Specification for Approval

Customer:_____

Model Name:_____

Supplier Approval			Customer approval
R&D Designed	R&D Approved	QC Approved	
Peter	Peng Jun		

Revision Record

REV NO.	REV DATE	CONTENTS	Note
A	2023-03-17	NEW ISSUE	

Table of Contents

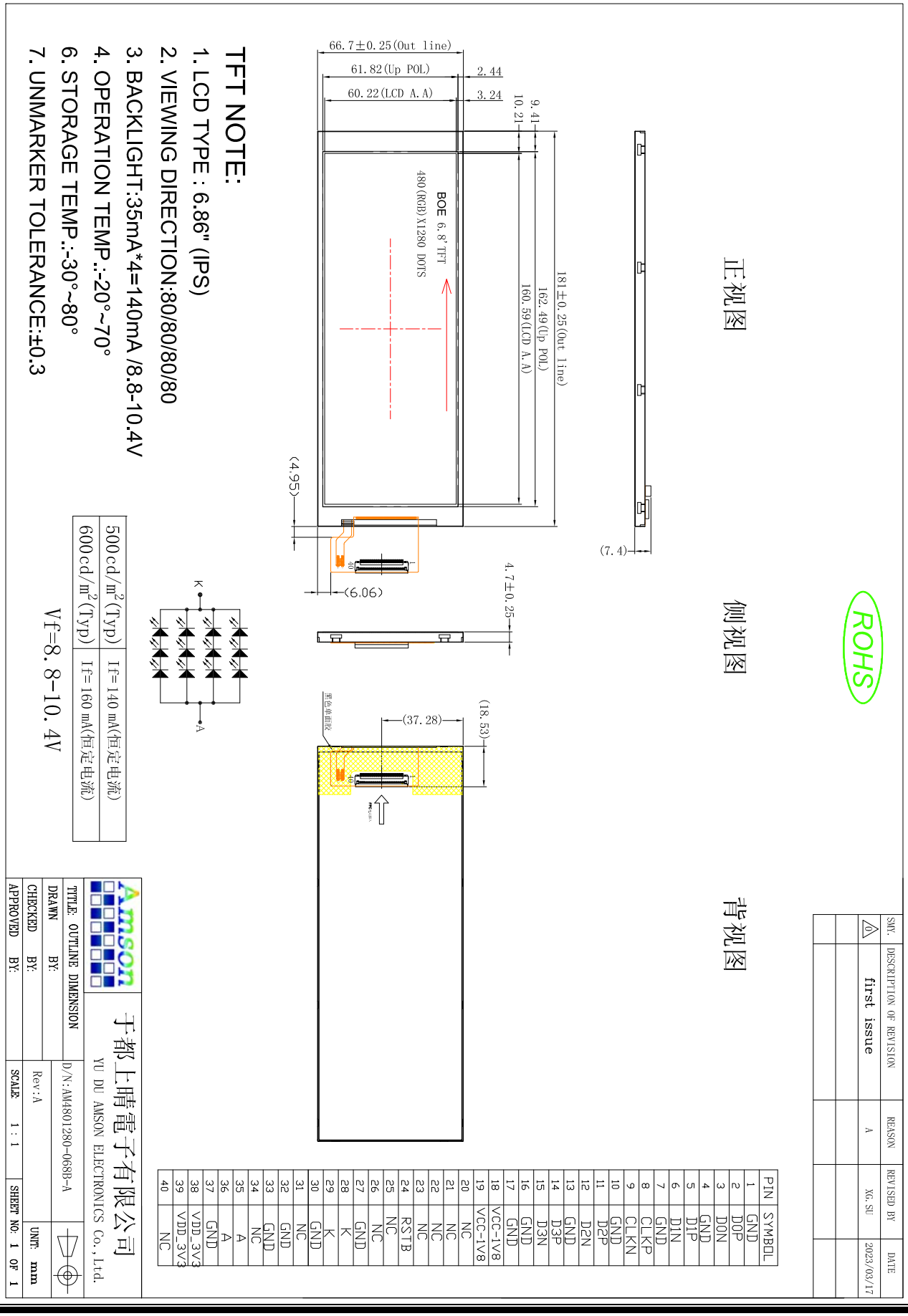
1. Scope

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

Item	Contents	Unit
	LCD	
LCD Type	TFT / Transmissive / Normal Black	--
Viewing direction	ALL.O'CLOCK	--
Backlight	White LED x12in Parallel/ Series	--
Interface	MIPI	--
Driver IC	ICN9707	--
Outline Dimension	66.7*181*4.7±0.25	mm
Glass area (W×H×T)	63.4208*169.0888*1.0	mm
Active area (W×H)	60.22*160.59	mm
Number of Dots	480*1280	--
Pixel pitch (W×H)	41.82*3*125.46	um
Operating Temperature	-20 +70	
Storage temperature	-30 +80	

