

# Specification for Approval

Customer: \_\_\_\_\_

Model Name: \_\_\_\_\_

Supplier Approval			Customer approval
R&D Designed	R&D Approved	QC Approved	
<i>Peter</i>	<i>Peng Jun</i>		



## Revision Record

REV NO.	REV DATE	CONTENTS	Note
A	2023-06-12	NEW ISSUE	

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## 1. Scope

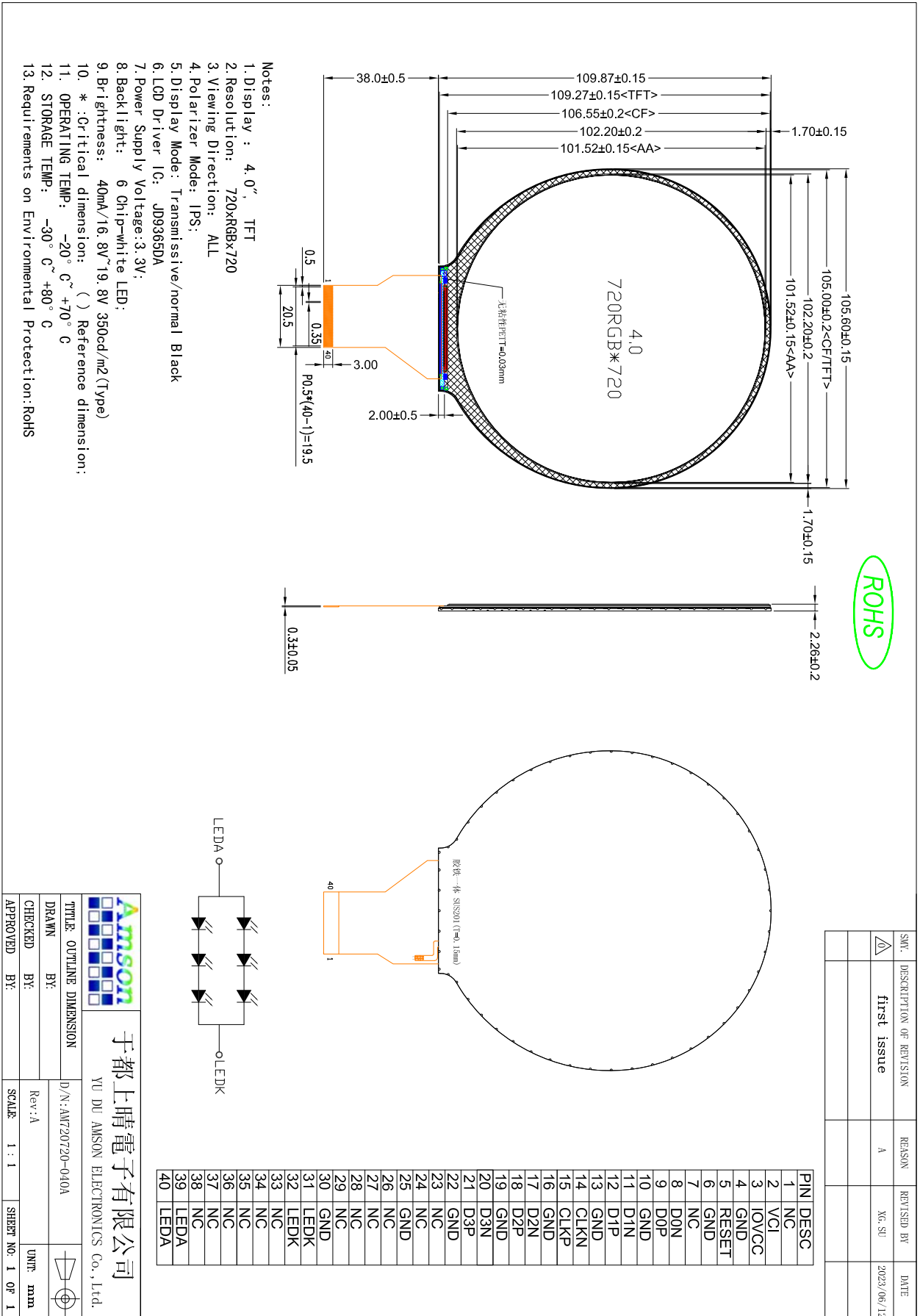
This specification defines general provisions as well as inspection standards for TFT module supplied by AMSON electronics.

