ALL SHORE INDUSTRIES

ASI-T-39548A6SRN/AY

ITEM	Standard value	UNIT
LCD Type	IPS TFT Transmissive	---
Driver element	a-Si TFT Active matrix	
Number of Dots	480*(RGB)*480	Dots
Pixel Arrangement	RGB Vertical Stripe	
Pixel Pitch (W*H)	0.1497*0.1462	mm
Active Area	71.856(H)*70.176(V)	mm
Glass Area (W*H)	74.256*76.176	mm
Viewing Direction	ALL FREE	
Control IC	ST7701S	
Module Size(W*H*T)	74.83*78.98*2.0	mm
Approx. Weight	TBD	g
Back Light	8 White LED	
Touch Panel Type	----	
Touch Panel Active Area	----	mm
Touch Panel View Area	----	mm

RECORDS OF REVISION

DATE	REF.PAGE PARAGRAPH DRAWING No.	REVISED No.	SUMMARY	REMARK
2018/11/10	ALL	1	FIRST ISSUE	
2018/12/10	ALL	2	Change the thickness	

One Edgewater Plaza, Staten Island, NY 10305 * Tel. 718-720-0018 * Fax. 718-720-0225 * Email: sales@allshore.com

Contents

1. Introduction

1.1 Scope of application

This specification applies to the Positive type TFT transmissive dot matrix LCD module. This LCD module should be designed for mobile phone use. LCD specification: Dots 480xRGBx480.
As to basic specification of the driver IC, refer to the IC (ST7701S) specification and datasheet.

1.2 Structure:

Display structure:
TFT LCD + FPC +IC
FULL 16.7M Color 3.95 inch TFT LCD size for LCD;
One bare chip with gold bump (COG) TECH;
SPI+RGB Interface

1.3 TFT features:

Structure: TFT PANNEL+IC+FPC+BL;
Transmissive Type LCD
480 dot-source and 800 dot-gate outputs;
16M Color can be selected by software;
White 8 LED back light;

1.4 Applications:

Digital/Mobile products

2. General specification

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LCD Type	IPS TFT Transmissive	---
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Touch Panel View Area	----	mm

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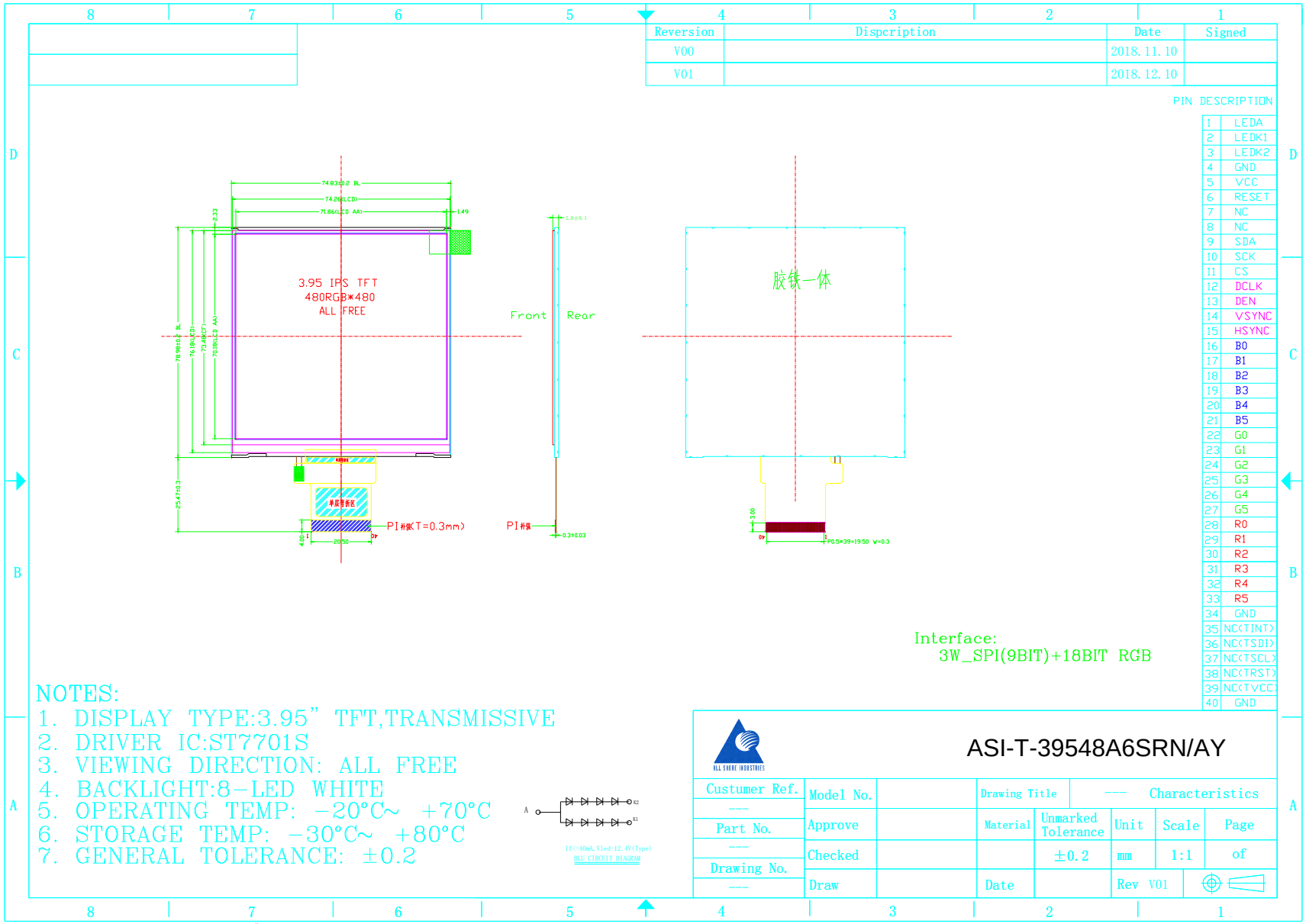
3. Mechanical drawing



