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	2015-10-27	NEW ISSUE	

Table of Contents

1. Scope

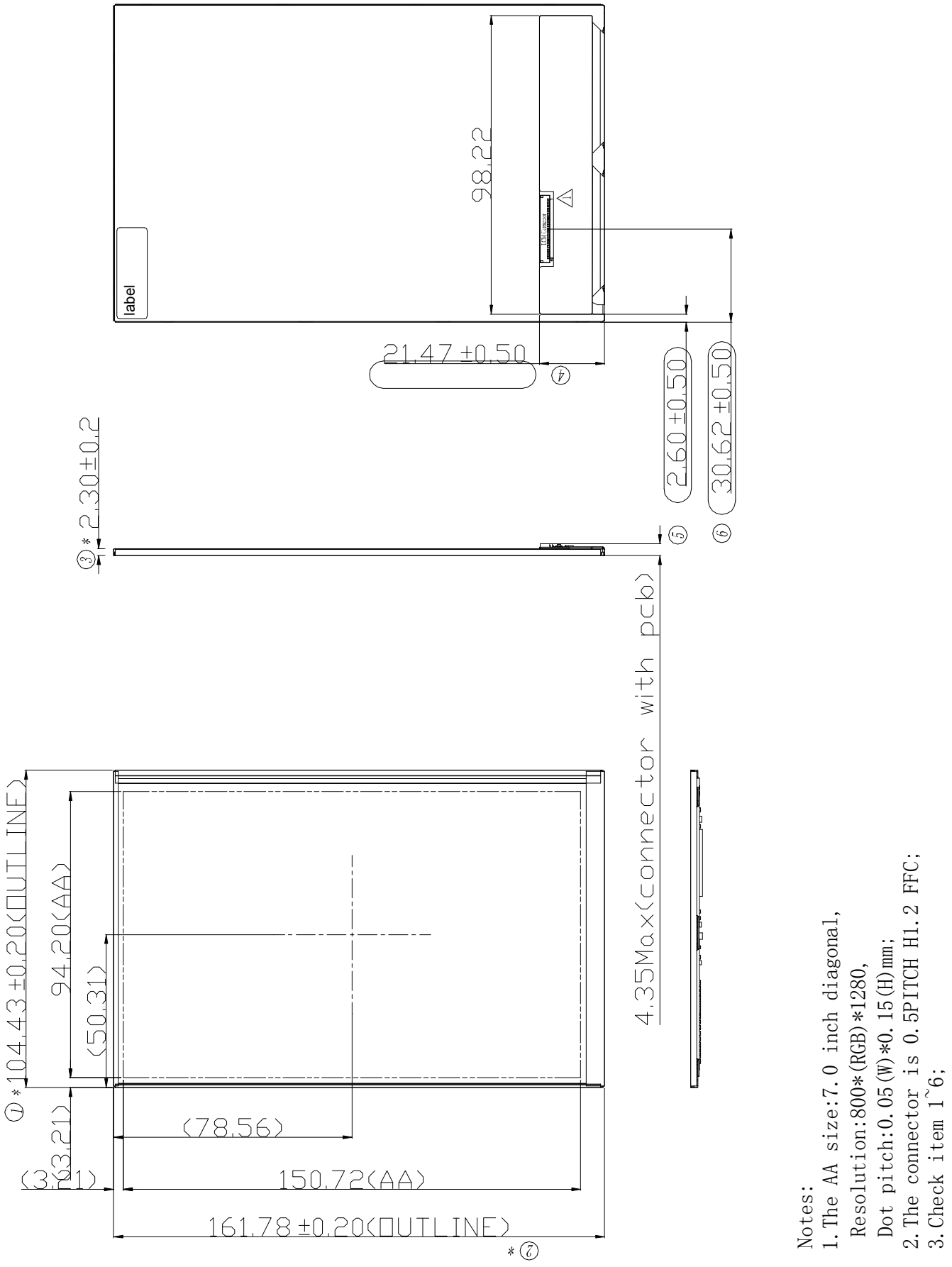
This specification defines general provisions as well as inspection standards for TFT module supplied by AMSON electronics.

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

2. General Information

ITEM	STANDARD VALUES	UNITS
LCD type	7.0”TFT	--
Dot arrangement	800×3(RGB)×1280	dots
Color filter array	RGB vertical stripe	--
Display mode	Normally Black, Transmissive	--
Viewing Direction	85/85/85/85	--
Driver IC	TBD	--
Module size	104.43(W)×161.78H)×2.30(T)	mm
Active area	94.20(W)×150.72(H)	mm
Dot pitch	0.039(W)×0.118(H)	mm
Interface	LVDS	--
Operating temperature	-10~ +50	°C
Storage temperature	-20 ~ +60	°C
Back Light	24White LED	--
Module Weight	79.5	g

