SPECIFICATION

PRODUCT NO. : TCXT24006B
VERSION : Ver 1.0
ISSUED DATE : 2020-02-25

This module uses ROHS material

FOR CUSTOMER: _____

□: APPROVAL FOR SPECIFICATION
■: APPROVAL FOR SAMPLE

DATA	APPROVED BY

Xinli Optoelectronics :

Presented by	Reviewed by	Organized by
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Note:

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1. Revision Recode

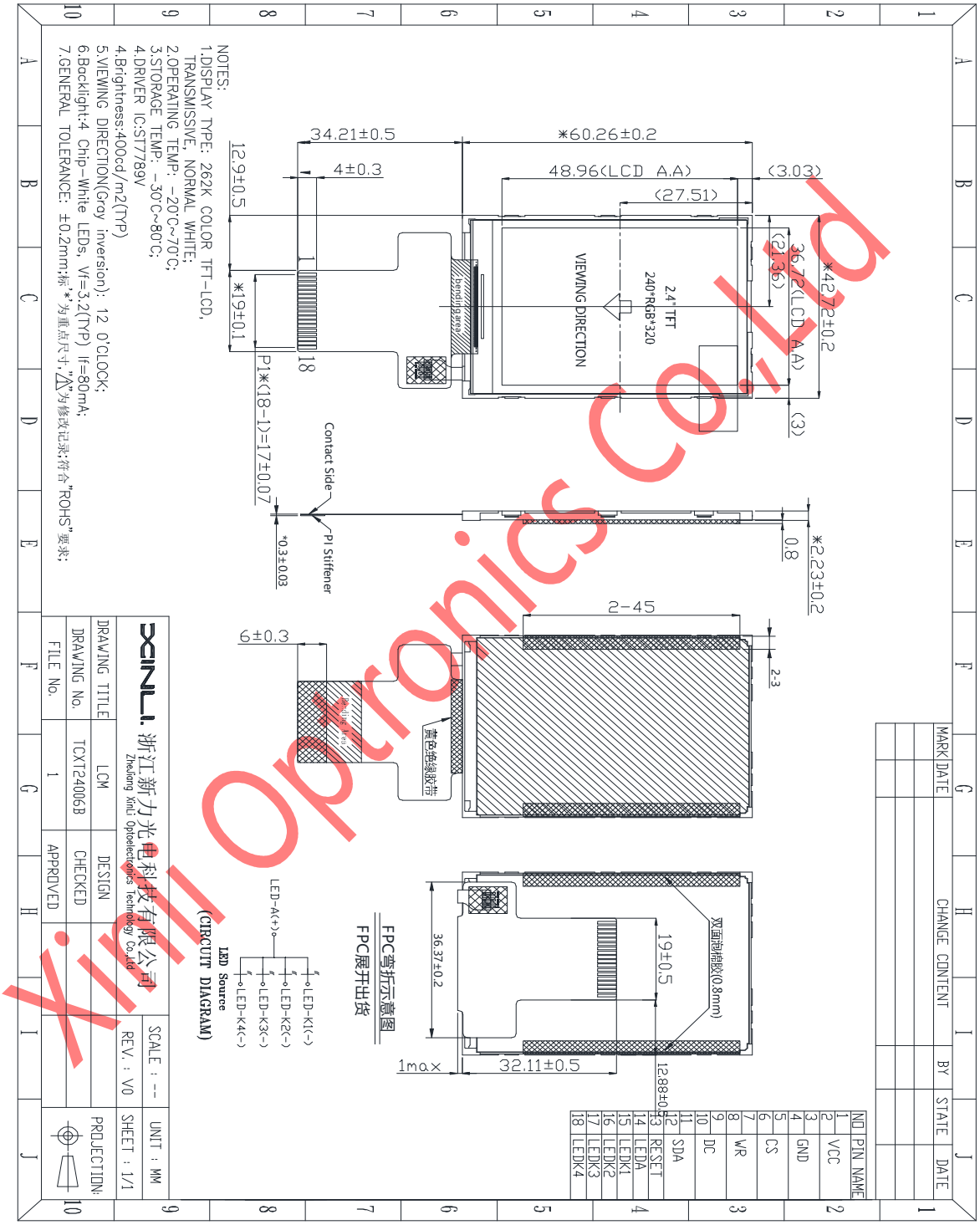
Revision	Description	Date
1.0	Initial Release	2019/10/18