3. External Dimensions



4. Interface Description

PIN No.	SYMBOL	Function
1	GND	Ground
2	DSI-D0P	DSI Data differential signal input pins. (Data lane0)
3	DSI-D0N	DSI Data differential signal input pins. (Data lane 0)
4	GND	Ground
5	DSI-D1P	DSI Data differential signal input pins. (Data lane 1)
6	DSI-D1N	DSI Data differential signal input pins. (Data lane 1)
7	GND	Ground
8	DSI-CLK P	DSI CLOCK differential signal input pins
9	DSI-CLK N	DSI CLOCK differential signal input pins
10	GND	Ground
11	DSI-D2P	DSI Data differential signal input pins. (Data lane 2)
12	DSI-D2N	DSI Data differential signal input pins. (Data lane 2)
13	GND	Ground
14	DSI-D3P	DSI Data differential signal input pins. (Data lane 3)
15	DSI-D3N	DSI Data differential signal input pins. (Data lane 3)
16-17	GND	Ground
18-19	IOVCC	I/O Power supply
20-23	NC	NC
24	RESET	Reset Signal pin (“Low” is enable)
25-26	NC	NC
27	GND	Ground
28-29	LEDK	Backlight LED Cathode
30	GND	Ground
31	NC	NC
32-33	GND	Ground
34	NC	NC
35-36	LEDA	Backlight LED Anode.
37	GND	Ground
38-39	VCC	Logic Power supply
40	NC	NC

5. Absolute Maximum Ratings

Item	Symbol	Rating			Unit
		MIN.	TYP.	MAX	
Operating Temperature range	TOP	-20	-	+70	
Storage Temperature range	TST	-30	-	+80	

6. DC Characteristics

Item	Symbol	Min.	Type.	Max.	Unit
Logic Supply Voltage	VDD	2.8	-	3.3	V
I/O Supply Voltage	IOVCC	1.8	-	3.3	V

IOVCC , IVOCC VCC

7. Timing Characteristics

High Speed Mode - Clock Timings

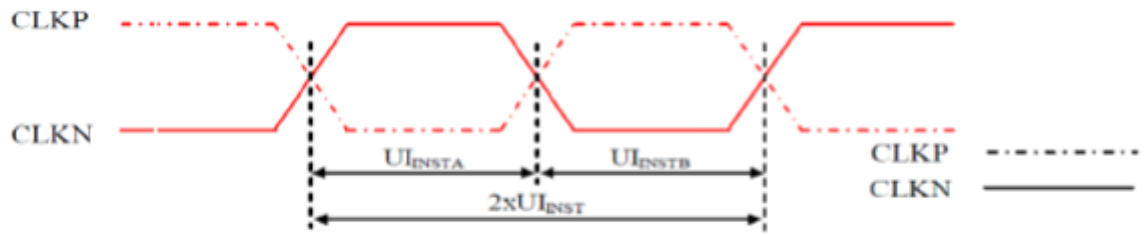


Figure 4.5.1-1: Clock Timing

Signal	Symbol	Parameter	Specification			Unit	Notes
			MIN	TYP	MAX		
CLK P/N	2xUIINST	Double UI instantaneous	4		25	nS	
CLK P/N	UIINSTA, UIINSTB	UI instantaneous Half	2		12.5	nS	1

