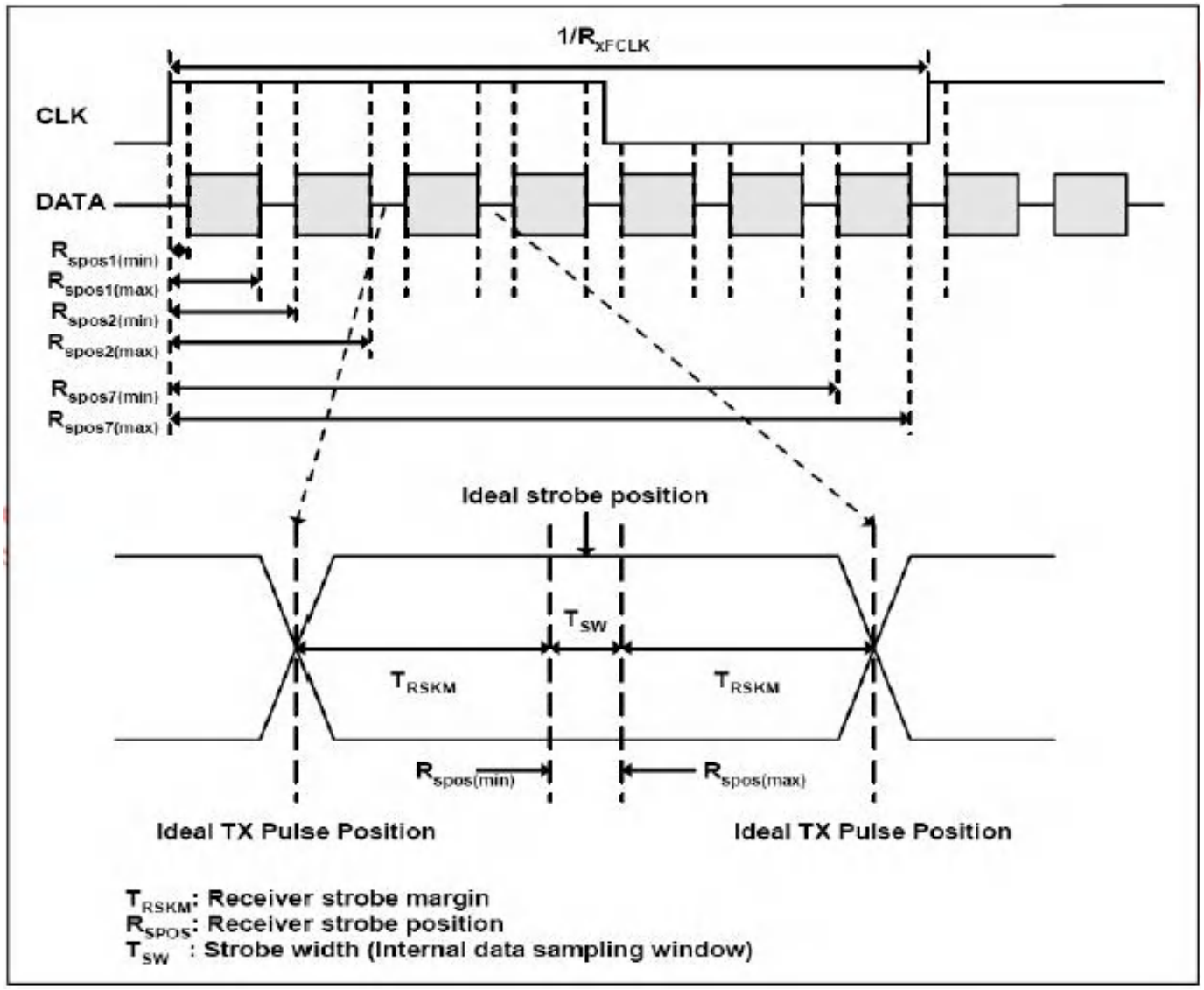
5. Interface Characteristics

5.1 LVDS mode AC Electrical Characteristics

Parameter	Symbol	Min	Typ	Max	Units	Condition
Clock frequency	RxFCLK	26.2	-	71	MHz	
Input data skew margin	TRSKM	500	-	-	ps	| VID | = 400mV RxVCM=1.2V RxFCLK=71MHz
Clock high time	TLVCH	-	4/(7xRxFCLK)	-	ns	
Clock low time	TLVCL	-	3/(7xRxFCLK)	-	ns	
PLL wake-up time	TenPLL	-	-	150	us	