2. General Description and Features

The 2.4 inch Module named TCXT24006B is a-Si TFT-LCD module, which is the type of transmissive. It is consisted of TFT-LCD Panel, one Driver IC, one FPC and one Back-Light unit. Features of this product are listed in the following table.

NO	Item	Contents	Unit
(1)	Module Outsize	42.72*60.26*2.23	mm
(2)	LCD Active area	36.72*48.96	mm
(3)	Dot Number	240*3(RGB)*320	/
(4)	Pixel size	0.153*0.153	mm
(5)	LCD type	TFT Transmissive	/
(6)	Display Color	256	/
(7)	Viewing direction	12:00	O'clock
(8)	Backlight Type	4-chip LEDs	/
(9)	Power Supply	2.8(TYP)	V
(10)	Drive IC	ST7789V	/
(11)	Interface	FPC 1mm_Pitch 18pin	/
(12)	Interface type	SPI interface	/
(13)	Module weight	TBD	g

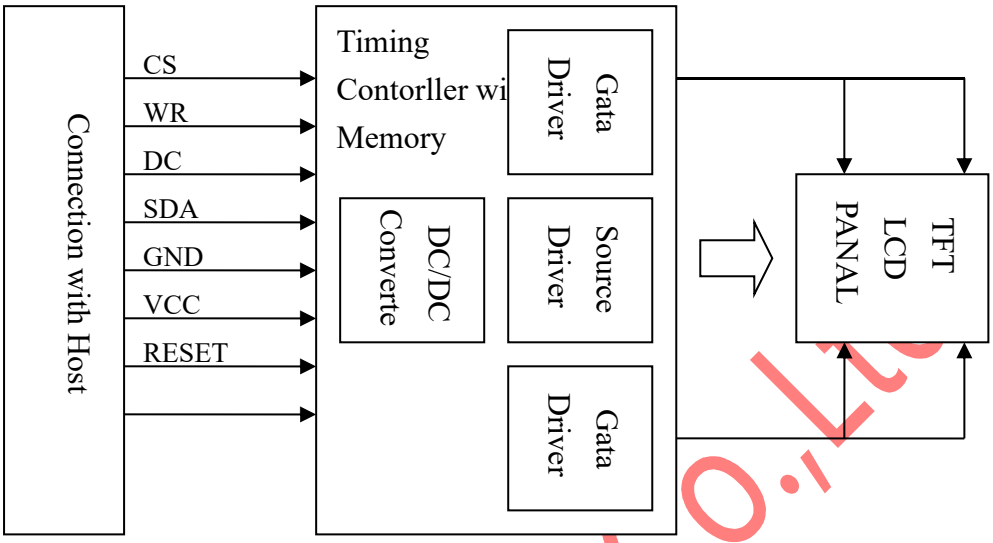
3. Mechanical Dimension

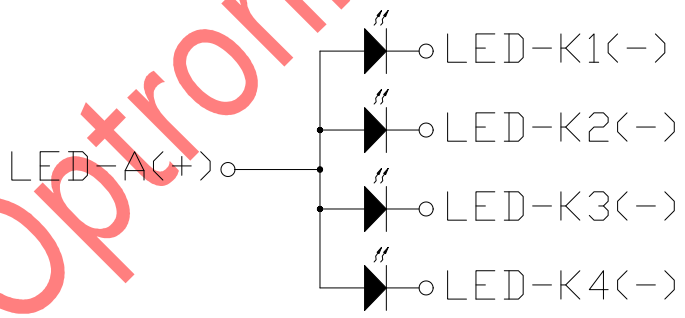


4. Interface Pin Connection

NO	Symbol	Level	Description
1	VCC	P	power supply for Analog Voltage
2	VCC	P	power supply for Analog Voltage
3	GND	P	Power ground
4	GND	P	Power ground
5	CS	I	Chip select signal.
6	CS	I	Chip select signal.
7	WR	I	Display data/command selection pin in 4-line serial interface.