ASI-T-39548A6SRN/AY

4. ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Min	Max	Unit
Supply voltage for logic	V_{DD}	-0.3	4.6	V
Input voltage for logic	V_{IN}	-0.5	V_{DD} +0.3	V
Supply current (One LED)	I_{LED}	15	20	mA
Operating temperature	T_{OP}	-20	+70	° C
Storage temperature	T_{ST}	-30	+80	° C

5. ELECTRICAL CHARACTERISTICS

Item	Symbol	Min	Typ	Max	Unit	Applicable terminal
Supply voltage for logic	V_{DD}	2.5	2.8	3. 6	V	V_{DD}
Input voltage	V_{IL}	-	-	0.3 V_{DD}	V	
	V_{IH}	0.7 V_{DD}	-	V_{DD}	V	
Input leakage current	I_{LKG}				μA	
LED Forward voltage	V_f	12	12.8	14.4	V	--
Input backlight current	I_{LED}	-	30	40	mA	
Brightness(LCM)	L	-	650	-	Cd/m^2	I_{LED}=40mA
Operating Life time	-	10,000	20,000		Hrs	

6. OPTICAL CHARACTERISTICS

The test of Optical specifications shall be measured in a dark room (ambient luminance 1lux and temperature = 25 2℃) with the equipment of Luminance meter system (Goniometer system and TOPCON BM-5) and test unit shall be located at an approximate distance 50cm from the LCD surface at a viewing angle of θ and Φ equal to 0 . The center of the measuring spot on the Display surface shall stay fixed.

Especial：Center Luminance of white is defined as the LCD surface（left30° down5°, right30° down5°，Equipment EZ-Contrast XL88, test spot 2mm ）

he backlight should be operating for 30 minutes prior to measurement.

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Transmittance (with Polarizer)		T (%)	Θ=0 Normal viewing angle	—	(4.2)	—	%	Measuring with normal polarizer，Reference Only Base on Vop=5.1V
Transmittance (without Polarizer)		T (%)		—	(14.7)	—	%	
Contrast Ratio		CR		640	800	—	—	(1)(2)
Response Time		$T_{R+}T_F$		—	25	35	msec	(1)(3)
Color Gamut	(%)			55	60	—	%	C-light
Color Chromaticity (CIE1931)	White	W_x		—	TBD	—	—	(1)(4) CF glass C-light
		W_y		—	TBD	—		
	Red	R_x		—	TBD	—	—	
		R_Y		—	TBD	—		
	Green	G_x		—	TBD	—	—	
		G_Y		—	TBD	—		
	Blue	B_x		—	TBD	—	—	
		B_Y		—	TBD	—		
Viewing Angle	Hor.	$Θ_L$	CR>10	70	80	—	—	(1)(4) Measuring with normal polarizer，Reference Only
		$Θ_R$		70	80	—		
	Ver.	$Θ_U$		70	80	—		
		$Θ_D$		70	80	—		
Optima View Direction		Free						(5)