If the event of unforeseen problem or unspecified items may occur, naturally shall negotiate and agree to solution.

## 2. General Information

No	Item	Specification	Remark
1	Panel Size	4.0inch	
2	Resolution	720(RGB)x 720	
3	Driver Method	A-Si TFT active matrix	
4	Active Area	101.52(W) x101.52(H)mm	
5	Pixel Arrangement	RGB-stripe	
6	Module Size	105.6(W)x109.87(H)x2.26(D)mm	
7	Display Mode	Normally Black	
8	Display Color	16.7M	
9	Viewing Direction	ALL	
10	Interface	MIPI	
11	Driver IC	JD9365DA	

## 3. External Dimensions



ROHS

SNV.	DESCRIPTION OF REVISION	REASON	REVISED BY	DATE
1	first issue	A	XG_SU	2023/06/12

**Amson**

于都上晴电子有限公司  
YU DU AMSON ELECTRONICS Co., Ltd.

YU DU AMSON ELECTRONICS Co., Ltd.

Rev: A

UNIT: mm

SCALE: 1 : 1

SHEET NO: 1 OF 1

DATE: 2023/06/12

## 4. Interface Description

PIN.NO	SYMBOL	FUNCTION
1	NC	No Connection.
2	VCI	Power Supply For LCD.
3	IOVCC	Power Supply For I/O.
4	GND	Ground.
5	RESET	Reset Signal input pin.
6	GND	Ground.
7	NC	No Connection.
8	D0N	Negative polarity of low voltage differential data 0 signal
9	D0P	Positive polarity of low voltage differential data 0 signal
10	GND	Ground.
11	D1N	Negative polarity of low voltage differential data 1 signal
12	D1P	Positive polarity of low voltage differential data 1 signal
13	GND	Ground
14	CLKN	Negative polarity of low voltage differential clock signal
15	CLKP	Positive polarity of low voltage differential clock signal
16	GND	Ground
17	D2N	Negative polarity of low voltage differential data 2 signal
18	D2P	Positive polarity of low voltage differential data 2 signal
19	GND	Ground
20	D3N	Negative polarity of low voltage differential data 3 signal
21	D3P	Positive polarity of low voltage differential data 3
22	GND	Ground
23	NC	No Connection.
24	NC	No Connection.
25	GND	Ground
26	NC	No Connection.
27	NC	No Connection.
28	NC	No Connection.
29	NC	No Connection.
30	GND	Ground



# AM-720720-040A

Version: A

2023-06-12

31	LEDK	Power Supply For LED Backlight Cathode Input.
32	LEDK	Power Supply For LED Backlight Cathode Input.
33	NC	No Connection.
34	NC	No Connection.
35	NC	No Connection.
36	NC	No Connection.
37	NC	No Connection.
38	NC	No Connection.
39	LEDA	Power Supply For LED Backlight Anode Input.
40	LEDA	Power Supply For LED Backlight Anode Input.

## 5. Absolute Maximum Ratings

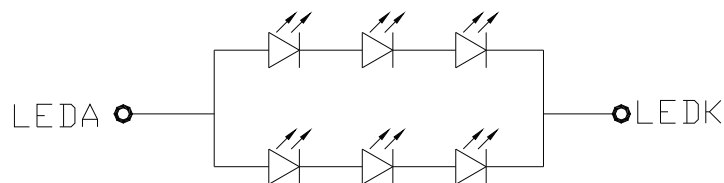
Voltage(AGND=GND=0V,Ta=25°C)

Parameter	Min.	Max.	Unit
Power Supply Voltage (VCI)	-0.3	+6.6	V
I/O Supply Voltage (IOVCC)	-0.3	+3.3	V
Operating Temperature	-20	70	°C
Storage Temperature	-30	80	°C

## 6. DC Characteristics

Parameter	Symbol	Values			Unit
		Min.	Typ.	Max.	
Digital Supply Voltage	VCI	2.6	3.0	3.6	V
I/O Supply Voltage	IOVCC	1.65	1.8	1.95	V