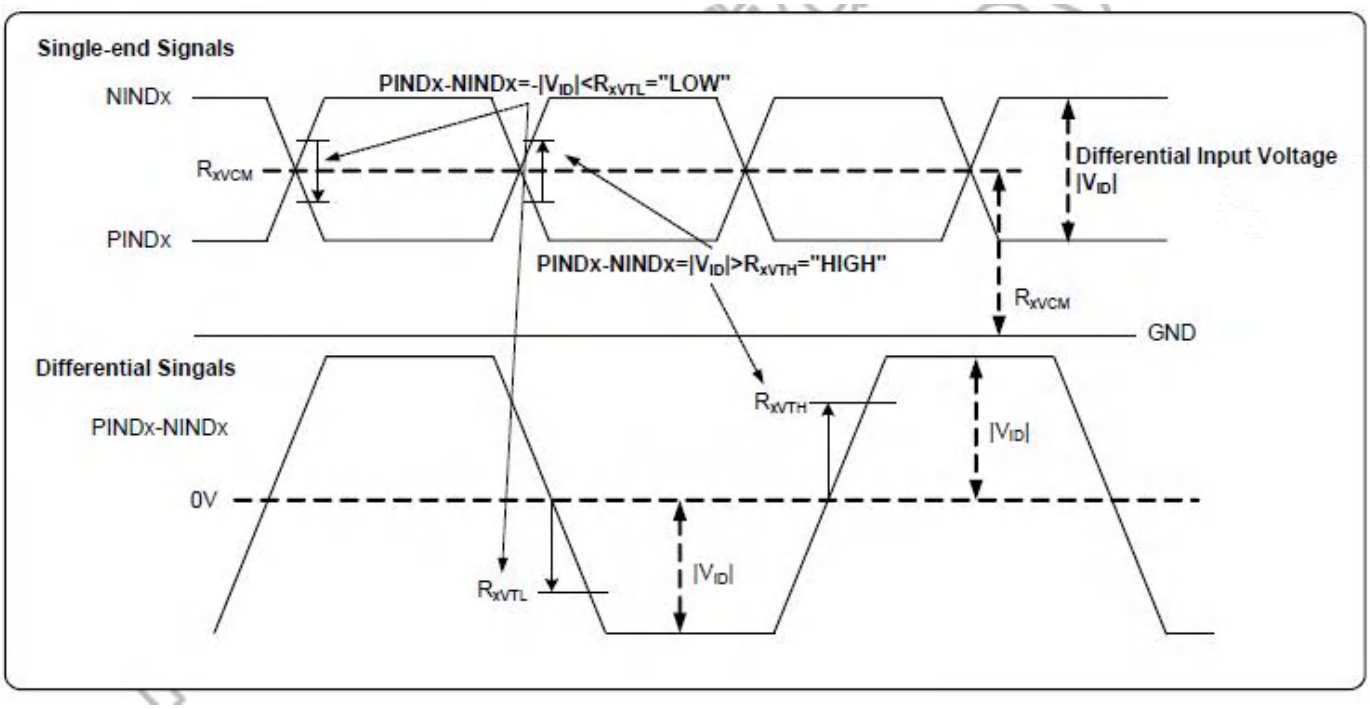





1/RxFCLK
CLK
DATA
Rspos1(min)
Rspos1(max)
Rspos2(min)
Rspos2(max)
Rspos7(min)
Rspos7(max)
Ideal strobe position
TSW
TRSKM
TRSKM
Rspos(min)
Rspos(max)
Ideal TX Pulse Position
Ideal TX Pulse Position
TRSKM: Receiver strobe margin
RSPOS: Receiver strobe position
TSW : Strobe width (Internal data sampling window)

5.2 LVDS DC Electrical Characteristics

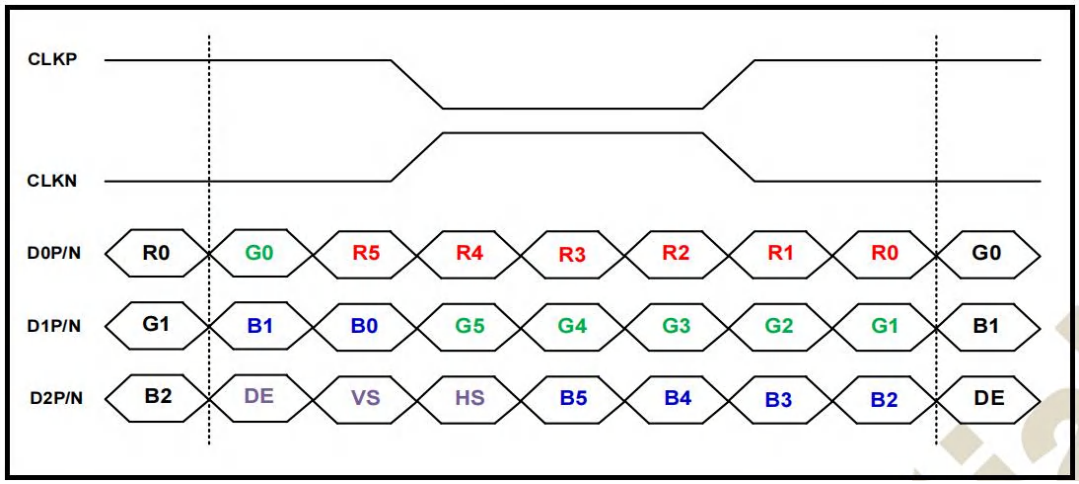
Parameter	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
LVDS Differential input high Threshold voltage	R_{xVTH}	-	-	+100	mV	R_{XVCM}=1.2V
LVDS Differential input low Threshold voltage	R_{xVTL}	-100	-	-	mV	
Input Voltage range (Singled-end)	R_{xVIN}	0	-	2.4	V	
LVDS Differential input common mode voltage	R_{xVCM}	$\|V_{ID}\|/2$	-	$2.4-\|V_{ID}\|/2$	V	
LVDS Differential input voltage	$\|V_{ID}\|$	0.2	-	0.6	V	



