SPECIFICATION

PRODUCT NO. : **XT18033A**
VERSION : **Ver 1.5**
ISSUED DATE : **2020-03-25**

浙江新力光电科技有限公司 受控文件 2020 -03- 25 ZHEJIANG XINLI OPTOELECTRONICS TECHNOLOGY CO.,LTD

This module uses ROHS2 material

FOR CUSTOMER: _____

□: APPROVAL FOR SPECIFICATION
■: APPROVAL FOR SAMPLE

DATE	APPROVED BY

Xinli Optoelectronics :

Presented by	Reviewed by	Organized by

Note:

1.Xinli Optronics reserves the right to make changes without further notice to any products herein to improve reliability, function or design.

1. Revision Recode

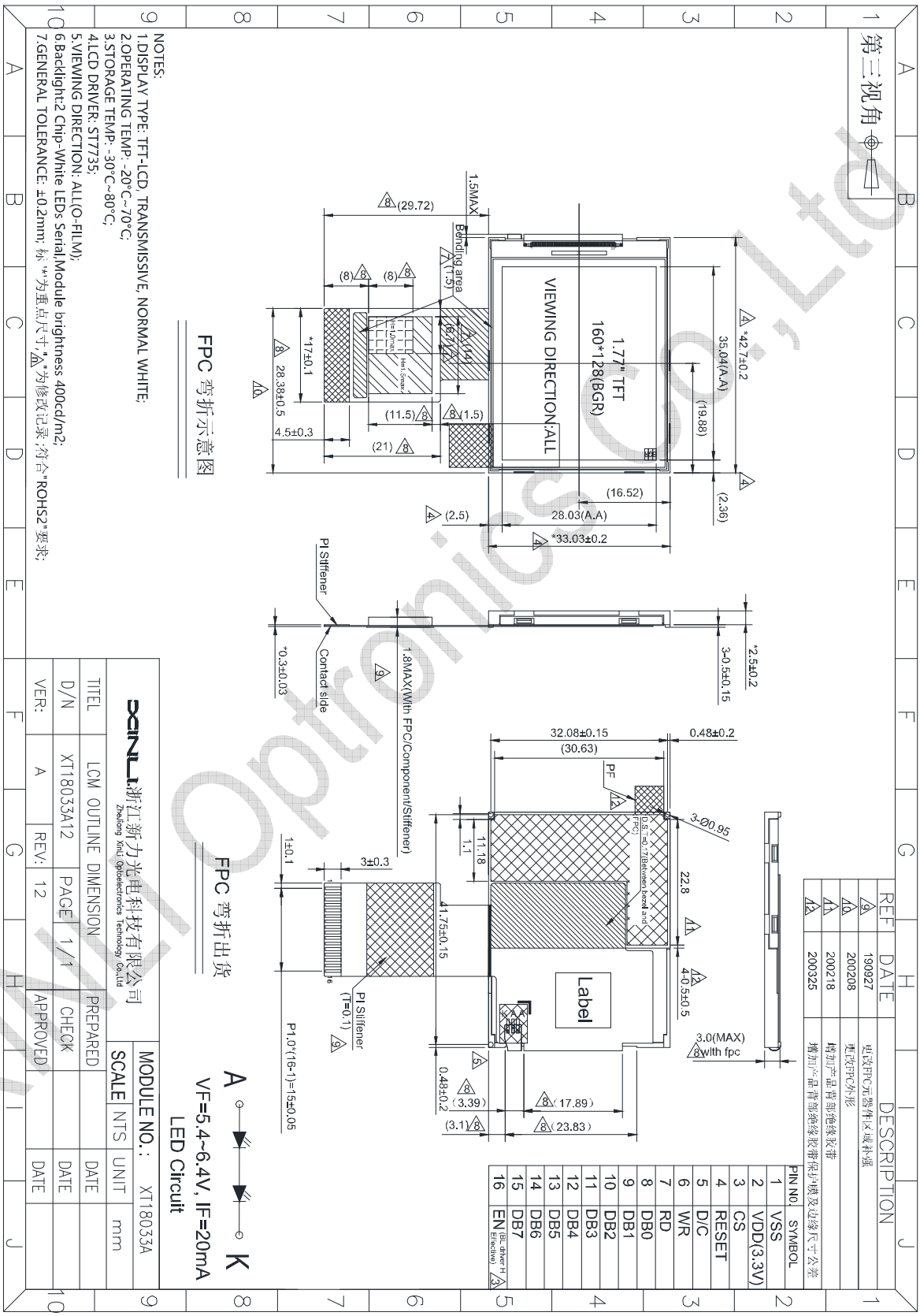
Revision	Description	Date
1.0	Initial Release	2019/09/19
1.1	Change the Mechanical Dimension	2019/09/27
1.2	Update data	2019/12/20
1.3	Optimization specification	2020/02/07
1.4	Change the Mechanical Dimension	2020/2/19
1.5	Change the Backlight Characteristics and Add insulation tape appearance standard	2020/3/25

2. General Description and Features

The 1.8 inch Module named XT18033A is a-Si TFT-LCD module, which is the type of transmissive. It is consisted of TFT-LCD Panel, Driver IC, FPC and Back-Light unit. Features of this product are listed in the following table.