Note :

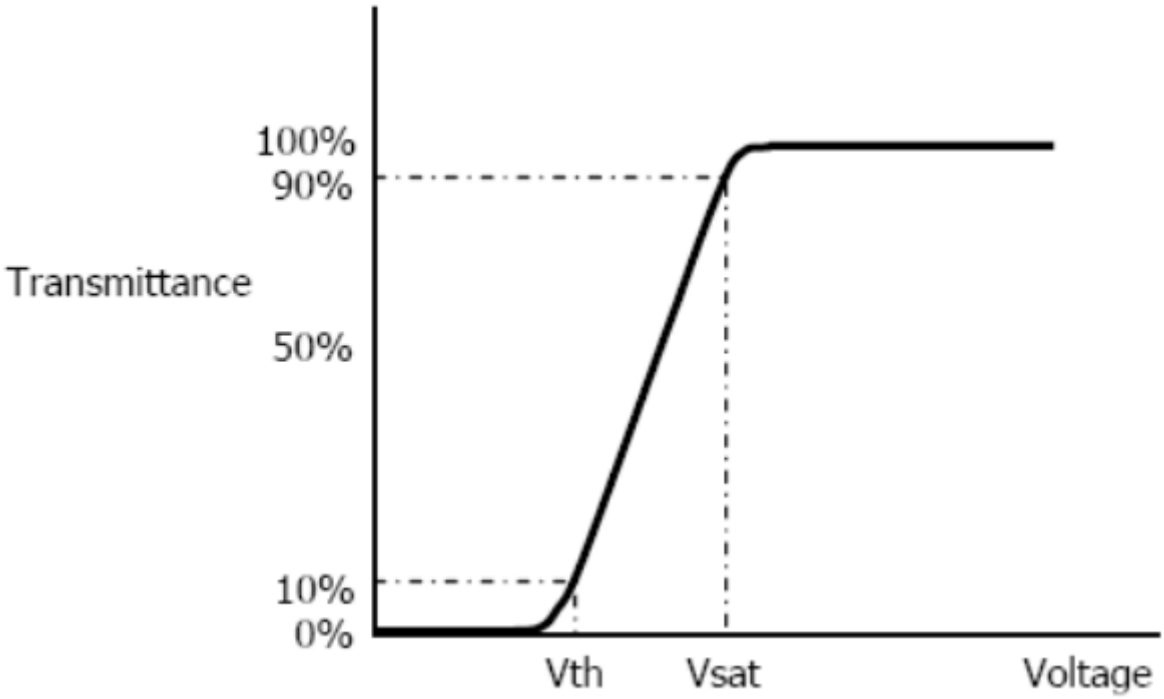
1. Viewing angle is the angle at which the contrast ratio is greater than 10. The viewing are determined for the horizontal or 3, 9 o'clock direction and the vertical or 6, 12 o'clock direction with respect to the optical axis which is normal to the LCD surface (see FIG.2).

2. Contrast measurements shall be made at viewing angle of = 0 and at the center of the LCD surface. Luminance shall be measured with all pixels in the view field set first to white, then to the dark (black) state. (See FIGURE 1 shown in Appendix) Luminance Contrast Ratio (CR)is defined mathematically.