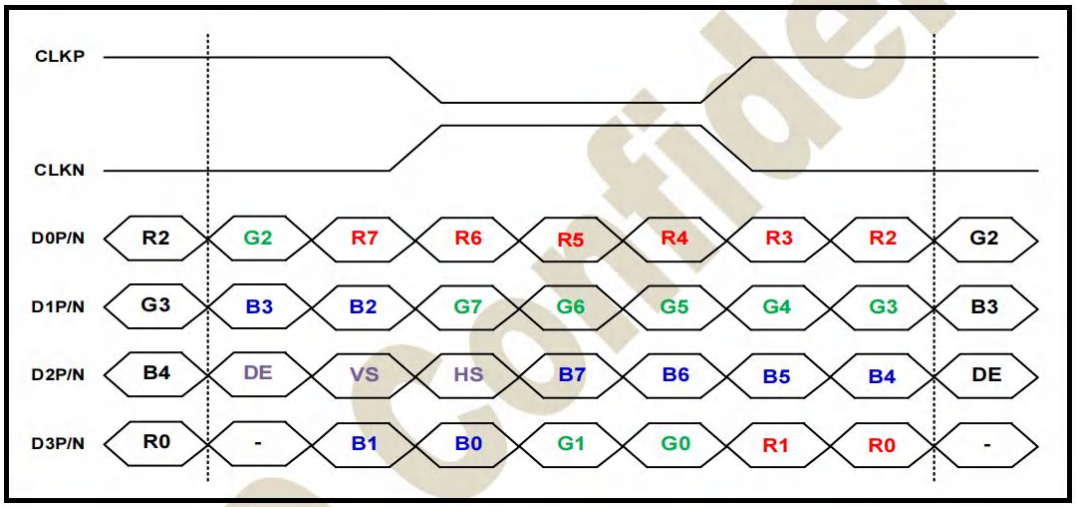
5.3 Timing

Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
DCLK frequency	fclk	52	65	71	MHz
Horizontal display area	thd		1024		DCLK
HSD period	th	1114	1344	1400	DCLK
HSD blanking	thb+thfp	90	320	376	DCLK
Vertical display area	tvd		768		T_H
VSD period	tv	778	806	845	T_H
VSD blanking	tvbp+tvfp	10	38	77	T_H

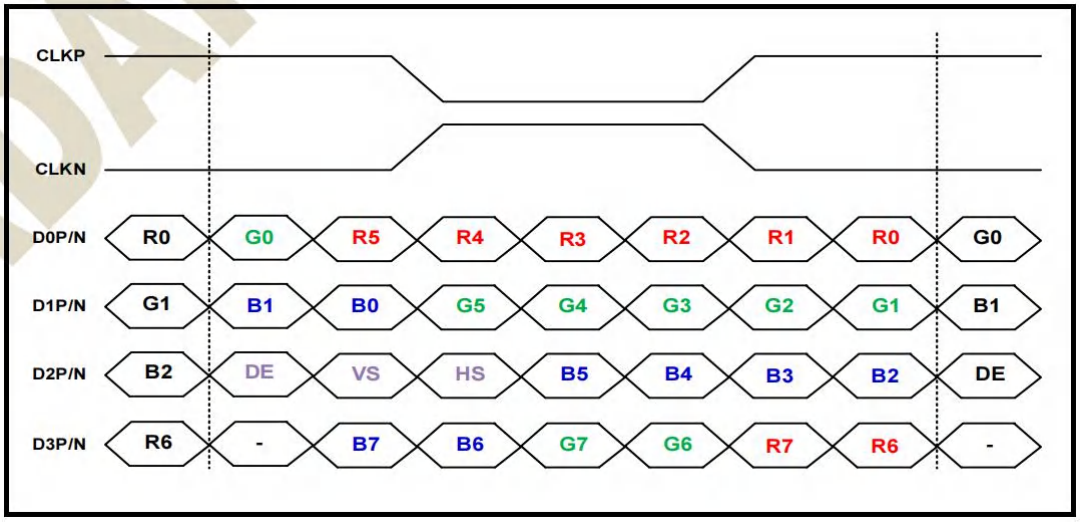
5.4 Data input format for LVDS



6-bit LVDS input (IM[1:0]=01, LANSEL[1:0]=10, LVFMT=Don't care)