NO	Item	Contents	Unit
(1)	Module Outsize	33.03*42.7*2.5	mm
(2)	LCD Active area	28.03*35.04	mm
(3)	Dot Number	128*3(RGB)*160	/
(4)	Dot size	0.198*0.198	mm
(5)	LCD type	TFT Transmissive	/
(6)	Display Color	256	/
(7)	Viewing direction	ALL(O-FILM)	O'clock
(8)	Backlight Type	2-chip LEDs	/
(9)	Power Supply	3.3（TYP)	V
(10)	IC	ST7735	/
(11)	Interface	FPC 1.0mm_Pitch 16 pin	/
(12)	Interface type	MCU	/
(13)	Module weight	6.9	g

3. Mechanical Dimension

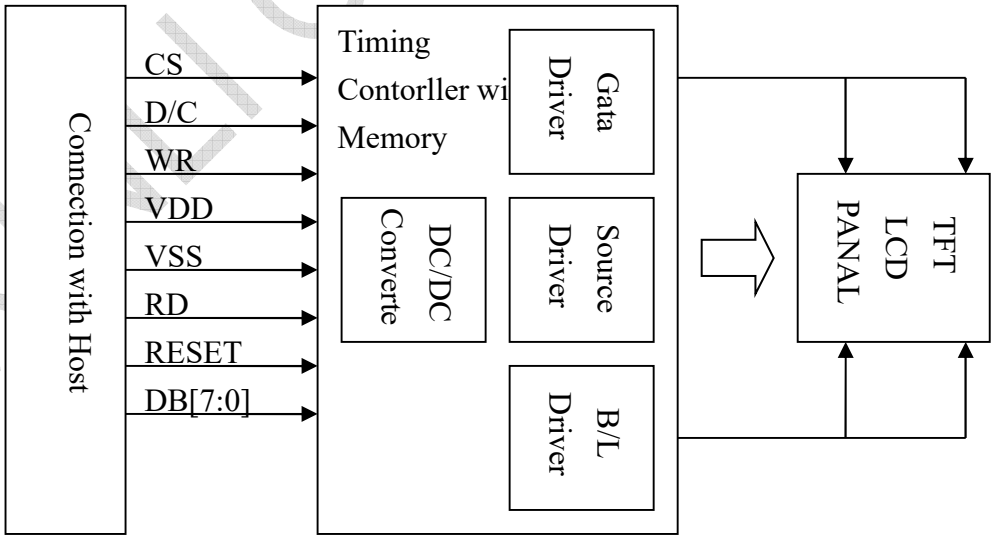


4. Interface Pin Connection

LCM interface Pin

NO	Symbol	Level	Description
1	VSS	P	Power ground
2	VDD	P	Power voltage
3	CS	I	Chip selection pin
4	RESET	P	Reset signal of the driver IC
5	D/C	I	Display data/command selection pin in parallel interface.
6	WR	I	Write enable in MCU parallel interface.
7	RD	I	Read enable in 8080 MCU parallel interface.
8	DB0	I	DATA BUS
9	DB1	I	DATA BUS
10	DB2	I	DATA BUS
11	DB3	I	DATA BUS
12	DB4	I	DATA BUS
13	DB5	I	DATA BUS
14	DB6	I	DATA BUS
15	DB7	I	DATA BUS
16	EN(B/L)	I	B/L Enable

5. Block Diagram



6. Maximum Rating

Item	Symbol	Rating	Unit
Operating temperature	Top	-20 to 70	℃
Storage temperature	Tst	-30 to 80	℃
Booster power supply	VDD	-0.3V ~ 4.5	V

7. Electrical Characteristics

Item		Symbol	Condition	Min.	Typ.	Max.	Unit
Analog power supply		VDD	-	3.0	3.3	3.6	V
Logic input signal Voltage	H level	V_{IH1}	-	0.7*VDD 0.8*VDD	-	VDD	V
	L level	V_{IL1}		0	-	0.3*VDD 0.2*VDD	V
Logic output signal Voltage	H level	V_{OH}	-	0.9*VDD	-	VDD	V
	L level	V_{OL}	-	0	-	0.1*VDD	V