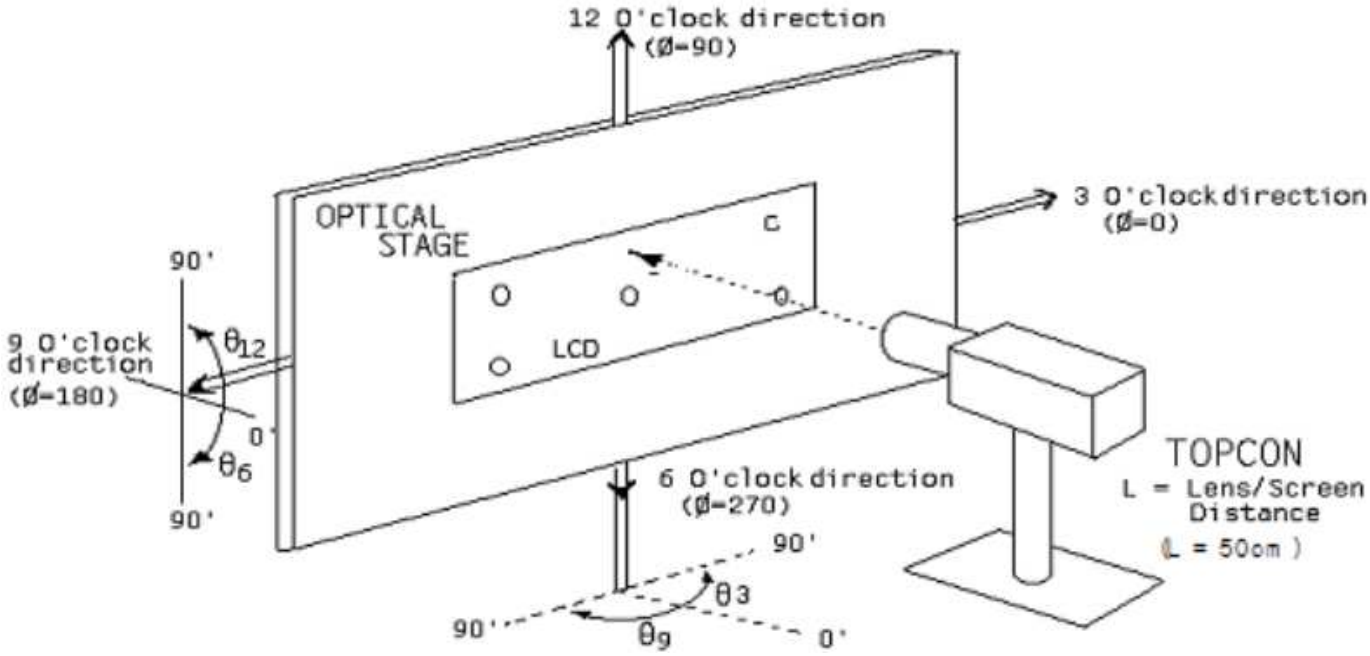
$$CR = \frac{\text{Luminance when displaying a white raster}}{\text{Luminance when displaying a black raster}}$$

3. Transmittance is the value with Polarizer.
4. The color chromaticity coordinates specified in the table above shall be calculated from the spectral data measured with all pixels first in red, green, blue and white; Measurements shall be made at the center of the C/F; Measurement condition is C - light source & Halogen Lamp.
5. The electro-optical response time measurements shall be made as FIG.3 by switching the "data" input signal ON and OFF. The times needed for the luminance to change from 10% to 90% is Tf, and 90% to 10% is Tr.