Note 1: UI = UIINSTA = UIINSTB

High Speed Mode - Clock / Data Timings

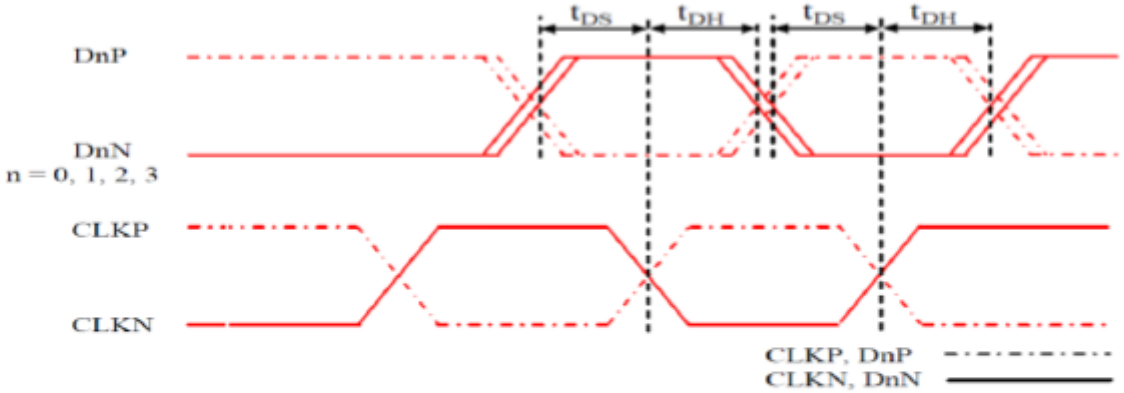


Figure 4.5.2-1: DSI Clock / Data Timings

Signal	Symbol	Parameter	Specification			Unit	Notes
			MIN	TYP	MAX		
Dn P/N (n=0,1,2 and 3)	tDS	Data to Clock Setup time	0.15*UI			UI	
	tDH	Clock to Data Hold time	0.15*UI			UI	

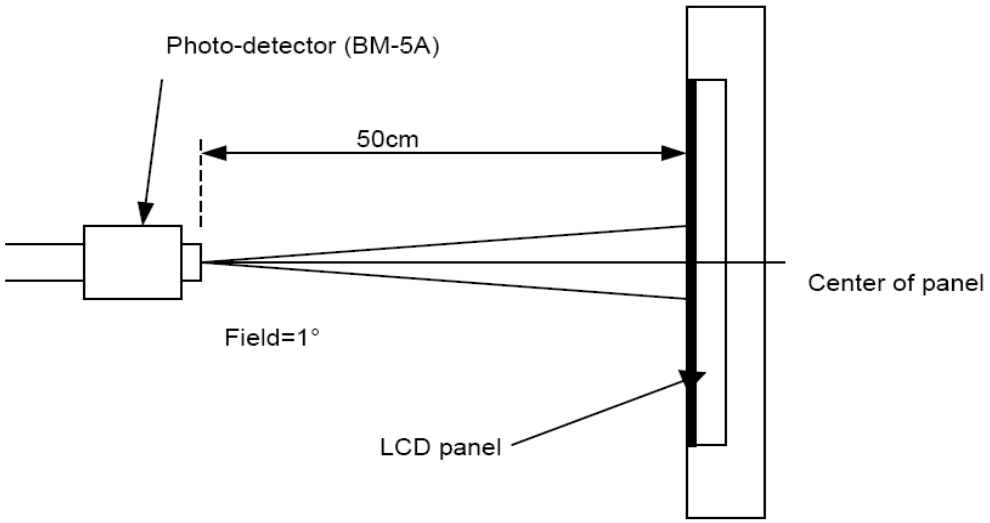
8. Backlight Characteristic

Item	Symbol	Condition	Min	Typ	Max	Unit
Forward Voltage	VF	IF=140mA	8.8	-	10.4	V
Uniformity	ΔBp	-	80	-	-	%
Luminance for LCD	Lv	IF=140mA	450	500	-	cd/m^2