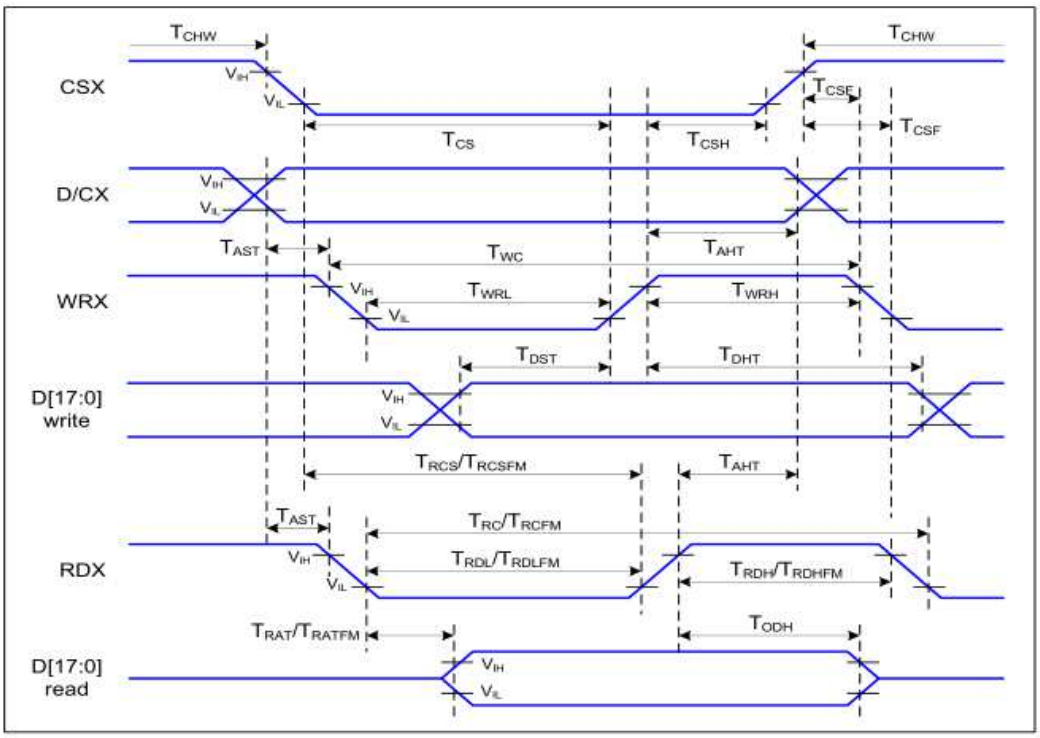
8. Backlight Characteristics

Item	syb	Min	Typ	Max	Unit	Condition
Voltage	Vf	-	5.6	-	V	IF=20mA
Number of LED	-	2			pcs	-
Power Consumption	PWF	118.8	123.2	149.6	mW	-
Connection mode	P	Series connection			-	-
LED lifetime	-	(20000)	-	-	Hrs	25℃, If=20mA,60%RH

LED lifetime is when the brightness decays to 50%

9. Timing Characteristics

Parallel Interface Characteristics: 18, 16, 9 or 8-bit Bus (8080 Series MCU Interface)

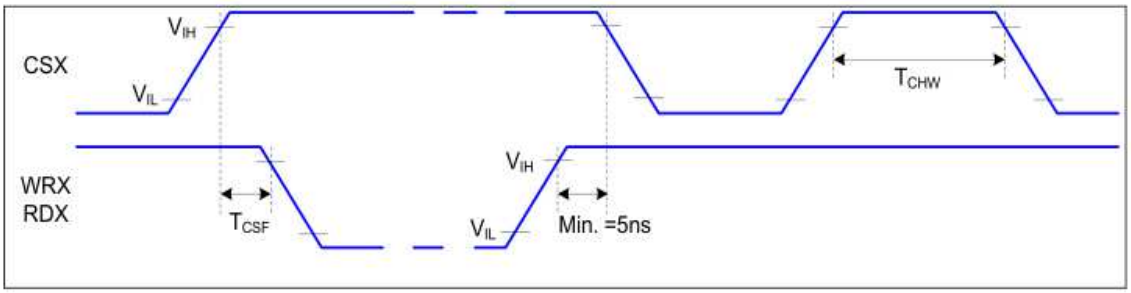


Ta=25 ℃, VDDI=1.65~3.7V, VDD=2.5~3.7V

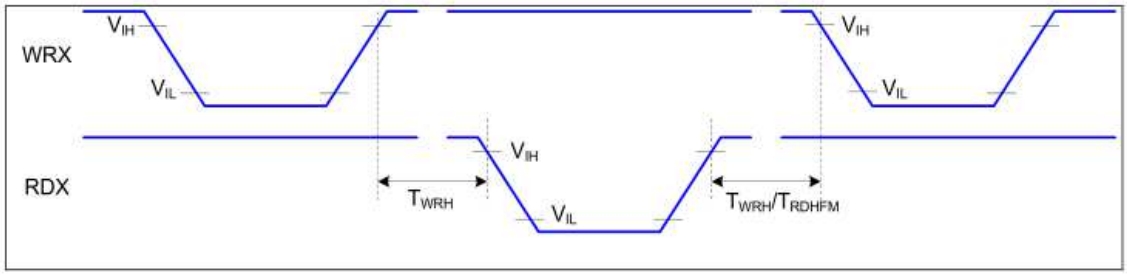
Signal	Symbol	Parameter	Min	Max	Unit	Description
D/CX	TAST	Address Setup Time	0		ns	-
	TAHT	Address Hold Time (Write/Read)	10		ns	
CSX	TCHW	Chip Select "H" Pulse Width	0		ns	-
	TCS	Chip Select Setup Time (Write)	15		ns	
	TRCS	Chip Select Setup Time (Read ID)	45		ns	
	TRCSFM	Chip Select Setup time (Read FM)	355		ns	
	TCSF	Chip Select Wait Time (Write/Read)	10		ns	
	TCSH	Chip Select Hold Time	10		ns	
WRX	TWC	Write Cycle	66		ns	
	TWRH	Control Pulse "H" Duration	15		ns	
	TWRL	Control Pulse "L" Duration	15		ns	
RDX (ID)	TRC	Read Cycle (ID)	160		ns	When Read ID Data
	TRDH	Control Pulse "H" Duration (ID)	90		ns	
	TRDL	Control Pulse "L" Duration (ID)	45		ns	