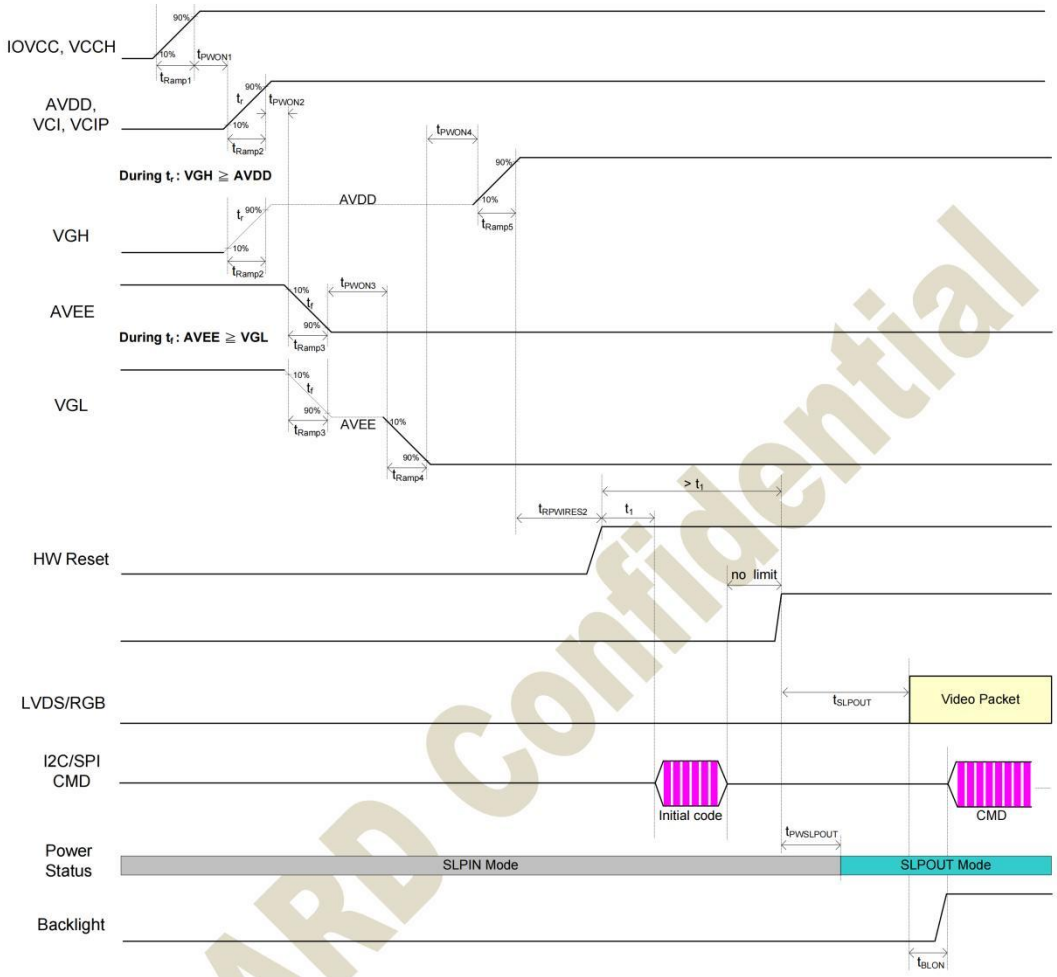
8-bit LVDS input (IM[1:0]=01, LANSEL[1:0]=11, LVFMT=1(JEIDA))



8-bit LVDS input (IM[1:0]=01, LANSEL[1:0]=11, LVFMT=0(VESA))