## 7. Backlight Characteristic



Parameter	Symbol	Min.	Typ.	Max.	Unit
Supply voltage of white LED backlight	VL	16.8	-	19.8	V
Current for LED backlight	IL	-	40	-	mA



## 8. Optical Characteristics

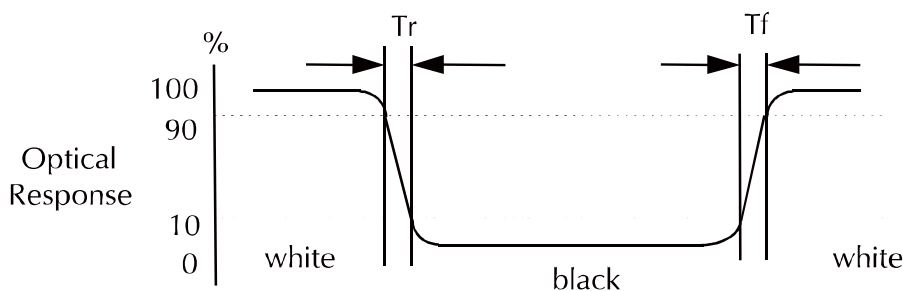
Item		Symbol	Min.	Typ.	Max.	Unit	Note
Contrast Ratio		CR	-	1200	-	-	
Color gamut (NTSC ratio)		-	-	50	-	%	
Response Time		Rising + Falling	-	30	-	ms	
Viewing Angle	Horizontal	$\theta x^+$	-	80	-	degree	
		$\theta x^-$	-	80	-		
	Vertical	$\theta y^+$	-	80	-		
		$\theta y^-$	-	80	-		
	White	X	+0.05	0.311	-0.05		
		Y		0.338			
Luminance(Center)		L	-	350	-	cd/m2	
Luminance Uniformity		$\Delta L$	75	80		%	

### a. Test equipment setup

After stabilizing and leaving the panel alone shall be warmed up for the stable operation of LCM, the measurement should be executed. Measurement should be executed in a stable, windless, and dark room. Optical specifications are measured by Topcon BM-7(fast) with a viewing angle of 2° at a distance of 50cm and normal direction.

### b. Definition of response time: Tr and Tf

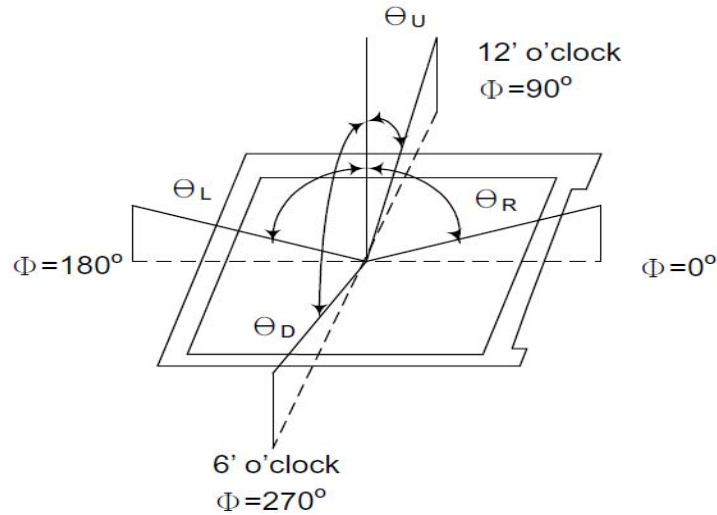
The response time is defined as the following figure and shall be measured by switching the input signal for "black" and "white".