RDX (FM)	TRCFM	Read Cycle (FM)	450		ns	When Read from Frame Memory
	TRDHFM	Control Pulse "H" Duration (FM)	90		ns	
	TRDLFM	Control Pulse "L" Duration (FM)	355		ns	
D[17:0]	TDST	Data Setup Time	10		ns	For CL=30pF
	TDHT	Data Hold Time	10		ns	
	TRAT	Read Access Time (ID)		40	ns	
	TRATFM	Read Access Time (FM)		340	ns	
	TODH	Output Disable Time	20	80	ns	

Rising And Falling Timing for Input And Output Signal



Chip Selection (CSX) Timing



Write-to-Read And Read-to-Write Timing

10. Application Circuit

Please consult our technical department for detail information.

11. Initial Code

Please consult our technical department for detail information.

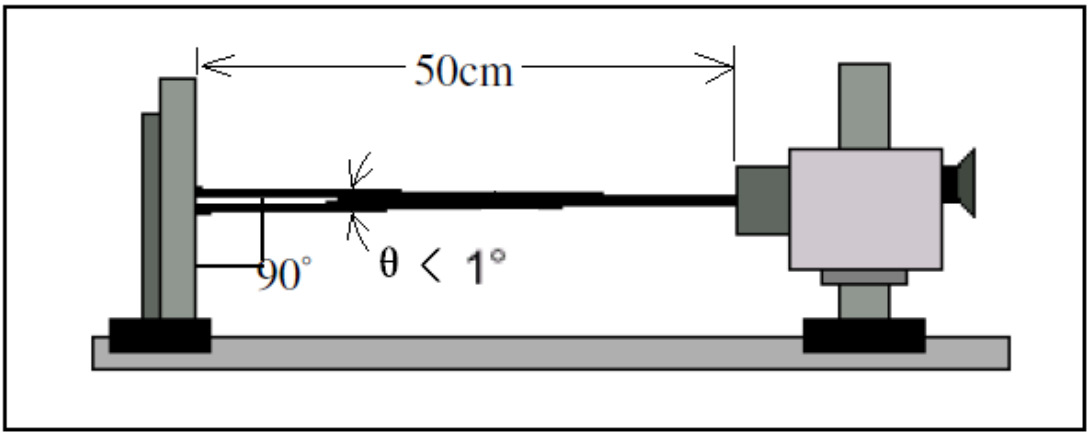
12. Electro-Optical Characteristics

Item		Symbol	Condition	Min	Typ	Max	Unit	Note
Transmission (with pol)		T		-	6.9	-	%	
Response time		Tr+Tf	θ =0° ∅=0° Ta=25℃	-	30	-	ms	4
Uniformity （Five point）		δ WHITE		-	80	-	%	7
Contrast ratio		Cr		-	300	-	-	3 ,5
Surface Luminance		Lv		-	400	-	-	3 ,7
Viewing angle range		θ	∅ = 90°	-	45	-	deg	6
			∅ = 270°	-	45	-	deg	
			∅ = 0°	-	20	-	deg	
			∅ = 180°	-	45	-	deg	
Color filter chromaticity (x, y)	White	X	θ =0° ∅=0°	0.2629	0.3029	0.3429		7
		Y		0.2785	0.3185	0.3585		

Note 1: Ambient temperature=25℃±2℃

Note 2: To be measured in the dark room with backlight unit.

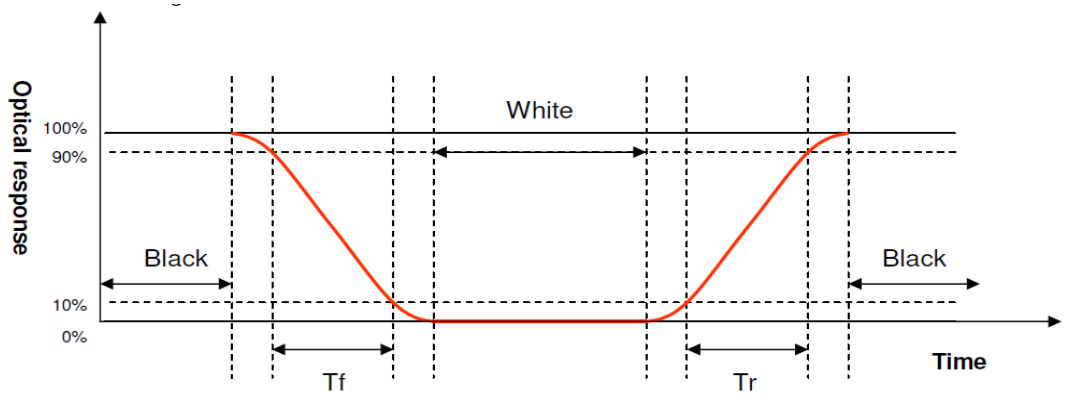
Note 3: To be measured at the center area of panel with a viewing cone of 1 by Topcon luminance meter BM-7A, after 10 minutes operation (module).