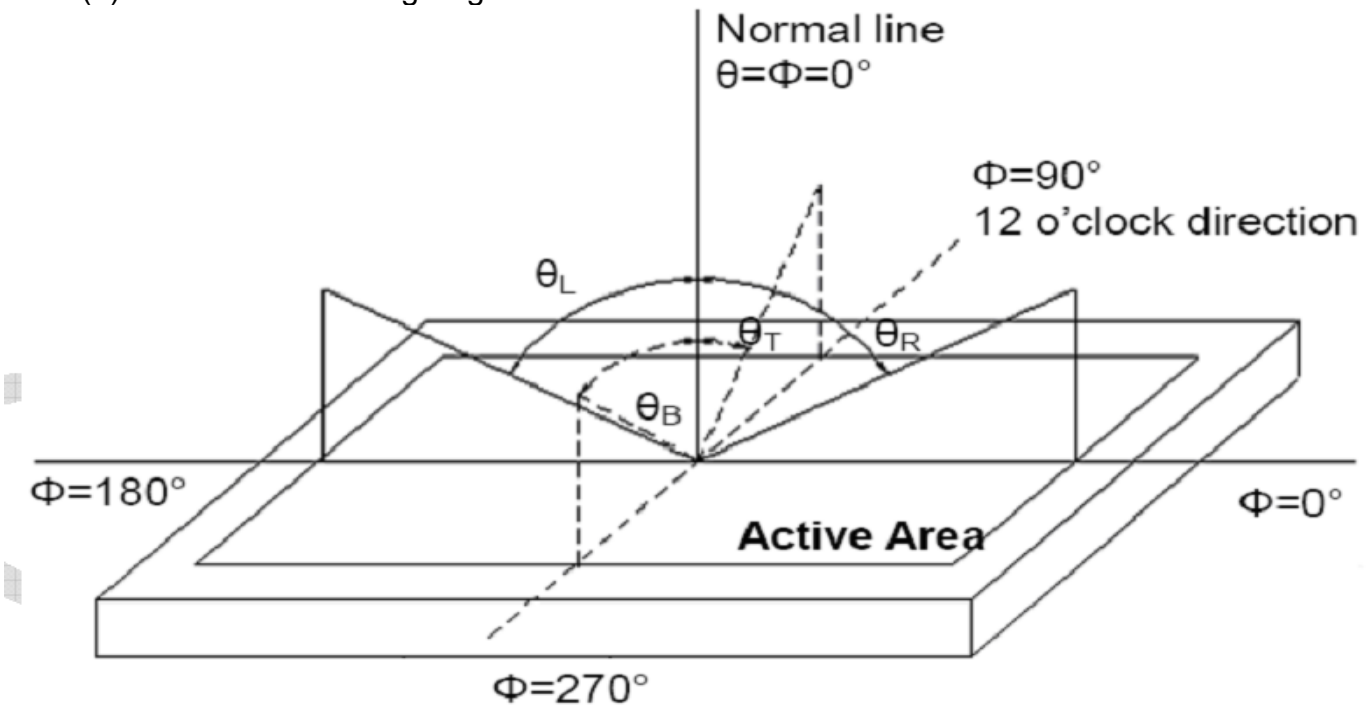
9. Optical Characteristics

Item	Conditions		Min.	Typ.	Max.	Unit	Note
Viewing Angle (CR>10)	Horizontal	θ_L	-	80	-	degree	(1),(2),(6)
		θ_R	-	80	-		
	Vertical	θ_T	-	80	-		
		θ_B	-	80	-		
Contrast Ratio	Center		-	800	-	-	(1),(3),(6)
Response Time	Tr+Tf		-	30	35	ms	(1),(4),(6)
CF Color Chromaticity (CIE1931)	Red x		Typ. -0.05	0.659	Typ. +0.05	-	(1), (6)
	Red y			0.322		-	
	Green x			0.290		-	
	Green y			0.588		-	
	Blue x			0.134		-	
	Blue y			0.124		-	
	White x			0.298		-	
	White y			0.328		-	

Note (1) Measurement Setup: The LCD module should be stabilized at given temp. 25°C for 15 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting backlight for 15 minutes in a windless room.