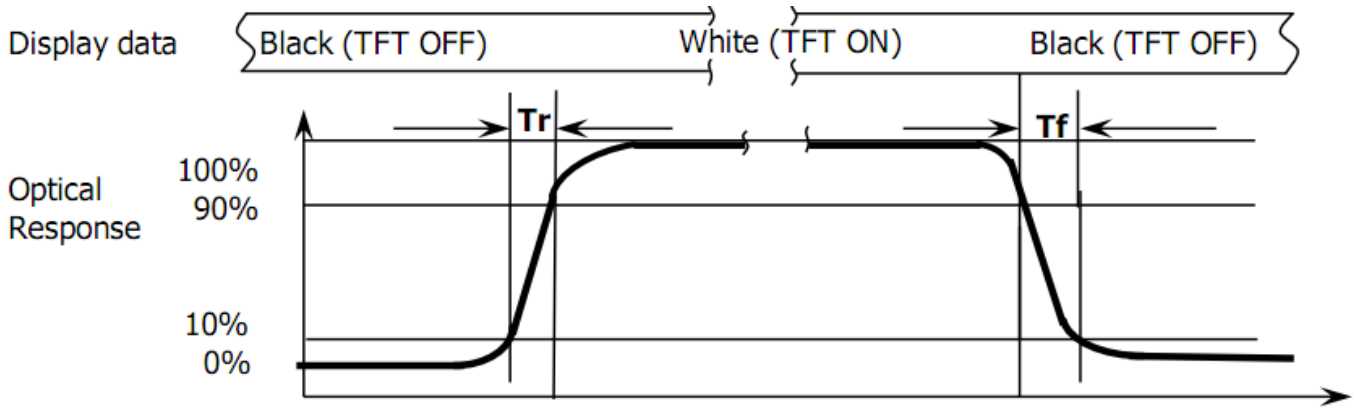
The definition of Vth & Vsat



Measurement Set Up



Response Time Testing



7. Interface Pin Function 1

NO.	SYMBOL	Description
1	LEDA	Backlight+
2	LEDK1	Backlight-
3	LEDK2	Backlight-
4	GND	Ground
5	VDD	Power Supply
6	RESET	The global reset signal.
7-8	NC	Not use
9	SDA	The data line of the SPI interface
10	SCK	The clock line of the SPI interface
11	CS	Chip enable signal
12	DCLK	The pixel clock signal of the RGB interface
13	DEN	The data enable signal of the RGB interface
14	VSYNC	The frame signal of the RGB interface.
15	HSYNC	The line signal of the RGB interface.
16-21	B0-B5	The 6bit blue data
22-27	G0-G5	The 6bit green data
28-33	R0-R5	The 6bit red data
34	GND	Ground
35	TP_INT	Not use
36	TP_SDI	Not use
37	TP_SCL	Not use
38	TP_RST	Not use
39	TP_VCC	Not use
40	GND	Ground

8. RGB AC Characteristics

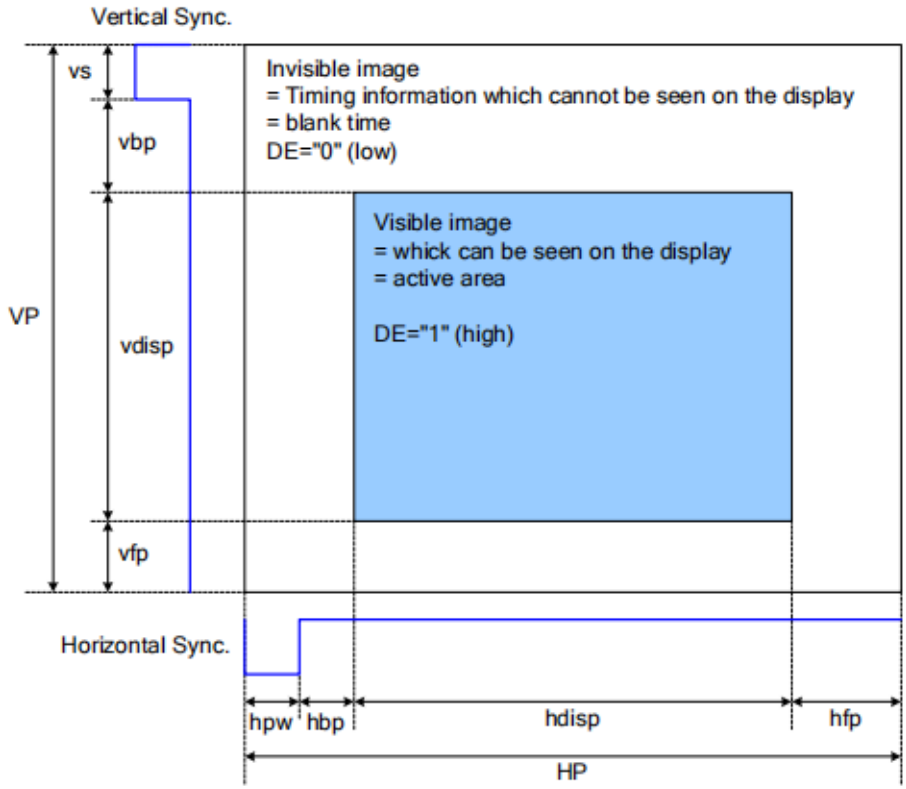


Figure 22 Access Area by RGB Interface

Please refer to the following table for the setting limitation of RGB interface signals.

Parameter	Symbol	Min.	Typ.	Max.	Unit
Horizontal Sync. Width	hpw	1	-	255	Clock
Horizontal Sync. Back Porch	hbp	1	--	255	Clock
Horizontal Sync. Front Porch	hfp	1	--	-	Clock
Vertical Sync. Width	vs	1	--	254	Line
Vertical Sync. Back Porch	vbp	1	--	254	Line
Vertical Sync. Front Porch	vfp	2	--	--	Line

(Please refer the IC ST7701S datasheet!)