8	WR	I	Display data/command selection pin in 4-line serial interface.
9	DC	I	serial interface clock.
10	DC	I	serial interface clock.
11	SDA	I	SPI interface input pin.
12	SDA	I	SPI interface input pin.
13	RESET	P	Reset pin.
14	VLEDA	P	Backlight+
15	VLEDK1	P	Backlight-
16	VLEDK2	P	Backlight-
17	VLEDK3	P	Backlight-
18	VLEDK4	P	Backlight-

5. Block Diagram





LED Source
(CIRCUIT DIAGRAM)

6. Maximum Rating

Item	Symbol	Rating	Unit
Operating temperature	Top	-20 to 70	℃
Storage temperature	Tst	-30 to 80	℃
power supply for Analog Voltage	VCC	-0.3 ~ 4.6	V

NOTE:

If the module was used these absolute maximum ratings as above, it may be damaged permanently. Using the module within the following electrical characteristic conditions are also exceeded, the module will malfunction and cause poor reliability. VDD>GND must be maintained.

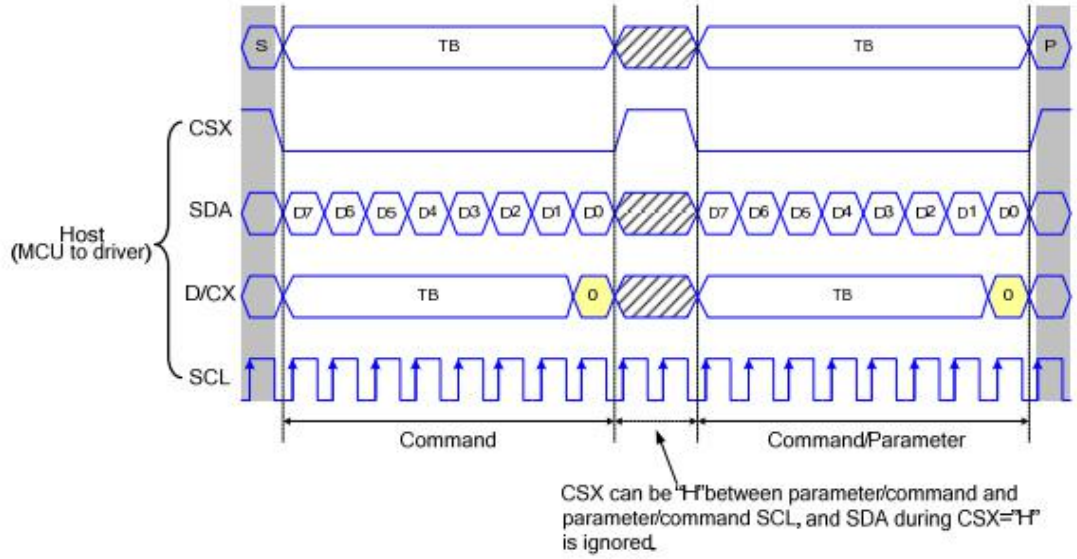
7. Electrical Characteristics

Item		Symbol	Condition	Min.	Typ.	Max.	Unit
Analog power supply		VCC	-	2.4	2.8	3.3	V
Logic input signal Voltage	H level	V_{IH}		0.7*VCC	-	VCC	V
	L level	V_{IL}		GND	-	0.3*VCC	V
Logic output signal Voltage	H level	V_{OH}		0.8*VCC	-	VCC	V
	L level	V_{OL}		GND	-	0.2*VCC	V