Note (2) Definition of Viewing Angle



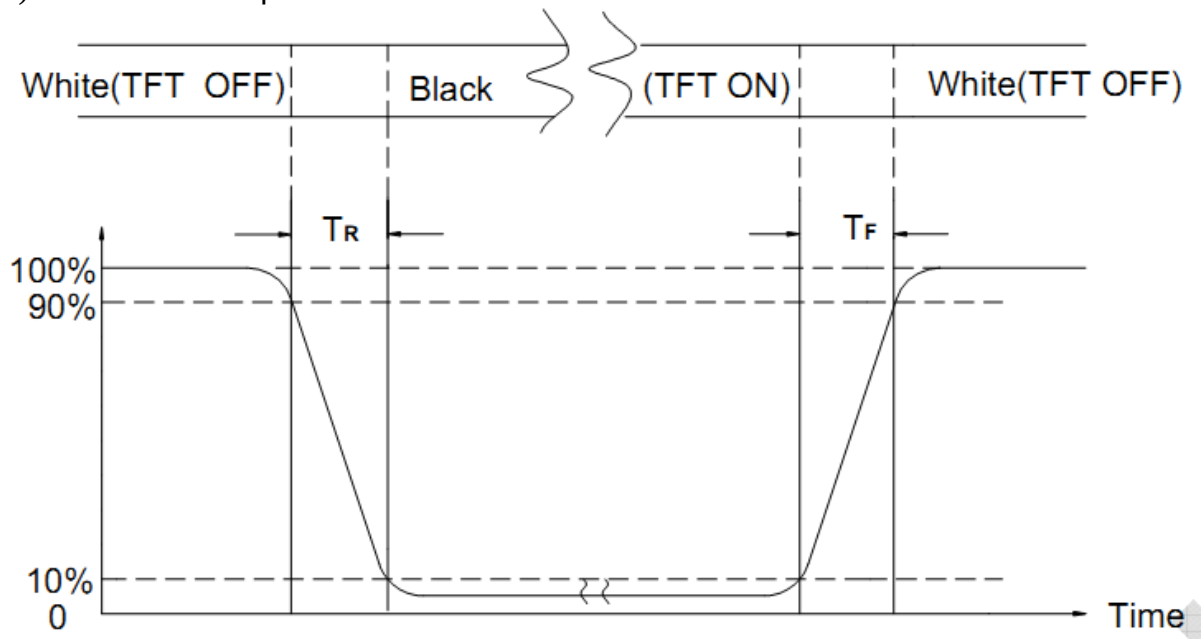
Note (3) Definition of Contrast Ratio (CR)

The contrast ratio can be calculated by the following expression

Contrast Ratio (CR) = L63 / L0

L63: Luminance of gray level 63, L0: Luminance of gray level 0

Note (4) Definition of response time



Note (5) Definition of Transmittance (Module is without signal input)

Transmittance = Center Luminance of LCD / Center Luminance of Back Light x 100%

Note (6) Definition of color chromaticity (CIE1931)

Color coordinates measured at the center point of LCD

10. Reliability Test Conditions and Methods

Reliability test condition:

Item	Condition	Time (hrs)	Assessment
High temp. Storage	80°C	48	No abnormalities in functions and appearance
High temp. Operating	70°C	48	
Low temp. Storage	-30°C	48	
Low temp. Operating	-20°C	48	
Humidity	60°C/ 90%RH	48	
Temp. Cycle	-30°C ← 25°C →80°C (60 min ← 5 min → 60min)	10cycles	

Recovery time should be 24 hours minimum. Moreover, functions, performance and appearance shall be free from remarkable deterioration within 50,000 hours under ordinary operating and storage conditions room temperature (20±8°C), normal humidity (below 65% RH), and in the area not exposed to direct sun light.

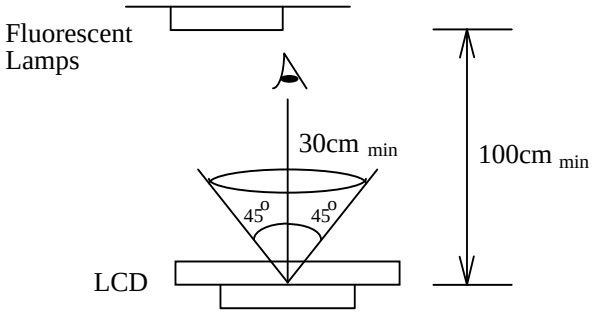
11. Inspection Standard

All The raw material is Rohs complicant.

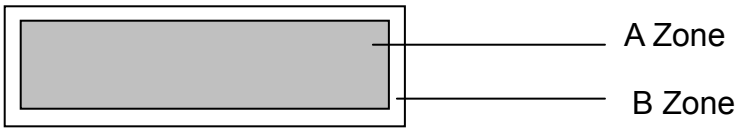
11.1 Standard of the product appearance test

Manner of appearance test: The inspection should be performed in using 20W x 2 fluorescent lamps. Distance between LCM and fluorescent lamps should be 100 cm or more. Distance between LCM and inspector eyes should be 30 cm or more.

Viewing direction for inspection is 45° from vertical against LCM.