10.LCM Quality Criteria

10.1 VISUAL & FUNCTION INSPECTION STANDARD

10.1.1 Inspection conditions

Inspection performed under the following conditions is recommended.

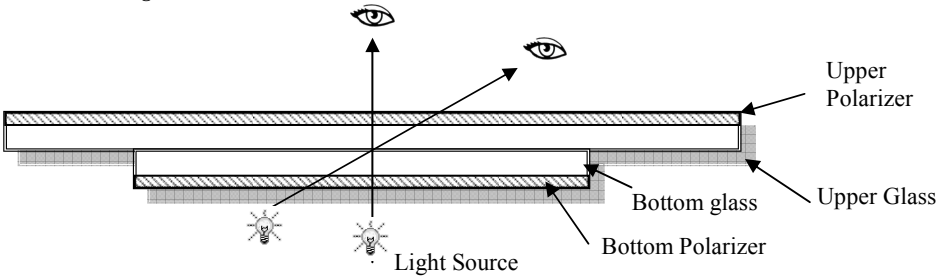
Temperature : 25±5℃

Humidity : 65%±10%RH

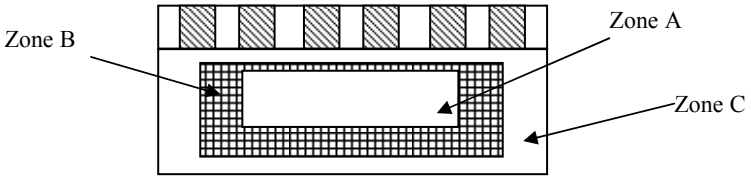
Viewing Angle : Normal viewing Angle.

Illumination: Single fluorescent lamp (300 to 700Lux)

Viewing distance:30-50cm



10.1.2 Definition



Zone A : Effective Viewing Area(Character or Digit can be seen)

Zone B : Viewing Area except Zone A

Zone C : Outside (Zone A+Zone B) which can not be seen after assembly by customer .)

Note:

As a general rule ,visual defects in Zone C can be ignored when it doesn’ t effect product function or appearance after assembly by customer.

10.1.3 Sampling Plan

According to GB/T 2828-2003 ; , normal inspection, Class Ⅱ

AQL:

Major defect	Minor defect
0.65	1.5

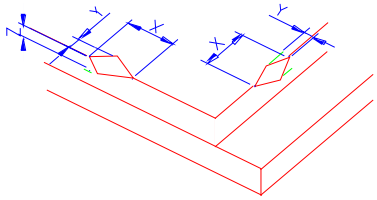
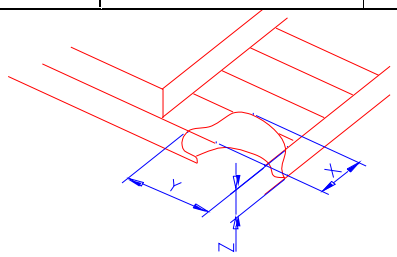
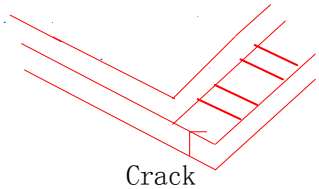
LCD: Liquid Crystal Display , TP: Touch Panel , LCM: Liquid Crystal Module

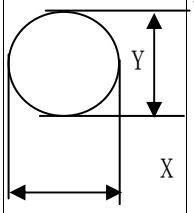
No	Items to be inspected	Criteria	Classification of defects
1	Functional defects	1) No display, Open or miss line 2) Display abnormally, Short 3) Backlight no lighting, abnormal lighting. 4) TP no function	Major
2	Missing	Missing component	
3	Outline dimension	Overall outline dimension beyond the drawing is not allowed	
4	Color tone	Color unevenness, refer to limited sample	Minor

5	Soldering appearance	Good soldering , Peeling off is not allowed.	
6	LCD/Polarizer/TP	Black/White spot/line, scratch, crack, etc.	