3. External Dimensions



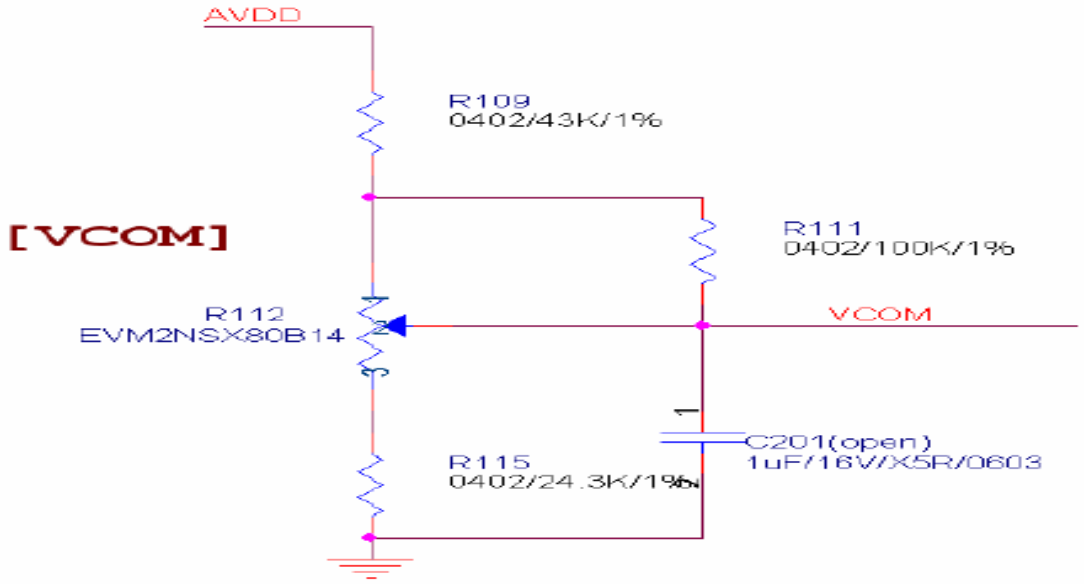
Notes:
1. The AA size:7.0 inch diagonal,
   Resolution:800*(RGB)*1280,
   Dot pitch:0.05(W)*0.15(H)mm;
2. The connector is 0.5PITCH H1.2 FFC;
3. Check item 1~6;

4. Interface Description

A 40pin connector is used for the module electronics interface. Innolux model is“F62240-H1210N” manufactured by Vigorconn.

PIN NO.	PIN NAME	DESCRIPTION
1	VCOM	Common Voltage
2	VDD	Power supply
3	VDD	
4	NC	No connection
5	NC	No connection
6	NC	No connection
7	GND	GROUND
8	RXIN0-	-LVDS Differential Data Input
9	RXIN0+	+LVDS Differential Data Input
10	GND	GROUND
11	RXIN1-	-LVDS Differential Data Input
12	RXIN1+	+LVDS Differential Data Input
13	GND	GROUND
14	RXIN2-	-LVDS Differential Data Input
15	RXIN2+	+LVDS Differential Data Input
16	GND	GROUND
17	RXCLKIN-	-LVDS Differential Clock Input
18	RXCLKIN+	+LVDS Differential Clock Input
19	GND	GROUND
20	RXIN3-	-LVDS Differential Clock Input
21	RXIN3+	+LVDS Differential Clock Input
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	AVDD	Power supply for Analog circuit
30	GND	GROUND
31	LEDK	The cathode of LED power
32	LEDK	The cathode of LED power
33	SHLR	Left / right selection
34	UPDN	Up/down selection
35	VGL	Gate OFF Voltage
36	NC	No connection
37	NC	No connection
38	VGH	Gate ON Voltage
39	LEDA	The Anode of LED power
40	LEDA	The Anode of LED power

Input, O: output, P: Power
Note1: Typical VCOM is only a reference value, it must be optimized according to each LCM, Be sure to use VR

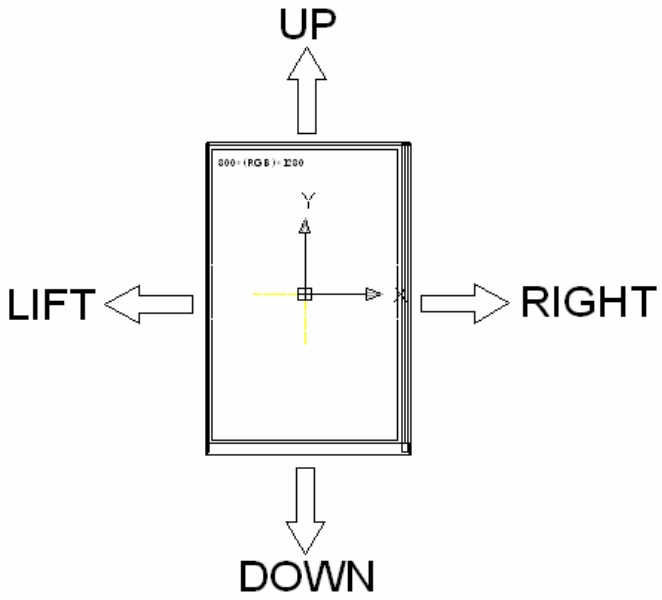


Note 2: Selection of scanning mode

Setting of scan control input		Scanning direction
UPDN	SHLR	
1.8V	1.8V	Up to down, left to right
GND	GND	Down to up, right to left
1.8V	GND	Up to down, right to left
GND	1.8V	Down to up, left to right