Note 4: Definition of response time:

The output signals of photo detector are measured when the input signals are changed from “black” to “white” (rising time) and from “white” to “black” (falling time), respectively. The response time is defined as the time interval between the 10% and 90% of amplitudes.

Refer to figure as below.



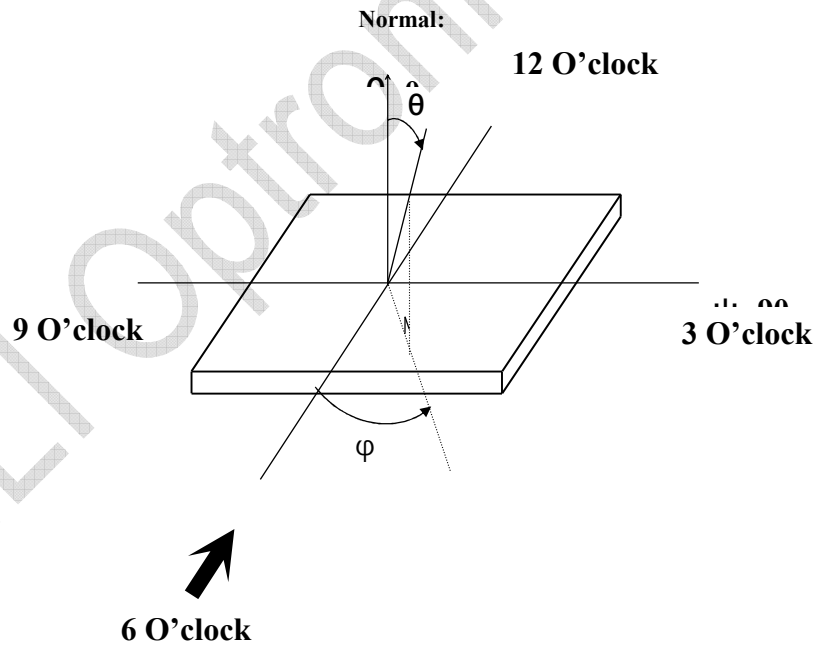
Note 5. Definition of contrast ratio:

Contrast ratio is calculated with the following formula:

$$\text{Contrast ratio (CR)} = \frac{\text{Photo detector output when LCD is at "White" state}}{\text{Photo detector output when LCD is at "Black" state}}$$

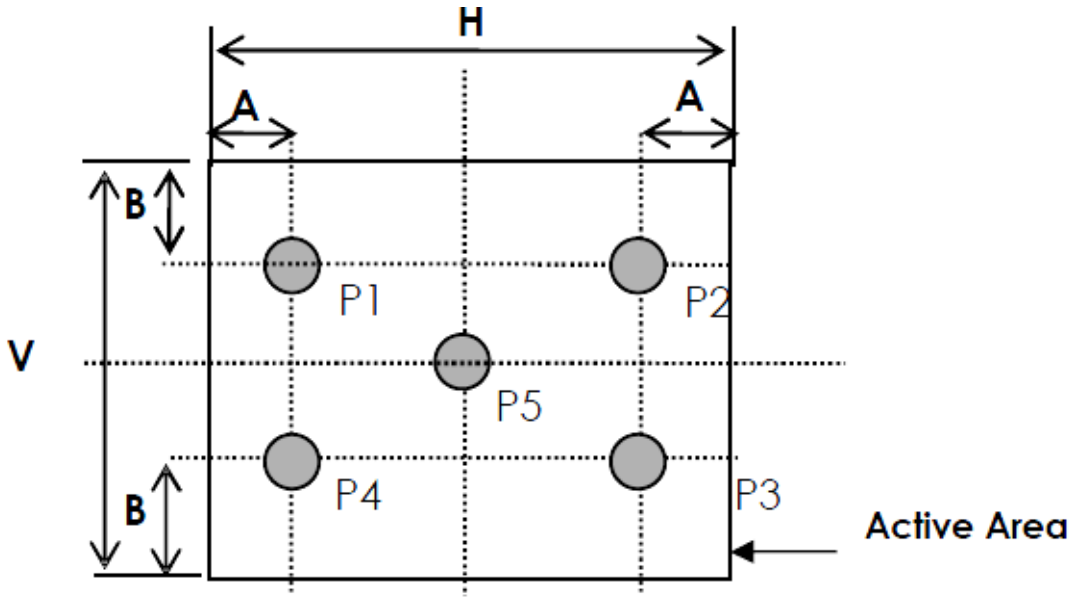
Note 6. Definition of viewing angle

Viewing angle is the angle at which the contrast ratio is greater than 10 for TFT module. The angles are determined for the horizontal or x axis and the vertical or y axis with respect to the z axis which is normal to the LCD surface.



Note 7. Surface luminance is the LCD surface from the surface with all pixels displaying white. Refer to figure as below.