### c. Definition of contrast ratio:

$$\text{Contrast Ratio (CR)} = \frac{\text{Brightness measured when LCD is at "white state"}}{\text{Brightness measured when LCD is at "black state"}}$$

d. Measured at the center area of the panel when all the input terminals of LCD panel are electrically



e. Definition of Luminance of White: Luminance of white at the center points

Light Source of Back-Light Unit	LED Type
---------------------------------	----------

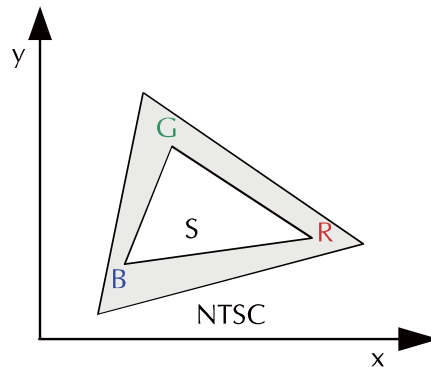
f. Definition of White Uniformity

$$\text{White Uniformity} = \frac{\text{Min. luminance of white among 9-points}}{\text{Max. luminance of white among 9-points}} \times 100\%$$

g. The definition of Color Gamut -Color Chromaticity CIE 1931

Color coordinate of white & red, green, blue at center point.

Color Gamut : NTSC(%) = ( RGB Triangle Area / NTSC Triangle Area ) x 100



## 9. Power ON/OFF

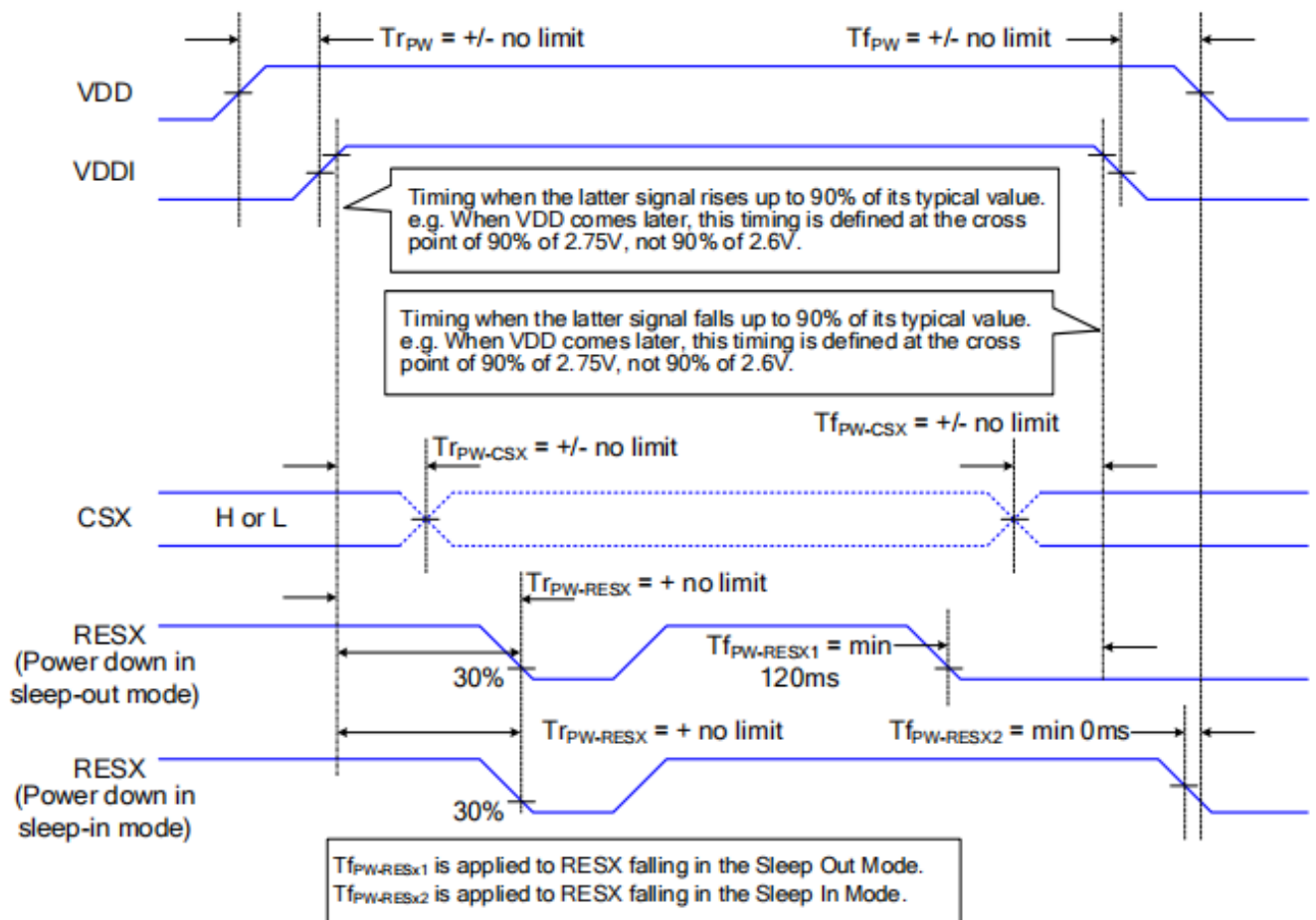
VDDI and VDDA can be applied or powered down in any order. During the Power Off sequence, if the LCD is in the Sleep Out mode, VDDA and VDDI must be powered down with minimum 120msec. If the LCD is in the Sleep In mode, VDDA and VDDI can be powered down with minimum 0msec after the RESX is released.