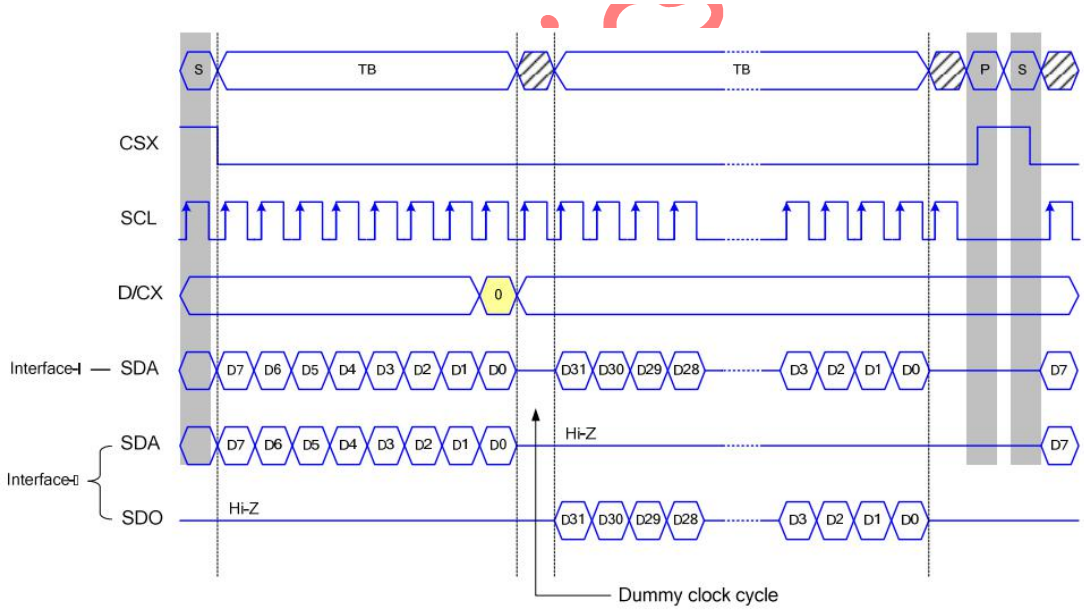
8. Backlight Characteristics

Item	syb	Min	Typ	Max	Unit	Condition
Voltage	Vf	-	3.2	-	V	IF=80mA
Number of LED	-	4			pcs	-
Power Consumption	PWF	-	256	-	mW	-
Connection mode	-	Parallel			-	-
LED life-span	-	-	(20000)	-	Hrs	-

9. Timing Characteristics



4-line serial interface write protocol (write to register with control bit in transmission)



4-line serial interface read protocol

10. Application Circuit

Please consult our technical department for detail information.

11. Initial Code

Please consult our technical department for detail information.