Definition of zone:



A Zone: viewing area
B Zone: outside viewing area

11.2 Specification of quality assurance

AQL inspection standard

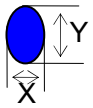
Sampling method: MIL-STD-105E, Level II, single sampling

Defect classification (Note: * is not including)

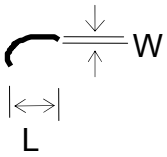
Classify	Item		Note	AQL
Major	Display state	Short or open circuit	1	0.65
		LC leakage		
		Flickering		
		No display		
		Wrong viewing direction		
		Contrast defect (dim, ghost)	2	
		Back-light	1,8	
	Non-display	Flat cable or pin reverse	10	
		Wrong or missing component	11	
Minor	Display state	Background color deviation	2	1.0
		Black spot and dust	3	
		Line defect, Scratch	4	
		Rainbow	5	
		Chip	6	
		Pin hole	7	
	Polarizer	Protruded	12	
		Bubble and foreign material	3	
	Soldering	Poor connection	9	
	Wire	Poor connection	10	
	TAB	Position, Bonding strength	13	

Note on defect classification

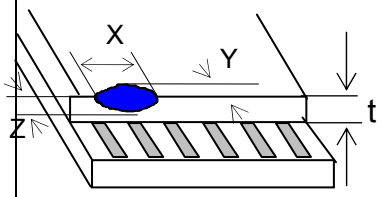
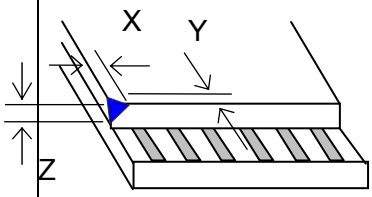
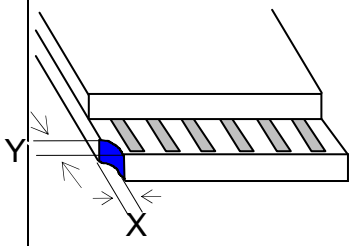
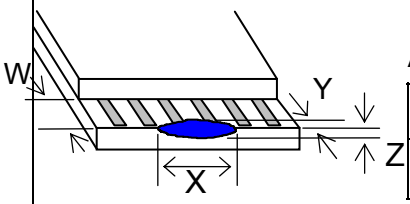
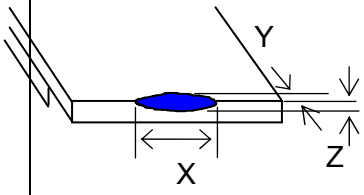
<table>
<tr><th>No.</th><th>Item</th><th>Criterion</th></tr>
<tr><td rowspan="6">1</td><td>Short or open circuit</td><td rowspan="6">Not allow</td></tr>
<tr><td>LC leakage</td></tr>
<tr><td>Flickering</td></tr>
<tr><td>No display</td></tr>
<tr><td>Wrong viewing direction</td></tr>
<tr><td>Wrong Back-light</td></tr>
<tr><td rowspan="2">2</td><td>Contrast defect</td><td rowspan="2">Refer to approval sample</td></tr>
<tr><td>Background color deviation</td></tr>
<tr><td>3</td><td>Point defect,
Black spot, dust
(including Polarizer)

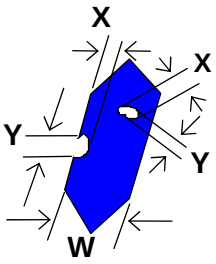
ϕ = (X+Y)/2</td><td> 

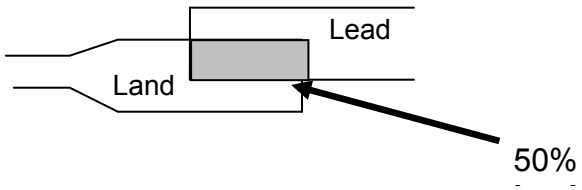
<table>
<tr><th>Point Size</th><th>Acceptable Qty.</th></tr>
<tr><td>ϕ≤0.10</td><td>Disregard</td></tr>
<tr><td>0.10<ϕ≤0.20</td><td>2</td></tr>
<tr><td>0.20<ϕ≤0.25</td><td>1</td></tr>
<tr><td>ϕ>0.25</td><td>0</td></tr>
</table>
Unit mm</td></tr>
<tr><td>4</td><td>Line defect,