5.5 Power Sequence

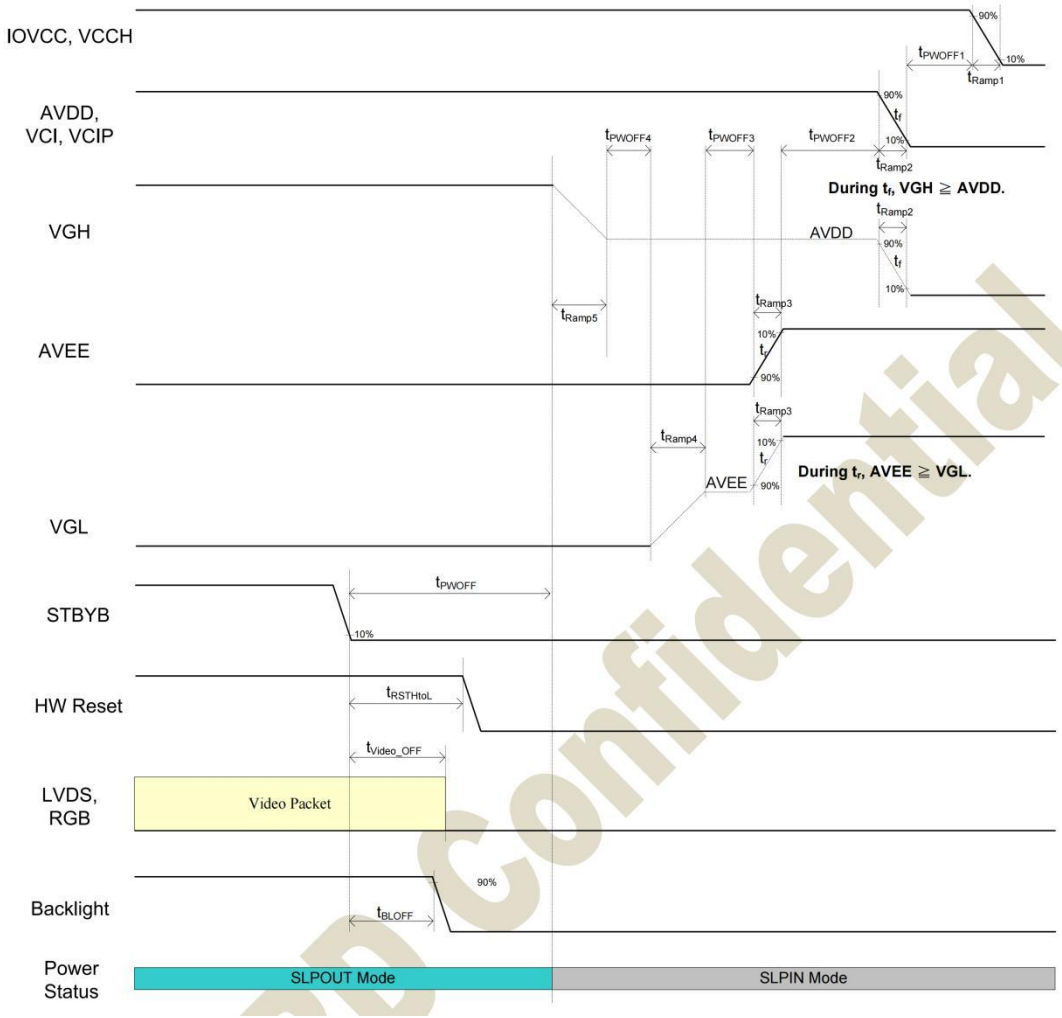
5.5.1 Power on Sequence



The power on sequence timing for different power input modes and interfaces are shown as below table.

Symbol	Value			Unit	Remark
	Min	Typ	Max		
t_{PWON1}	0	5	-	ms	
t_{PWON2}	0	5	-	ms	
t_{PWON3}	0	5		ms	
t_{PWON4}	0	5		ms	
t_{ramp1}	0.2	-	20	ms	IOVCC, VCCH
t_{ramp2}	0.2	-	20	ms	VCI, VCIP, AVDD
t_{ramp3}	0.2	-	20	ms	AVEE
t_{ramp4}	0.2	-	-	ms	VGL
t_{ramp5}	0.2	-	-	ms	VGH
$t_{RPWIRES1}$	10	-	-	ms	
$t_{RPWIRES2}$	1	-	-	ms	
t_{MIPI_LP11}	-	-	$t_{RPWIRES1}$	ms	
t_{RESETL}	20	-	-	µs	
t_1	5	-	-	ms	
t_{SLPOUT}	120	-	-	ms	
$t_{PWSLPOUT}$	-	45	-	ms	
t_{BLON}	2	-	-	VS	

5.5.2 Power off Sequence



The power off sequence timing for different power input modes and interfaces are shown as below table.