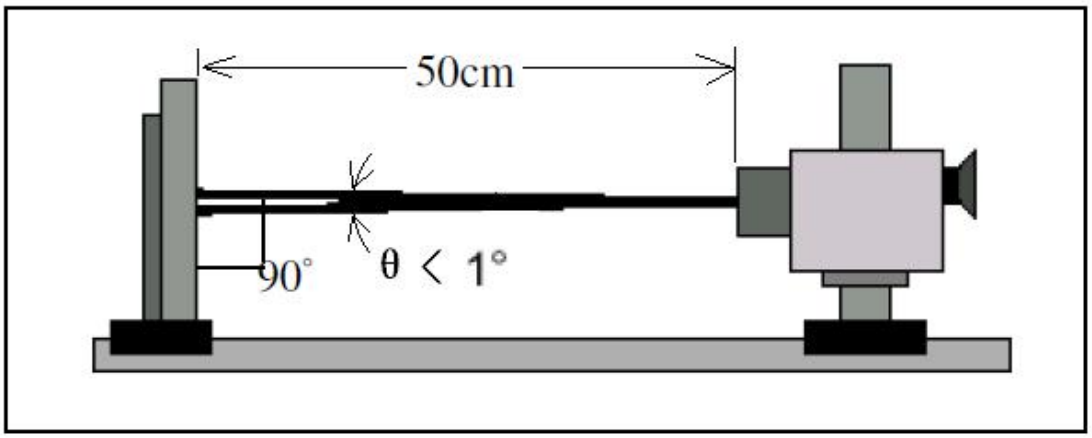
12. Electro-Optical Characteristics

Item		Symbol	Condition	Min	Typ	Max	Unit	Note
Response time		Tr+ Tf	θ =0°	-	16	32	ms	4
Uniformity (Five point)		δ WHITE	∅=0° Ta=25℃	-	75	-	%	7
Contrast ratio		Cr		400	500	-	-	3 ,5
Surface Luminance		Lv		-	400	-	-	3 ,7
Color gamut		%			60		%	C-light
Viewing angle range		θ	∅ = 90°	35	45	-	deg	6
			∅ = 270°	35	45	-	deg	
			∅ = 0°	10	20	-	deg	
			∅ = 180°	35	45	-	deg	
Color filter chromaticity (x, y)	White	X	θ = ϕ = 0°	TBD	TBD	TBD		7
		Y		TBD	TBD	TBD		
	Red	X	θ = ϕ = 0°	TBD	TBD	TBD		
		Y		TBD	TBD	TBD		
	Green	X	θ = ϕ = 0°	TBD	TBD	TBD		
		Y		TBD	TBD	TBD		
	Blue	X	θ = ϕ = 0°	TBD	TBD	TBD		
		Y		TBD	TBD	TBD		

Note 1: Ambient temperature=25℃±2℃

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

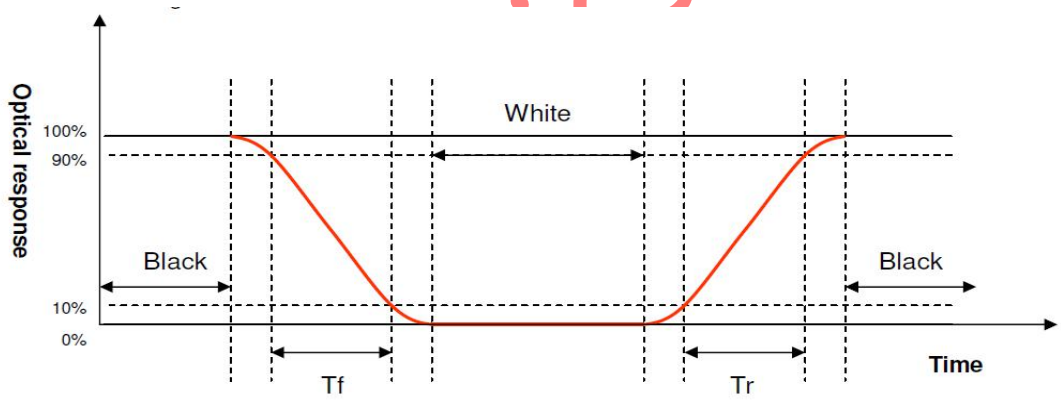
Note 3: To be measured at the center area of panel with a viewing cone of 1 by Topcon luminance meter BM-7A, after 10 minutes operation (module).



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.