Measuring method for Contrast ratio, surface luminance, Luminance uniformity， CIE (x, y) chromaticity



A : 5 mm B : 5 mm H,V : Active Area

Light spot size Æ=7mm, 500mm distance from the LCD surface to detector lens

measurement instrument is TOPCON's luminance meter BM-7A

Uniformity definition= [min of 5point/max of 5points]x100%

Lv = Average Surface Luminance with all white pixels (P_1, P_2, P_3, P_4, P_5)

13. Quality Assurance

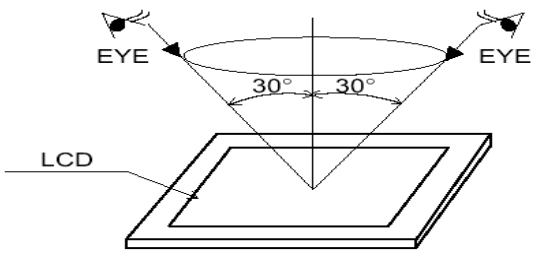
The customer should check and accept the products of XINLI within one month after reception. This standard for Quality Assurance should affirm the quality of LCD products to supply to purchaser by XINLI Company Limited.

1. Appearance Inspection

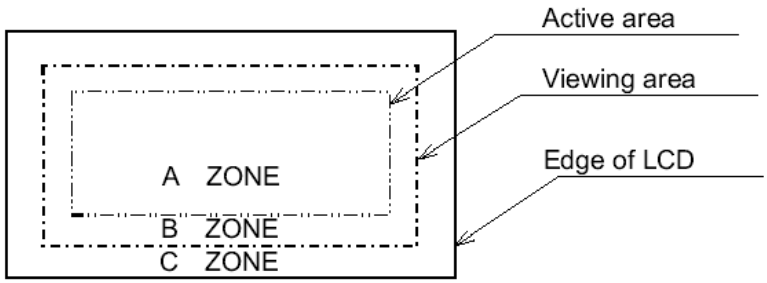
（1）Ambient illumination condition need 750lux for visual cosmetic inspection (300lux for Electrical characteristic functional inspection.)

（2）The distance from eyes to LCD must be 30cm.

（3）Viewing direction must be within 30 degrees to vertical line of LCD center.



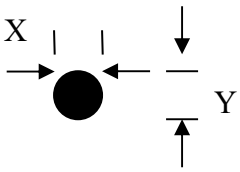
2. Definition of A zone, B zone and C zone

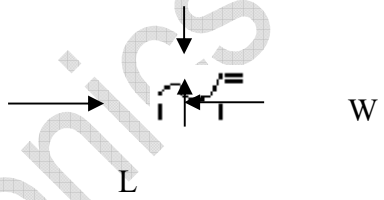


B ZONE: A ZONE and 1/2 BM

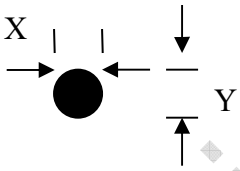
3. Appearance Criterion

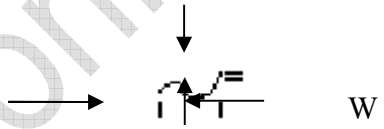
<table>
<tr><th>Item No.</th><th>Items to be inspected</th><th>Inspection standard</th></tr>
<tr><td>3.1</td><td>LCD black spots, white spots, color spots</td><td>
<table>
<tr><td>Defect Type</td><td>Acceptable QTY</td></tr>
<tr><td>Bright Dots</td><td>1</td></tr>
<tr><td>Dark Dots</td><td>2</td></tr>
<tr><td>Total Bright and Dark Dots</td><td>3</td></tr>
</table>
The definition of dot: The size of a defective dot over 1/2 of whole dot is regarded as one defective dot.
Bright dot: Dots appear bright and unchanged in size in which LCD panel is displaying under black pattern.
The bright dot defect must be visible through 2% ND filter
Dark dot: Dots appear dark and unchanged in size in which LCD panel is displaying under pure red, green, blue pattern.
The size of a defective dot less than 1/2 dot is no count
</td></tr>
</table>

<table>
<tr>
<td>3.2</td>
<td>Spot Defect
（Including：
Black spot，
White spot，
Pinhole，Foreigh
particle，
Polarizer dirl）</td>
<td>Define：
φ=(x+y)/2
 

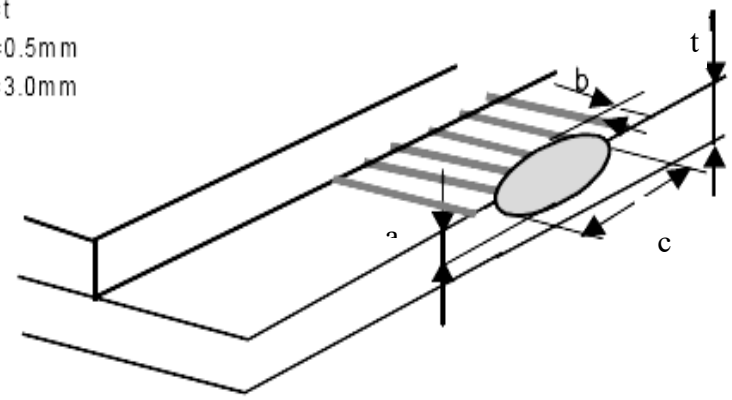
<table>
<tr><th>Size φ (mm)</th><th>Acceptable QTY</th></tr>
<tr><td>φ≦0.20</td><td>Ignore</td></tr>
<tr><td>0.20≦φ≦0.30
Space between>5mm</td><td>3</td></tr>
<tr><td>0.30<φ</td><td>Not allowed</td></tr>
</table>
Ignore the spot distance while defect is in spec.
The distance between two spot should be larger than 20mm.</td>
</tr>
<tr>
<td>3.3</td>
<td>Line Defect
（Including：
Black spot，
White spot，
Pinhole，Foreigh
particle，
Polarizer dirl）</td>
<td>Define：
 