Symbol	Value			Unit	Remark
	Min	Typ	Max		
t_{PWOFF1}	0	5	-	ms	
t_{PWOFF2}	0	5	-	ms	
t_{PWOFF3}	0	5	-	ms	
t_{PWOFF4}	0	5	-	ms	
t_{ramp1}	0.2	-	20	ms	IOVCC, VCCH
t_{ramp2}	0.2	-	20	ms	VCI, VCIP, AVDD
t_{ramp3}	0.2	-	20	ms	AVEE
t_{ramp4}	0.2	-	-	ms	5Power: VGL
t_{ramp5}	0.2	-	-	ms	5Power: VGH
t_{PWOFF}	120	-	-	ms	
t_{MIPI_LP11}	0	-	t_{PWOFF}	ms	
$t_{DISPOFF}$	50	-	t_{PWOFF}	ms	
$t_{RSTHtoL}$	50	-	t_{PWOFF}	ms	
t_{Video_OFF}	0	-	t_{PWOFF}	ms	
t_{BLOFF}	0	-	-	ms	

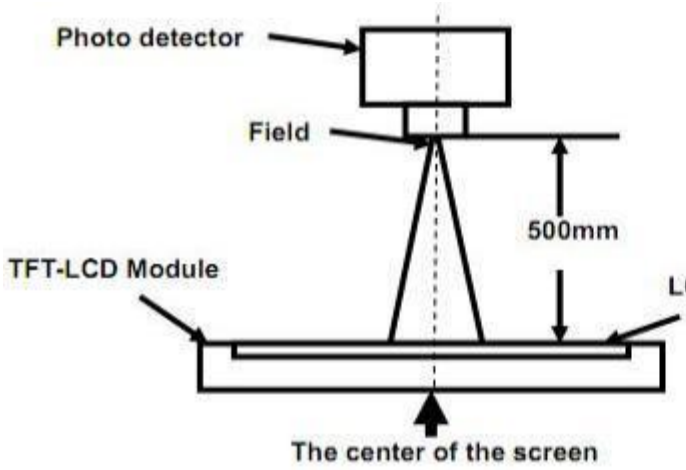
NOTE:This section is only for reference,Details please refer to the IC specification.

6. Optical Specifications

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Viewing Angle (CR≥10) B/L ON	θ_T	Φ=90°(12 o'clock)	80	85	-	deg	Note2
	θ_B	Φ=270°(6 o'clock)	80	85	-	deg	Note2
	θ_L	Φ=180°(9 o'clock)	80	85	-	deg	Note2
	θ_R	Φ=0°(3 o'clock)	80	85	-	deg	Note2
Response Time	T_{ON}	Normal θ=Φ=0°	-	25	30	msec	Note4
	T_{OFF}		-	25	30	msec	Note4
Contrast Ratio	CR		700	1900	-	-	Note1 Note3
Color Chromaticity	W_X		-0.02	0.309	+0.02	-	Note1 Note5
	W_Y		-0.02	0.333	+0.02	-	Note1 Note5
Luminance	L		-	500	-	cd/m²	Note1 Note7
Luminance Uniformity	Y_U		70	75	-	%	Note1 Note6
Color gamut	-		70	75	-	%	-

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	Field
Contrast Ratio	SR-3A	1°
Luminance		
Chromaticity		
Lum Uniformity		
Response Time	BM-7A	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).