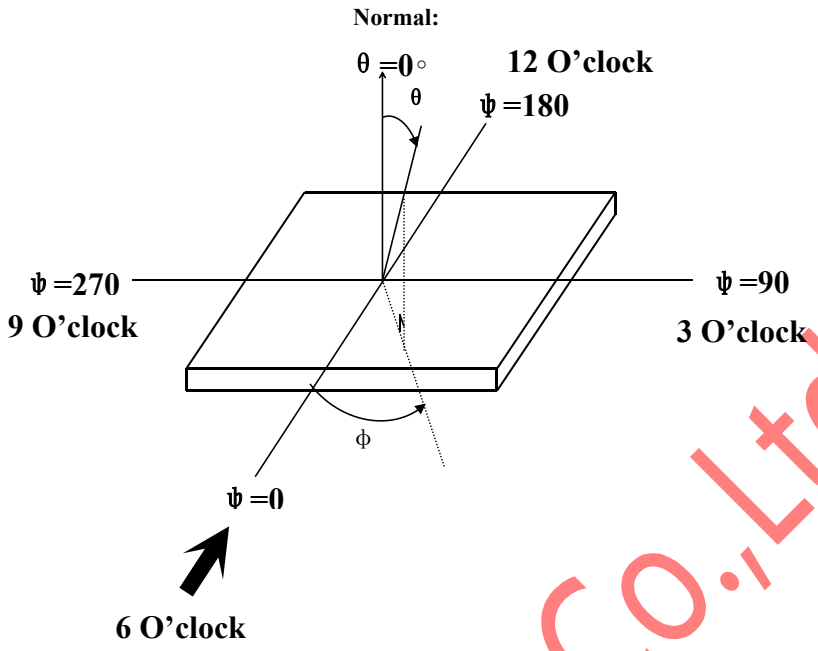
Note 5. Definition of contrast ratio:

Contrast ratio is calculated with the following formula:

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

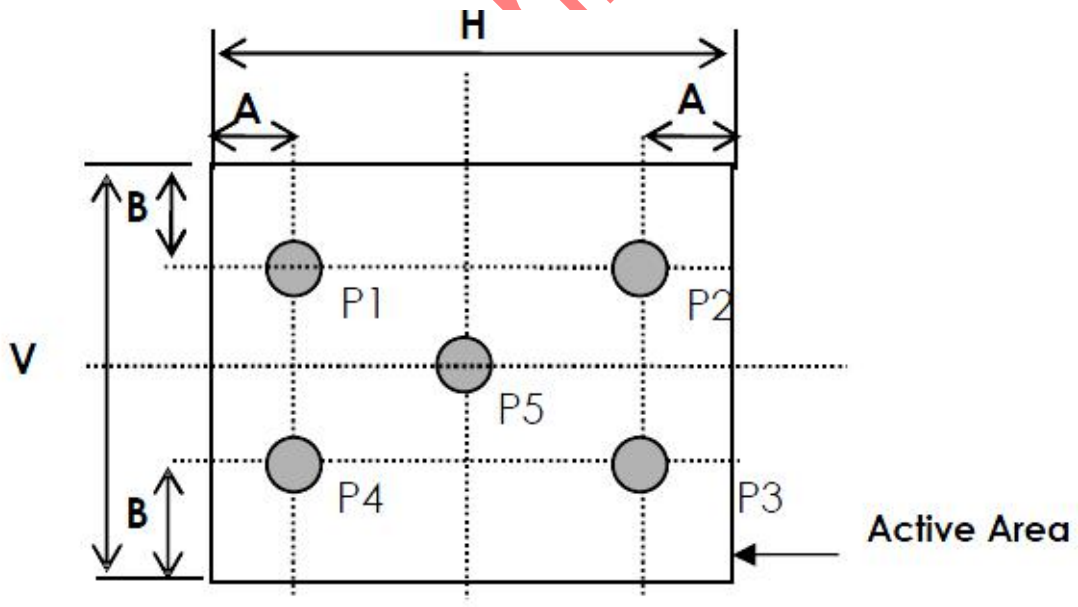
Note 6. Definition of viewing angle

Viewing angle is the angle at which the contrast ratio is greater than 2, for TFT module the contrast ratio is greater than 10. 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

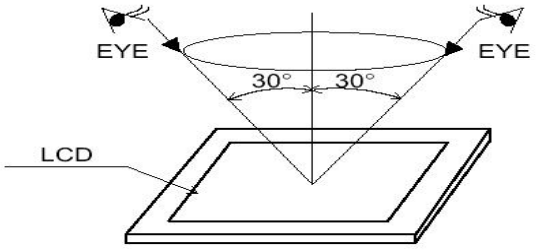
The customer should check and accept the products of XINLI within one month after reception. This standard for Quality Assurance should affirm the quality of LCD products to supply to purchaser by XINLI Company Limited.