CSX can be applied at any timing or can be permanently grounded. RESX has high priority over CSX.

Notes:

1. There will be no damage to the ST7701S if the power sequences are not met.
2. There will be no abnormal visible effects on the display panel during the Power On/Off Sequences.
3. There will be no abnormal visible effects on the display between the end of Power On Sequence and before receiving the Sleep Out command, and also between receiving the Sleep In command and the Power Off Sequence.
4. If the RESX line is not steadily held by the host during the Power On Sequence as defined in Sections 9.1 and 9.2, then it will be necessary to apply the Hardware Reset (RESX) after the completion of the Host Power On Sequence to ensure correct operations. Otherwise, all the functions are not guaranteed.

The power on/off sequence is illustrated below



## 10. Reliability Test Conditions and Methods

Item	Test Conditions		Remark
High Temperature Storage	Ta=80°C	96hrs	Note1, Note4
Low Temperature Storage	Ta=-30°C	96hrs	Note1, Note4
High Temperature Operation	Ts=70°C	96hrs	Note2, Note4
Low Temperature Operation	Ts=-20°C	96hrs	Note4
Operation at High Temperature and Humidity	+60°C, 90%RH	96hrs	Note4
Thermal Shock	-20°C /30min ~ +60°C /30minforatotal10cycles.Start with cold temperature and end with high temperature.		
Package Drop Test	Height60cm 1corner, 3edges, 6surfaces		
Elector Static Discharge	±2KV, HumanBodyMode,150pF/330Ω		

Note1: Ta is the ambient temperature of samples.

Note2: Ts is the temperature of panel's surfaces.

Note3: In the standard condition, there shall be no practical problem that may affect the display function. After the reliability test, the product only guarantees operation, but don't guarantee all of the cosmetic specification.

Note4: Before cosmetic and function test, the product must have enough recovery time, at least 2 hours at room temperature.

## 11.1 VISUAL & FUNCTION INSPECTION STANDARD

### 11.1.1 Inspection conditions

Inspection performed under the following conditions is recommended.

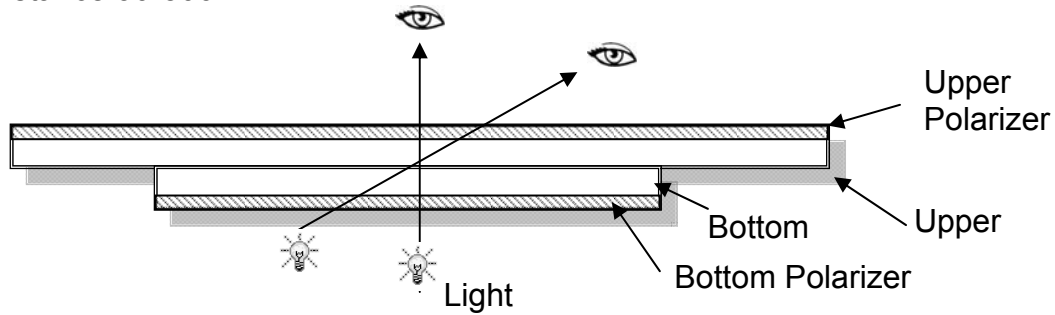
Temperature :  $25 \pm 5^{\circ}\text{C}$