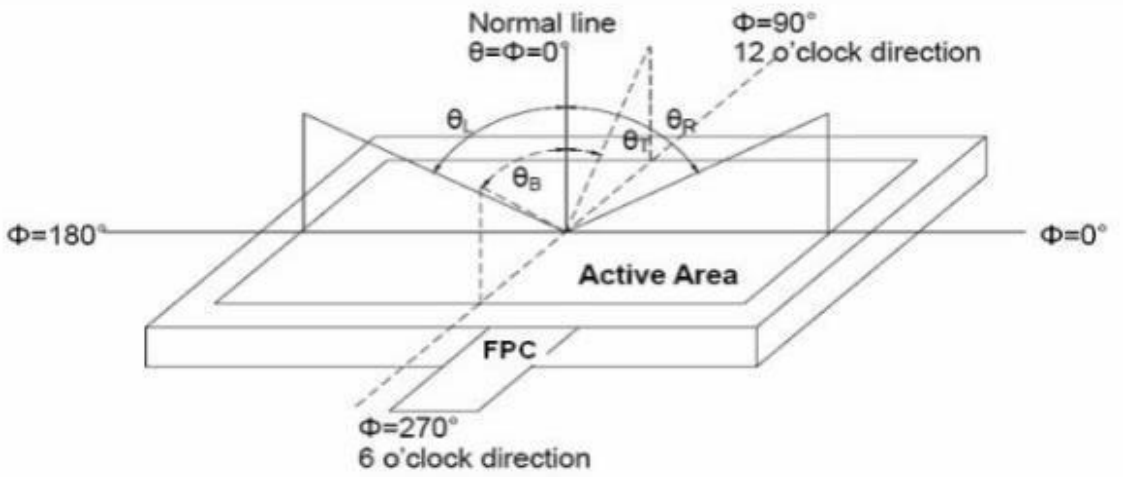


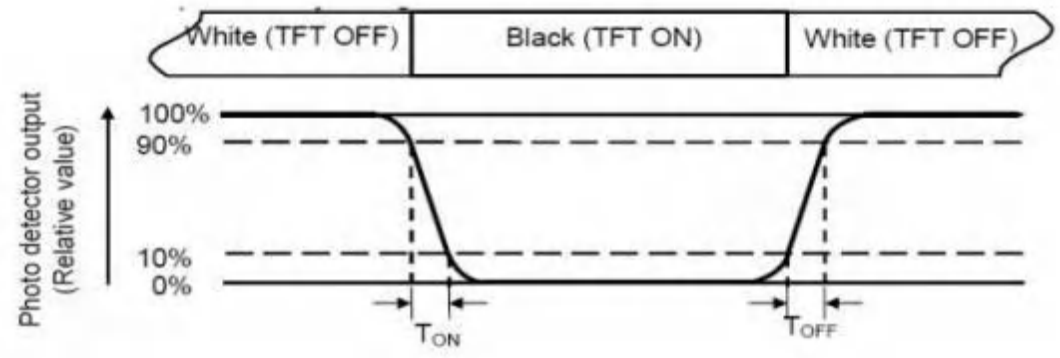
Fig. 1 Definition of viewing angle

Note 3: Definition of contrast ratio

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

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 90% to 10%. And fall time (TOFF) 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

The luminance uniformity in surface luminance is determined by measuring luminance at each test position 1 through n, and then dividing the maximum luminance of n points luminance by minimum luminance of n points luminance. For more information see FIG.2.

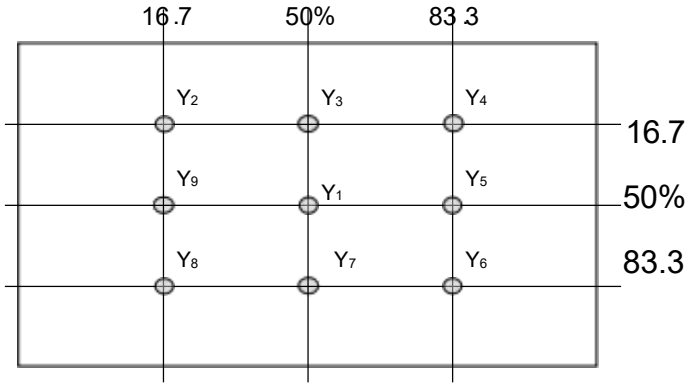


Fig. 2 Definition of points

Note 7:Definition of Luminance (Refer Fig. 2)

Surface luminance is the luminance with all pixels displaying white.

Lv = Average Surface Luminance with all white pixels(P1,P2,P3, ...,Pn).