1. Appearance Inspection

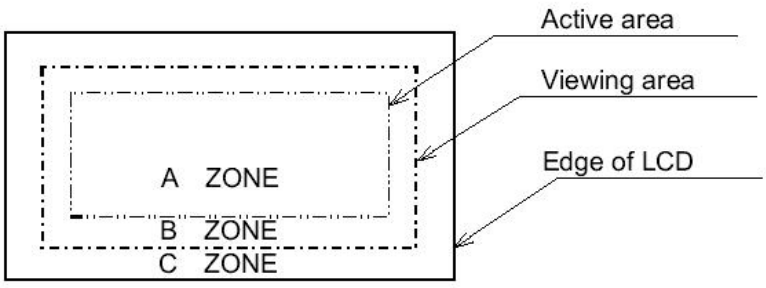
（1）Ambient illumination condition need 750lux for visual cosmetic inspection (300lux for Electrical characteristic functional inspection.)

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

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

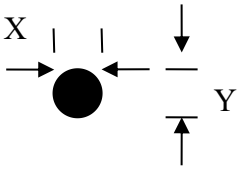


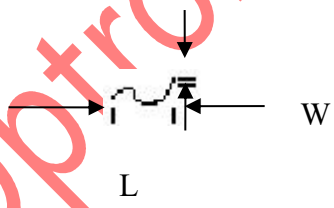
2. Definition of A zone, B zone and C zone