Humidity :  $65\% \pm 10\% \text{RH}$

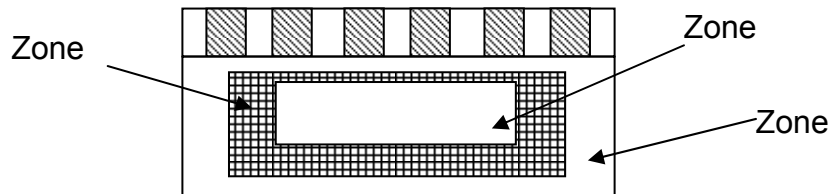
Viewing Angle : Normal viewing Angle.

Illumination: Single fluorescent lamp (300 to 700Lux)

Viewing distance:30-50cm



### 11.1.2 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 cannot 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.

### 11.1.3 Sampling Plan

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

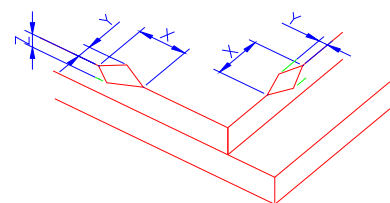
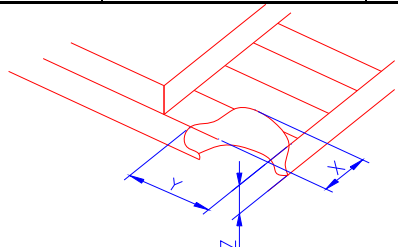
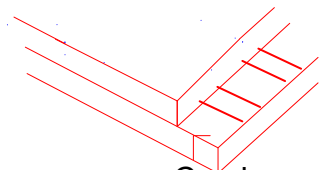
AQL:

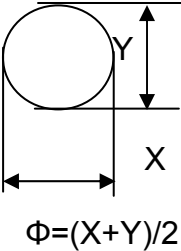
Major defect	Minor defect
0.65	1.5

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.	

### 11.1.4 Criteria (Visual)

Number	Items	Criteria(mm)						
1.0 LCD Crack / Broken  NOTE: X: Length Y: Width Z: Height L: Length of ITO, T: Height of LCD	(1) The edge of LCD broken	 <table border="1" data-bbox="845 571 1388 728"> <thead> <tr> <th>X</th> <th>Y</th> <th>Z</th> </tr> </thead> <tbody> <tr> <td>≤3.0mm</td> <td>&lt;Inner border line of the seal</td> <td>≤T</td> </tr> </tbody> </table>	X	Y	Z	≤3.0mm	<Inner border line of the seal	≤T
	X	Y	Z					
	≤3.0mm	<Inner border line of the seal	≤T					
(2)LCD corner broken	 <table border="1" data-bbox="901 1019 1332 1097"> <thead> <tr> <th>X</th> <th>Y</th> <th>Z</th> </tr> </thead> <tbody> <tr> <td>≤3.0mm</td> <td>≤L</td> <td>≤T</td> </tr> </tbody> </table>	X	Y	Z	≤3.0mm	≤L	≤T	
X	Y	Z						
≤3.0mm	≤L	≤T						
(3) LCD crack	 <p style="text-align: center;">Crack Not allowed</p>							