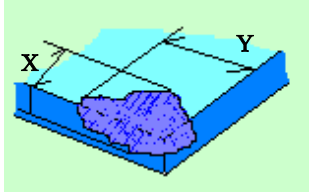
10.1.4 Criteria (Visual)

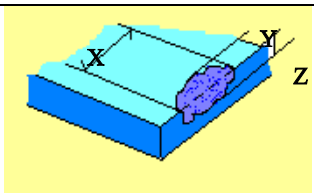
<table>
<tr><th>Number</th><th>Items</th><th>Criteria(mm)</th></tr>
<tr><td rowspan="3">1.0 LCD Crack/Broken

NOTE:
X: Length
Y: Width
Z: Height
L: Length of ITO,
T: Height of LCD</td><td>(1) The edge of LCD broken</td><td> 
<table><tr><th>X</th><th>Y</th><th>Z</th></tr><tr><td>≤3.0mm</td><td><Inner border line of the seal</td><td>≤T</td></tr></table></td></tr>
<tr><td>(2)LCD corner broken</td><td> 
<table><tr><th>X</th><th>Y</th><th>Z</th></tr><tr><td>≤3.0mm</td><td>≤L</td><td>≤T</td></tr></table></td></tr>
<tr><td>(3) LCD crack</td><td> 
Crack
Not allowed</td></tr>
</table>

<table>
<tr><th>Number</th><th>Items</th><th>Criteria (mm)</th></tr>
<tr><td>2.0</td><td>Spot defect</td><td>
① light dot (LCD/TP/Polarizer black/white spot , light dot, pinhole, dent, stain)


Φ=(X+Y)/2
<table>
<tr><th rowspan="2">Zone
Size (mm)</th><th colspan="3">Acceptable Qty</th></tr>
<tr><th>A</th><th>B</th><th>C</th></tr>
<tr><td>Φ≤0.10</td><td colspan="2">Ignore</td><td rowspan="4">Ignore</td></tr>
<tr><td>0.10<Φ≤0.15</td><td colspan="2">3(distance≧10mm)</td></tr>
<tr><td>0.15<Φ≤0.2</td><td colspan="2">1</td></tr>
<tr><td>0.2<Φ</td><td colspan="2">0</td></tr>
</table>
②Dim spot (LCD/TP/Polarizer dim dot, light leakage、dark spot)
<table>
<tr><th rowspan="2">Zone
Size (mm)</th><th colspan="3">Acceptable Qty</th></tr>
<tr><th>A</th><th>B</th><th>C</th></tr>
<tr><td>Φ≤0.1</td><td colspan="2">Ignore</td><td rowspan="4">Ignore</td></tr>
<tr><td>0.1<Φ≤0.2</td><td colspan="2">2(distance≧10mm)</td></tr>
<tr><td>0.2<Φ≤0.3</td><td colspan="2">1</td></tr>
<tr><td>Φ>0.3</td><td colspan="2">0</td></tr>
</table>
③ Polarizer accidented spot
<table>
<tr><th rowspan="2">Zone
Size (mm)</th><th colspan="3">Acceptable Qty</th></tr>
<tr><th>A</th><th>B</th><th>C</th></tr>
<tr><td>Φ≤0.2</td><td colspan="2">Ignore</td><td rowspan="3">Ignore</td></tr>
<tr><td>0.2<Φ≤0.5</td><td colspan="2">2(distance≧10mm)</td></tr>
<tr><td>Φ>0.5</td><td colspan="2">0</td></tr>
</table>
</td></tr>
<tr><td></td><td>Line defect (LCD/TP /Polarizer black/white line, scratch, stain)</td><td>
<table>
<tr><th rowspan="2">Width(mm)</th><th rowspan="2">Length(mm)</th><th colspan="3">Acceptable Qty</th></tr>
<tr><th>A</th><th>B</th><th>C</th></tr>
<tr><td>Φ≤0.03</td><td>Ignore</td><td colspan="2">Ignore</td><td rowspan="3">Ignore</td></tr>
<tr><td>0.03<W≤0.05</td><td>L≤3.0</td><td colspan="2">N≤2</td></tr>
<tr><td>0.05<W≤0.08</td><td>L≤2.0</td><td colspan="2">N≤2</td></tr>
<tr><td>0.08<W</td><td colspan="4">Define as spot defect</td></tr>
</table>
</td></tr>
</table>