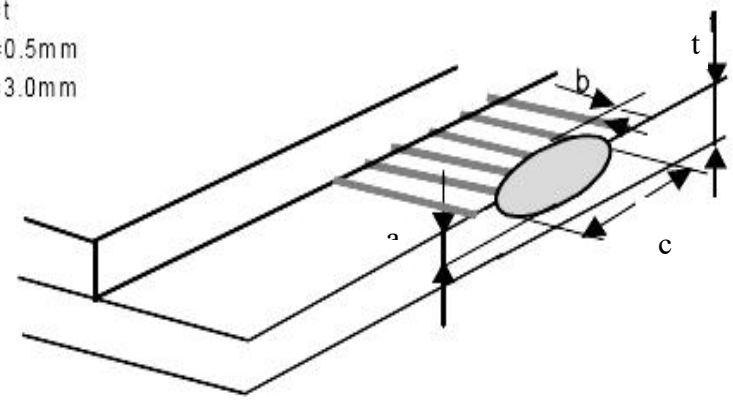
B ZONE: A ZONE and 1/2 BM

3. Appearance Criterion

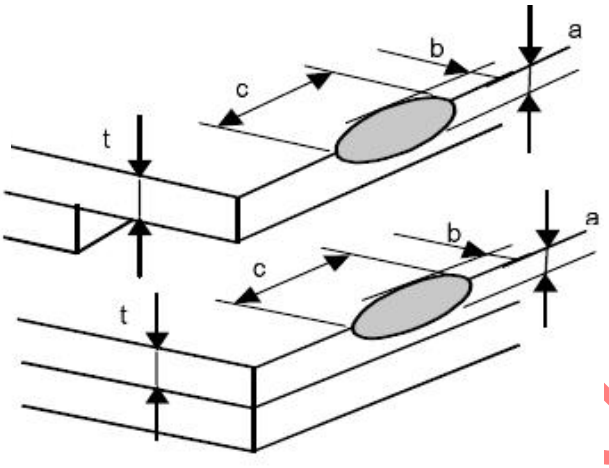
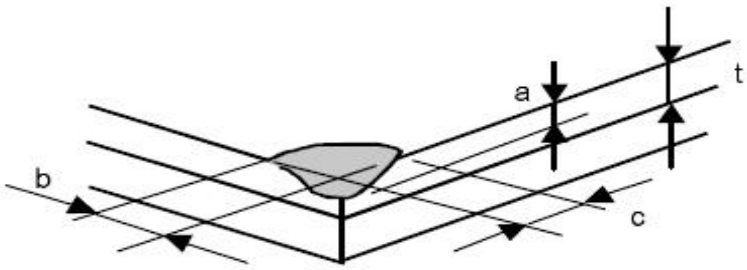
<table>
<tr><th>Item</th><th>Criterion</th><th>Note</th></tr>
<tr><td>LCD black spots, white spots, color spots, contamination, scratches (display/non-display)</td><td>
1 Round type: As following drawing
φ=(x+y)/2


<table>
<tr><td rowspan="2">Size</td><td colspan="2">Acceptable QTY</td><td rowspan="2">Remark</td></tr>
<tr><td>A.A</td><td>V.A</td></tr>
<tr><td>φ≦0.20</td><td>Ignore</td><td>Ignore</td><td rowspan="5">No more than two spots within 5mm</td></tr>
<tr><td>0.20<φ≦0.25</td><td>2</td><td>3</td></tr>
<tr><td>0.25 ≦φ≦0.30</td><td>1</td><td>2</td></tr>
<tr><td>0.30<φ</td><td>0</td><td>0</td></tr>
<tr><td>Total</td><td>3</td><td>5</td></tr>
</table>
2 Line Type: (As following drawing)


<table>
<tr><td>Length</td><td>Width</td><td colspan="2">Acceptable QTY</td><td>Remark</td></tr>
<tr><td></td><td></td><td>A.A</td><td>V.A</td><td></td></tr>
<tr><td>---</td><td>W≦0.03</td><td>Ignore</td><td>Ignore</td><td></td></tr>
<tr><td>L≦2.5</td><td>0.03< W≦0.05</td><td rowspan="2">2</td><td rowspan="2">3</td><td rowspan="2">No more than two lines within 5mm</td></tr>
<tr><td>L≦1.5</td><td>0.05< W≦0.08</td></tr>
<tr><td>---</td><td>0.08< W</td><td>0</td><td>0</td><td></td></tr>
</table>
</td><td></td></tr>
</table>

<table>
<tr>
<td>Polarizer bubbles</td>
<td>If bubbles are visible, judge using black spot specifications, not easy to find, must check in specify direction.
<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≦0.30</td><td>Ignore</td><td>Ignore</td></tr>
<tr><td>0.30<φ≦0.60</td><td>2</td><td>3</td></tr>
<tr><td>Total</td><td>2</td><td>3</td></tr>
</table>
</td>
<td></td>
</tr>
<tr>
<td>Chipped glass</td>
<td>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</td>
<td></td>
</tr>
</table>

	a<= t b<=1.0mm c<=5.0mm  *Effective width of seal area shall be more than 0.3mm.  	
Cracked glass	The LCD with extensive crack is not acceptable.	
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	
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.	
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.	
Mura (Non-uniformity)	Not accepted under 5% ND filter	
Tape/Label	Incorrect position, missed label is not permitted.	
Connector	Assembly NG or Function fail caused by deformation is not permitted	
Outline size	Spec. out is not permitted.	

14. Reliability Test

			℃,120
			℃,120
			℃,120
			℃,120
			℃， %
		-30℃← →25℃ ← →-80℃ 30min←→5min←→30min one cycle	℃ ℃，

15. Precautions for Operation and Storage

1. Precautions for Operation

1. Precautions for Storage

℃ ℃

℃

2. Warranty period

16. Package Specification

TBD