Number	Items	Criteria (mm)																																																																	
2.0	Spot defect  $\Phi=(X+Y)/2$	<p>① light dot (LCD/TP/Polarizer black/white spot , light dot, pinhole, dent, stain)</p> <table border="1"> <thead> <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> </thead> <tbody> <tr> <td><math>\Phi \leq 0.10</math></td> <td colspan="3">Ignore</td> </tr> <tr> <td><math>0.10 &lt; \Phi \leq 0.15</math></td> <td colspan="3">3( distance <math>\geq 10\text{mm}</math>)</td> </tr> <tr> <td><math>0.15 &lt; \Phi \leq 0.2</math></td> <td colspan="3">1</td> </tr> <tr> <td><math>0.2 &lt; \Phi</math></td> <td colspan="3">0</td> </tr> </tbody> </table> <p>② Dim spot (LCD/TP/Polarizer dim dot, light leakage, dark spot)</p> <table border="1"> <thead> <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> </thead> <tbody> <tr> <td><math>\Phi \leq 0.1</math></td> <td colspan="3">Ignore</td> </tr> <tr> <td><math>0.1 &lt; \Phi \leq 0.2</math></td> <td colspan="3">2( distance <math>\geq 10\text{mm}</math>)</td> </tr> <tr> <td><math>0.2 &lt; \Phi \leq 0.3</math></td> <td colspan="3">1</td> </tr> <tr> <td><math>\Phi &gt; 0.3</math></td> <td colspan="3">0</td> </tr> </tbody> </table> <p>③ Polarizer accidented spot</p> <table border="1"> <thead> <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> </thead> <tbody> <tr> <td><math>\Phi \leq 0.2</math></td> <td colspan="3">Ignore</td> </tr> <tr> <td><math>0.2 &lt; \Phi \leq 0.5</math></td> <td colspan="3">2( distance <math>\geq 10\text{mm}</math>)</td> </tr> <tr> <td><math>\Phi &gt; 0.5</math></td> <td colspan="3">0</td> </tr> </tbody> </table>	Zone Size (mm)	Acceptable Qty			A	B	C	$\Phi \leq 0.10$	Ignore			$0.10 < \Phi \leq 0.15$	3( distance $\geq 10\text{mm}$ )			$0.15 < \Phi \leq 0.2$	1			$0.2 < \Phi$	0			Zone Size (mm)	Acceptable Qty			A	B	C	$\Phi \leq 0.1$	Ignore			$0.1 < \Phi \leq 0.2$	2( distance $\geq 10\text{mm}$ )			$0.2 < \Phi \leq 0.3$	1			$\Phi > 0.3$	0			Zone Size (mm)	Acceptable Qty			A	B	C	$\Phi \leq 0.2$	Ignore			$0.2 < \Phi \leq 0.5$	2( distance $\geq 10\text{mm}$ )			$\Phi > 0.5$	0		
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	Line defect (LCD/TP/Polarizer black/white line, scratch, stain)	<table border="1"> <thead> <tr> <th rowspan="2">Width(mm)</th> <th rowspan="2">Length(m m)</th> <th colspan="3">Acceptable Qty</th> </tr> <tr> <th>A</th> <th>B</th> <th>C</th> </tr> </thead> <tbody> <tr> <td><math>\Phi \leq 0.03</math></td> <td>Ignore</td> <td colspan="3">Ignore</td> </tr> <tr> <td><math>0.03 &lt; W \leq 0.05</math></td> <td><math>L \leq 3.0</math></td> <td colspan="2">N<math>\leq 2</math></td> <td rowspan="2">Ignore</td> </tr> <tr> <td><math>0.05 &lt; W \leq 0.08</math></td> <td><math>L \leq 2.0</math></td> <td colspan="2">N<math>\leq 2</math></td> </tr> <tr> <td><math>0.08 &lt; W</math></td> <td colspan="4">Define as spot defect</td> </tr> </tbody> </table>	Width(mm)	Length(m m)	Acceptable Qty			A	B	C	$\Phi \leq 0.03$	Ignore	Ignore			$0.03 < W \leq 0.05$	$L \leq 3.0$	N $\leq 2$		Ignore	$0.05 < W \leq 0.08$	$L \leq 2.0$	N $\leq 2$		$0.08 < W$	Define as spot defect																																									
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3.0	Polarizer Bubble	<table border="1"> <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><math>\Phi \leq 0.2</math></td> <td colspan="3">Ignore</td> </tr> <tr> <td><math>0.2 &lt; \Phi \leq 0.4</math></td> <td colspan="3">2(distance <math>\geq 10</math>mm)</td> </tr> <tr> <td><math>0.4 &lt; \Phi \leq 0.6</math></td> <td colspan="3">1</td> </tr> <tr> <td><math>0.6 &lt; \Phi</math></td> <td colspan="3">0</td> </tr> </table>	Zone Size (mm)	Acceptable Qty			A	B	C	$\Phi \leq 0.2$	Ignore			$0.2 < \Phi \leq 0.4$	2(distance $\geq 10$ mm)			$0.4 < \Phi \leq 0.6$	1			$0.6 < \Phi$	0		
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$0.4 < \Phi \leq 0.6$	1																								
$0.6 < \Phi$	0																								
4.0	SMT	According to IPC-A-610C class II standard . Function defect and missing part are major defect ,the others are minor defect.																							