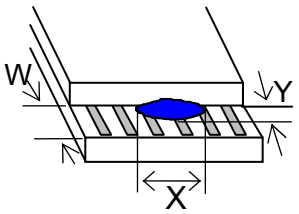
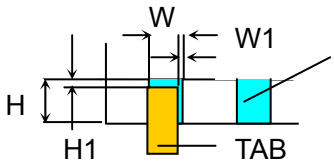
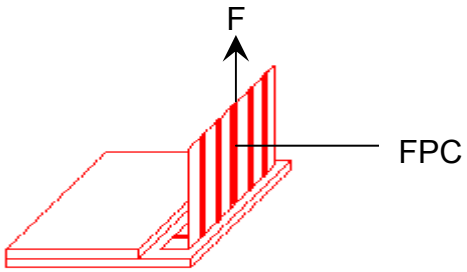
Scratch</td><td> 

<table>
<tr><th colspan="2">Line</th><th rowspan="2">Acceptable Qty.</th></tr>
<tr><th>L</th><th>W</th></tr>
<tr><td>---</td><td>0.015≥W</td><td>Disregard</td></tr>
<tr><td>3.0≥L</td><td>0.03≥W</td><td rowspan="2">2</td></tr>
<tr><td>2.0≥L</td><td>0.05≥W</td></tr>
<tr><td>1.0≥L</td><td>0.1 W</td><td>1</td></tr>
<tr><td>---</td><td>0.05<W</td><td>Applied as point defect</td></tr>
</table>
Unit: mm</td></tr>
<tr><td>5</td><td>Rainbow</td><td>Not more than two color changes across the viewing area.</td></tr>
</table>

No	Item	Criterion
6	Chip Remark: X: Length direction Y: Short direction Z: Thickness direction t: Glass thickness W: Terminal Width	 Acceptable criterion X: 2 / Y: 0.5mm / Z: /2  Acceptable criterion X: ≤2 / Y: 0.5mm / Z: ≤t  Acceptable criterion X: ≤3 / Y: ≤2 / Z: ≤t shall not reach to ITO  Acceptable criterion X: Disregard / Y: ≤0.2 / Z: ≤t  Acceptable criterion X: ≤5 / Y: ≤2 / Z: ≤t/3

<table>
<tr><th>No.</th><th>Item</th><th>Criterion</th></tr>
<tr><td>7</td><td>Segment
pattern
W = Segment width
ϕ = (X+Y)/2</td><td>(1) Pin hole
ϕ < 0.10mm is acceptable.
 

<table>
<tr><th>Point Size</th><th>Acceptable Qty</th></tr>
<tr><td>ϕ≤1/4W</td><td>Disregard</td></tr>
<tr><td>1/4W< ϕ≤1/2W</td><td>1</td></tr>
<tr><td>ϕ 1/2W</td><td>0</td></tr>
</table>
Unit: mm</td></tr>
<tr><td>8</td><td>Back-light</td><td>A. The color of backlight should correspond its specification.
B. Not allow flickering</td></tr>
<tr><td>9</td><td>Soldering</td><td>C. Not allow heavy dirty and solder ball on PCB.
(The size of dirty refer to point and dust defect)
D. Over 50% of lead should be soldered on Land.
 
</td></tr>
<tr><td>10</td><td>Wire</td><td>E. Copper wire should not be rusted
F. Not allow crack on copper wire connection.
G. Not allow reversing the position of the flat cable.
H. Not allow exposed copper wire inside the flat cable.</td></tr>
<tr><td>11*</td><td>PCB</td><td>I. Not allow screw rust or damage.
J. Not allow missing or wrong putting of component.</td></tr>
</table>

No	Item	Criterion
12	Protruded W: Terminal Width	 Acceptable criteria: Y ≤ 0.4
13	TAB	1. Position  W1 1/3W H1 1/3H 2 FPC bonding strength test  P (=F/FPC bonding width) 650gf/cm ,(speed rate: 1mm/min) 5pcs per SOA (shipment)
14	Total no. of acceptable Defect	A. Zone Maximum 2 minor non-conformities per one unit. Defect distance: each point to be separated over 10mm B. Zone It is acceptable when it is no trouble for quality and assembly in customer's end product.

12. Handling Precautions

12.1 Mounting method

The LCD panel of AMSON TFT module consists of two thin glass plates with polarizes which easily be damaged. And since the module in 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 happen 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 use C-MOS LSI drivers, so we recommended 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 direct 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 then the limit cause 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 then the operating temperature range and on the other hand at higher temperature LCD's how 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.