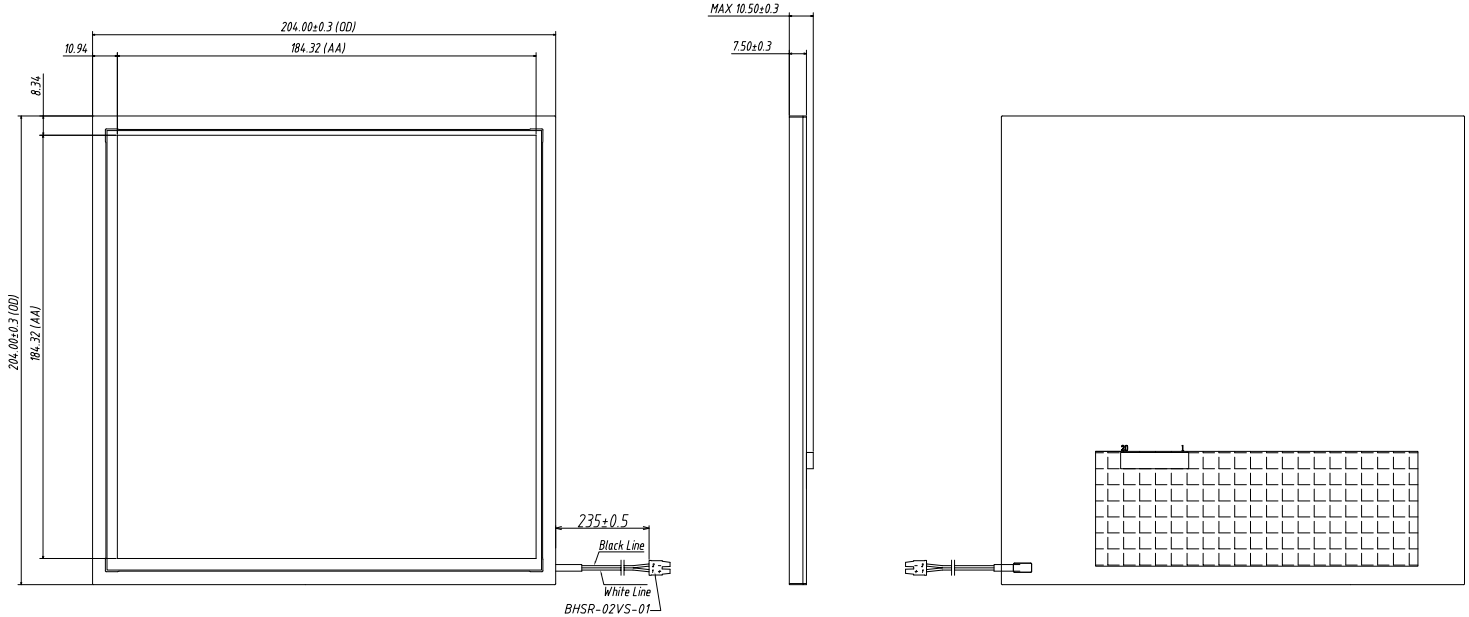
7. Reliability Test Items

Test Item	Test Conditions	
High Temperature Storage	Ta= +85℃	96hrs
Low Temperature Storage	Ta= -35℃	96hrs
High Temperature Operation	Ta= +80℃	96hrs
Low Temperature Operation	Ta= -30℃	96hrs
High Temperature and Humidity Storage	Ta= +60℃, 90% RH	96hrs
Thermal Shock (Non-operation)	-30℃/30 min ~ +80℃/30 min for 20 cycles Start with cold temperature end with high temperature	
Electro Static Discharge	Contact = ± 4 kV, class B Air = ± 8 kV, class B R=330Ω,C=150pF	
Vibration	Sweep: 10Hz~55Hz~10Hz Stroke: 1.5mm 2 hrs for each direction of X .Y. Z.	
Mechanical Shock	60G 6ms,±X,±Y,±Z 3 times for each direction	
Package Drop Test	Height: 60 cm 1 corner, 3 edges, 6 surfaces	

Notes: The test result shall be evaluated after the sample has been left at room temperature and humidity for 2 hours without load. No condensation shall be accepted. The sample will not be accepted if appear these defects:

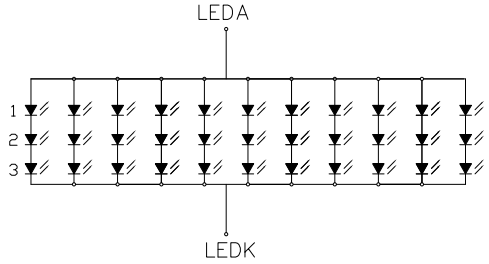
1). Air bubble in the LCD
2). Seal leak or Glass crack
3). Non display or abnormal display
4). Brightness reduction >50%

8. Mechanical Drawing



Note:

1. Backlight parameter:
   Voltage:9V～10.2V
   Current:590mA～640mA
2. Brightness: 500 cd/m²
3. LED Circuit:



LCM Pin Assignment

No.	Symbol	Description
1	LVDS_D3P	LVDS_D3_Pare differential small amplitude signals
2	LVDS_D3N	LVDS_D3_Nare differential small amplitude signals
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4	SELB	NC
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6	LVDS_CLKP	LVDS_CLK_Pare differential small amplitude signals
7	LVDS_CLKN	LVDS_CLK_Nare differential small amplitude signals
8	GND	Ground
9	LVDS_D2P	LVDS_D2_Pare differential small amplitude signals
10	LVDS_D2N	LVDS_D2_Nare differential small amplitude signals
11	GND	Ground
12	LVDS_D1P	LVDS_D1_Pare differential small amplitude signals
13	LVDS_D1N	LVDS_D1_Nare differential small amplitude signals
14	GND	Ground
15	LVDS_D0P	LVDS_D0_Pare differential small amplitude signals
16	LVDS_D0N	LVDS_D0_Nare differential small amplitude signals
17	UPDN	
18	SHLR	
19	VDD3V3	Power supply 3.0-3.6V， type：3.3V
20	VDD3V3	Power supply 3.0-3.6V， type：3.3V

Drawn By : Chen Pingping	Material :		APTUS INTERNATIONAL Co.,LTD
Checked By :	Drawing Date : 2024/10/20	Tolerances : ±0.20	Product : 10.3 Inch Module
Confirm By :	FIRST ANGLE PROJECTION	Version : 1.0	Product No. : DBC103HXN20L050A

9. Packing

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
- Ketene
- 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.