## 12. Handling Precautions

### 12.1 Mounting method

The LCD panel of AMSON TFT module consists of two thin glass plates with polarizers which easily be damaged. And since the module is so constructed as to be fixed by utilizing fitting holes in the printed circuit board.

Extreme care should be needed when handling the LCD modules.

### 12.2 Caution of LCD handling and cleaning

When cleaning the display surface, Use soft cloth with solvent

[Recommended below] and wipe lightly

- Isopropyl alcohol
- Ethyl alcohol

Do not wipe the display surface with dry or hard materials that will damage the polarizer surface.

Do not use the following solvent:

- Water
- Aromatics

Do not wipe ITO pad area with the dry or hard materials that will damage the ITO patterns

Do not use the following solvent on the pad or prevent it from being contaminated:

- Soldering flux
- Chlorine (Cl) , Sulfur (S)

If goods were sent without being silicon coated on the pad, ITO patterns could be damaged due to the corrosion as time goes on.

If ITO corrosion happens by miss-handling or using some materials such as Chlorine (Cl), Sulfur (S) from customer, Responsibility is on customer.

### 12.3 Caution against static charge

The LCD module uses C-MOS LSI drivers, so we recommend that you:

Connect any unused input terminal to power or ground, do not input any signals before power is turned on, and ground your body, work/assembly areas, and assembly equipment to protect against static electricity.

### 12.4 packing

- Module employs LCD elements and must be treated as such.
- Avoid intense shock and falls from a height.
- To prevent modules from degradation, do not operate or store them exposed directly to sunshine or high temperature/humidity

### 12.5 Caution for operation

- It is an indispensable condition to drive LCD's within the specified voltage limit since the higher voltage than the limit causes the shorter LCD life.
- An electrochemical reaction due to direct current causes LCD's undesirable deterioration, so that the use of direct current drive should be avoided.
- Response time will be extremely delayed at lower temperature than the operating temperature range and on the other hand at higher temperature LCD's show dark color in them. However those phenomena do not mean malfunction or out of order with LCD's, which will come back in the specified operation temperature.
- If the display area is pushed hard during operation, some font will be abnormally displayed but it resumes normal condition after turning off once.
- Slight dew depositing on terminals is a cause for electro-chemical reaction resulting in terminal open circuit.

Usage under the maximum operating temperature, 50%Rh or less is required.

## 12.6 storing

In the case of storing for a long period of time for instance, for years for the purpose or replacement use, the following ways are recommended.

- Storage in a polyethylene bag with the opening sealed so as not to enter fresh air outside in it. And with no desiccant.
- Placing in a dark place where neither exposure to direct sunlight nor light's keeping the storage temperature range.
- Storing with no touch on polarizer surface by the anything else.  
[It is recommended to store them as they have been contained in the inner container at the time of delivery from us

## 12.7 Safety

- It is recommendable to crash damaged or unnecessary LCD's into pieces and wash off liquid crystal by either of solvents such as acetone and ethanol, which should be burned up later.
- When any liquid leaked out of a damaged glass cell comes in contact with your hands, please wash it off well with soap and water

## 13. Precaution for Use

### 13.1

A limit sample should be provided by the both parties on an occasion when the both parties agreed its necessity. Judgment by a limit sample shall take effect after the limit sample has been established and confirmed by the both parties.

### 13.2

On the following occasions, the handing of problem should be decided through discussion and agreement between responsible of the both parties.

- When a question is arisen in this specification
- When a new problem is arisen which is not specified in this specifications
- When an inspection specifications change or operating condition change in customer is reported to AMSON TFT , and some problem is arisen in this specification due to the change
- When a new problem is arisen at the customer's operating set for sample evaluation in the customer site.

## 14. Packing Method

TBD.