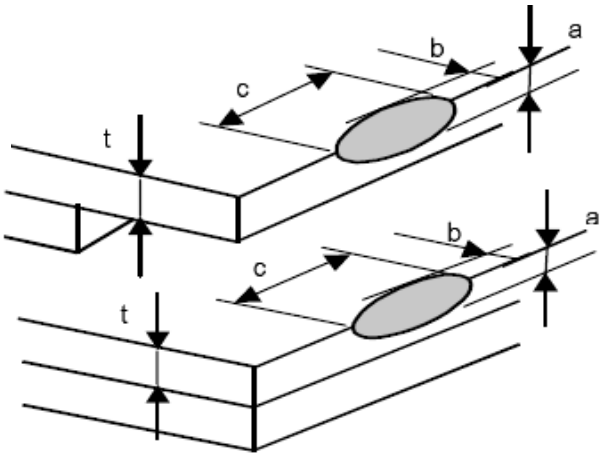
<table>
<tr><th>Length</th><th>Width</th><th colspan="2">Acceptable QTY</th><th>Remark</th></tr>
<tr><td></td><td></td><td>A.A</td><td>V.A</td><td></td></tr>
<tr><td>---</td><td>W≦0.02</td><td>Ignore</td><td>Ignore</td><td></td></tr>
<tr><td>L≦2.5</td><td>0.02< W≦
0.05</td><td>3</td><td>4</td><td>No
more than
two lines
within
20mm</td></tr>
<tr><td>---</td><td>0.03< W</td><td>0</td><td>0</td><td></td></tr>
</table>
Ignore the spot distance while defect is in spec.
The distance between two line should be larger than 20mm.</td>
</tr>
<tr>
<td>3.4</td>
<td>Polarizer bubbles</td>
<td>If bubbles are visible, judge using black spot specifications, not easy to find, must check in specify direction.</td>
</tr>
</table>

<table>
<tr><td></td><td></td><td>
<table>
<tr><td rowspan="2">Size</td><td colspan="2">Acceptable QTY</td></tr>
<tr><td>A.A</td><td>V.A</td></tr>
<tr><td>φ≦0.20</td><td>Ignore</td><td>Ignore</td></tr>
<tr><td>0.20<φ≦0.40</td><td>3</td><td>5</td></tr>
<tr><td>0.40<φ</td><td>0</td><td>0</td></tr>
</table>
Ignore the spot distance while defect is in spec.
The distance between two bubble should be larger than 20mm.
</td></tr>
<tr><td>3.5</td><td>Insulating tape of Bezel</td><td>
Define：
φ=(x+y)/2


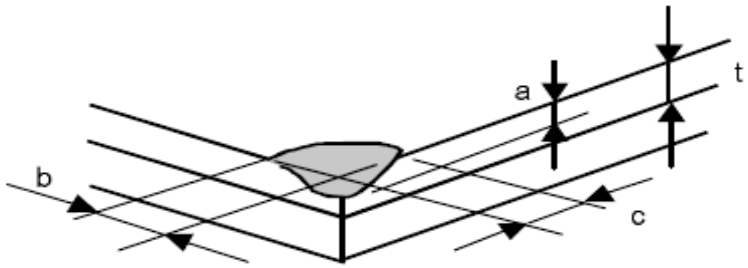
Define：


<table>
<tr><td>Size φ (mm)</td><td>Acceptable QTY</td></tr>
<tr><td>φ≦1.5</td><td>Ignore</td></tr>
<tr><td>1.5<φ</td><td>Not allowed</td></tr>
</table>
<table>
<tr><td>Length</td><td>Width</td><td>Acceptable QTY</td><td>Remark</td></tr>
<tr><td>L≦4</td><td>-</td><td>Ignore</td><td></td></tr>
<tr><td>4<L</td><td></td><td>Not allowed</td><td></td></tr>
</table>
</td></tr>
<tr><td>3.6</td><td>Mini Electrical Dot Defect</td><td>Not accepted under 5% ND filter.</td></tr>
<tr><td>3.7</td><td>Mura (Non-uniformity)</td><td>Not accepted under 5% ND filter,but a limits sample will be allowed.</td></tr>
</table>