<table>
<tr><td>3.0</td><td>Polarizer Bubble</td><td colspan="2">
<table>
<tr><td rowspan="2">Zone
Size (mm)</td><td colspan="3">Acceptable Qty</td></tr>
<tr><td>A</td><td>B</td><td>C</td></tr>
<tr><td>Φ≤0.2</td><td colspan="2">Ignore</td><td rowspan="4">Ignore</td></tr>
<tr><td>0.2<Φ≤0.4</td><td colspan="2">2(distance≧10mm)</td></tr>
<tr><td>0.4<Φ≤0.6</td><td colspan="2">1</td></tr>
<tr><td>0.6<Φ</td><td colspan="2">0</td></tr>
</table>
</td></tr>
<tr><td>4.0</td><td>SMT</td><td colspan="2">According to IPC-A-610C class Ⅱ standard . Function defect and missing part are major defect ,the others are minor defect.</td></tr>
<tr><td rowspan="4">5.0</td><td rowspan="4">TP Related</td><td>TP bubble/ accidented spot</td><td>
<table>
<tr><td rowspan="2">Size Φ(mm)</td><td colspan="3">Acceptable Qty</td></tr>
<tr><td>A</td><td>B</td><td>C</td></tr>
<tr><td>Φ≤0.1</td><td colspan="2">Ignore</td><td rowspan="4">Ignore</td></tr>
<tr><td>0.1<Φ≤0.2</td><td colspan="2">2 (distance≧</td></tr>
<tr><td>0.2<Φ≤0.3</td><td colspan="2">1</td></tr>
<tr><td>0.3<Φ</td><td colspan="2">0</td></tr>
</table>
</td></tr>
<tr><td>Assembly deflection</td><td>beyond the edge of backlight ≤0.15mm</td></tr>
<tr><td>Newton Ring</td><td>Newton Ring area>1/3 TP area
NG
Newton Ring area≤1/3 TP area
OK</td><td> 
</td></tr>
<tr><td>TP corner broken
X：length
Y：width
Z：height</td><td>
<table>
<tr><td>X</td><td>Y</td><td>Z</td></tr>
<tr><td>X≤3.0mm</td><td>Y≤3.0mm</td><td>Z<LCD thickness</td></tr>
</table>
*Circuitry broken is not allowed.</td><td> 
</td></tr>
</table>

		TP edge broken X: length Y: width Z: height	X: X≤6.0mm; Y: Y≤2.0mm; Z: Z<LCD thickness * Circuitry broken is not allowed.	

Criteria (functional items)

Number	Items	Criteria (mm)
1	No display	Not allowed
2	Missing segment	Not allowed
3	Short	Not allowed
4	Backlight no lighting	Not allowed
5	TP no function	Not allowed

10.2 Handling Precautions

10.2.1 Avoid static electricity damaging the LSI.

10.2.2 Do not remove the panel or frame from the module .

10.2.3 The polarizing plate of the display is very fragile . So, please handle it very carefully.

10.2.4 Do not wipe the polarizing plate with a dry cloth, as it may easily scratch the surface of the plate.

10.2.5 The color tone of display and background of LCM has the possibility to be changed in the storage temperature range.

10.2.6 Pay attention to the working environment, as the element may be destroyed by static electricity.

--Be sure to ground human body and electric appliance during work.

--Avoid working in a dry environment to minimize the generations of static electricity.

--Static electricity may be generated when the protective film is fast peeled off.

10.2.7 When soldering the terminal of LCM, make certain the AC power source of soldering iron does not leak.

10.4.8 If the display surface becomes contaminated ,breathe on the surface and gently wipe it with a soft-dry- clean cloth .If it is heavily contaminated ,moisten cloth with the following solvent(ex:Ethyl alcohol).Solvents other than those above-mentioned may damage the polarizer(Especially ,do not use them .ex: Warter / Ketone)

10.3 Operation instructions

10.3.1 It is recommended to drive the LCD within the specified voltage limits, try to adjust the operating voltage for the optimal contrast, the color and contrast of LCD panel will varies at different temperature.

10.3.2 Response time is greatly delayed at low operating temperature range. However, this does not mean the LCD will be out of the order, It will recover when it returns to the specified temperature range.

10.3.3 If the display area is pushed hard during operation, the display will become abnormal.

10.3.4 Do not operate the LCD at the environments over the specified conditions, this may cause damage on the LCD and shorten the lifetime.

10.4 Storage instructions:

10.4.1 Store LCDs in a sealed polyethylene bag.

10.4.2 Store LCDs in a dark place, Do not expose to sunlight or fluorescent light. Keep the temperature between 0℃and 35℃.

10.4.3 Avoid the polarizer touch any other object, (It is recommended to store them in the container in which they were shipped.)