<table>
<tr><td rowspan="2">3.8</td><td rowspan="2">FPC</td><td>Broken</td><td>Not allowed</td></tr>
<tr><td>Crease</td><td>Can't see the white crease</td></tr>
<tr><td rowspan="3">3.9</td><td rowspan="3">Bezel</td><td>Rust</td><td rowspan="3">NG</td></tr>
<tr><td>oil</td></tr>
<tr><td>Broken(Affect the assembly)</td></tr>
<tr><td>3.10</td><td>Chipped glass</td><td colspan="2">Symbols:
a: Chip length b: Chip width c: Chip thickness
t: Glass thickness
1 ITO electrode
a<=t
b<=0.5mm
c<=3.0mm
 

2 General ,corner portion
a<= t
b<=1.0mm
c<=5.0mm
 

*Effective width of seal area shall be more than 0.3mm.</td></tr>
</table>

		
3.11	Cracked glass	The LCD with extensive crack is not acceptable.
3.12	Backlight elements	1 Illumination source flickers when lit. 2 Spots or scratches that appear when lit must be judged using LCD spot, lines and contamination standards. 3 Backlight doesn't light or color is wrong
3.13	Soldering	1 No unmelted solder paste may be present on the PCB. 2 No cold solder joints, missing solder connections, oxidation or icicle. 3 No residue or solder balls on PCB. 4 No short circuits in components on PCB.
3.14	General appearance	1 No oxidation, contamination, curves or, bends on interface pin (OLB) of TCP. 2 No cracks on interface pin(OLB) of TCP 3 NO contamination, solder residue or solder balls on product. 4 The IC on the TCP may not be damaged, circuits. 5 The residual rosin or tin oil of soldering (component or chip component) is not burned into brown or black color. 6 Sealant on top of the ITO circuit has not hardened 7 Pin type must match type in specification sheet. 8 LCD pin loose or missing pins. 9 Product packaging must the same as specified on packaging

		specification sheet. 10 Product dimension and structure must conform to product specification sheet.
3.15	Mura (Non-uniformity)	Not accepted under 5% ND filter,but a limits sample will be allowed.
3.16	Mura (Light Leakage)	Extreme light leakage is not acceptable.

14. Reliability Test

This standard reliability test is done only for the first lot of MP products. Customer and supplier must hold a discussion if other reliability test is requested by customer.

NO.	Test Item	Description	Test Condition
1	High temperature storage	Endurance test applying the high storage temperature for a long time	80℃,96 H
2	Low temperature storage	Endurance test applying the low storage temperature for a long time	-30℃,96H
3	High temperature operation	Endurance test applying the electric stress under high temperature for a long time	70℃,96H
4	Low temperature operation	Endurance test applying the electric stress under low temperature for a long time	-20℃,96H

5	High temperature /humidity storage	Endurance test applying the high temperature and high humidity storage for a long time	60℃,90% RH, 96H
6	High temperature /humidity operation	Endurance test applying electric stress under high temperature and high humidity for a long time	70℃,80%RH, 96H
7	Temperature Cycle	Endurance test applying the low and high temperature cycle -20℃← →25℃ ← →70℃ 30min←→5min←→30min ◄——————————► one cycle	-20℃/70℃, 10 cycles
8	ESD Test	To check the product operating capability after electrostatic environment.	Voltage: ± 2KV(contact discharge); ±4 KV(air discharge)

15. Precautions for Operation and Storage

1. Precautions for Operation

(1)Since LCD panel made of glass,in order to prevent from glass broken or color tone change,please do not apply any mechanical shock or impact or excessive force to it when installing the LCD module.

(2)If LCD panel is broken and liquid crystal substance leaks out and contact your skin or clothes,please immediately wash it off by using soap and water.

(3)The polarizer on the LCD surface is soft and easily scratched.Please be careful when handling.

(4)If LCD surface becomes contaminated,please wipe it off gently by using moisten soft cloth with normal hexane,do not use acetone,ketone,ethanol, alcohol or water.If there is saliva or water on the LCD surface,please wipe it off immediately.

(5)When handing LCD module,please be sure that the body and the tools are properly grounded.And do not touch I/F pins with bare hands or contaminate I/F pins.

(6)Do not attempt to disassemble or process the LCD module.

(7)LCD module should be used under recommended operating conditions shown in chapter 6 and 7.

(8)Response time will be extremely slower at lower temperature than at specified temperature and LCD will show different color when at higher temperature.The phenomenon will disappear when returning to specified condition.

(9)Foggy dew,moisture condensation or water droplets deposited on surface and contact terminals will cause polarizer stain or damage,the deteriorated display quality and electrochemical reaction then leads to the shorter life time and permanent damage to the module probably.Please pay attention to the environmental temperature and humidity.

2. Precautions for Storage

(1)Please store LCD module in a dark place,avoid exposure to sunlight,the light of fluorescent lamp or any ultraviolet ray.

(2)Keep the environment temperature at between 10℃and 35 ℃ and at normal humidity.Avoid high temperature,high humidity or temperature below 0℃.

(3)That keeps the LCD modules stored in the container shipped from supplier before using them is recommended.

(4)Do not leave any article on the LCD module surface for an extended period of time.

3. Warranty period

Warrants for a period of 12 Months from the shipping date when stored or used under normal condition.

16. Package Specification