Default: Scanning direction is Up to down, left to right

Note 3: Definition of scanning direction.
Refer to the figure as below:



5. Operation Specifications

5.1. Absolute Maximum Ratings

Item	Symbol	Min.	Max.	Unit
Power voltage	VDD	-0.3	3.6	V
	AVDD	8	13.5	V
	VCOM	-0.3	5	V
	VGH	-0.3	42.0	V
	VGL	-20.0	0.3	V
LED Reverse Voltage	V_R		5	V
LED Forward Current	I_F		30	mA

Note 1: The absolute maximum rating values of this product are not allowed to be exceeded at any times. Should a module be used with any of the absolute maximum ratings exceeded, the characteristics of the module may not be recovered, or in an extreme case, the module may be permanently destroyed.

5.2. Operation Conditions

Item	Symbol	Min.	Typ.	Max.	Unit	Remark
Power voltage	VDD	3.0	3.3	3.6	V	
	AVDD	8.6	8.8	9.0	V	
	VGH	21.3	22	22.7	V	
	VGL	-7.7	-7.0	-6.3	V	
Input signal voltage	Vcom	2.8	3.0	3.2	V	
Input logic High Voltage	V_{IH}	1.7	1.8	1.95	V	
Input logic Low Voltage	V_{IL}	0	-	0.7	V	

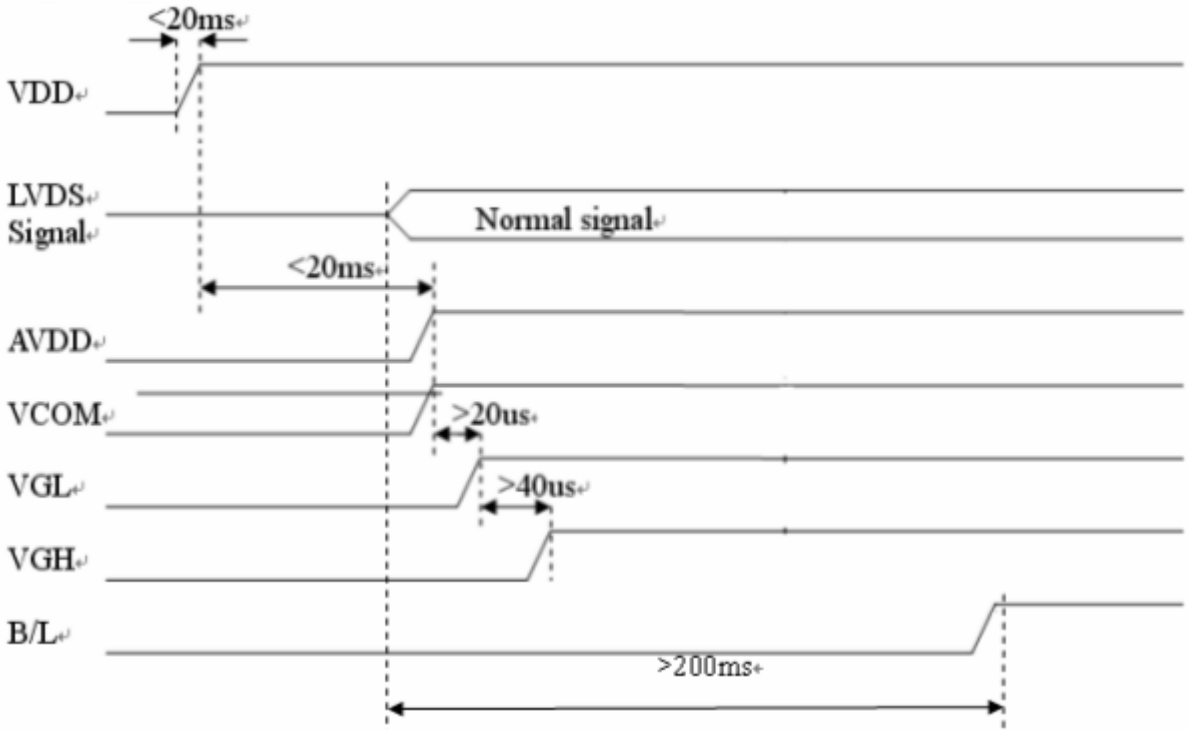
5.3. Current Consumption

(GND =0V)

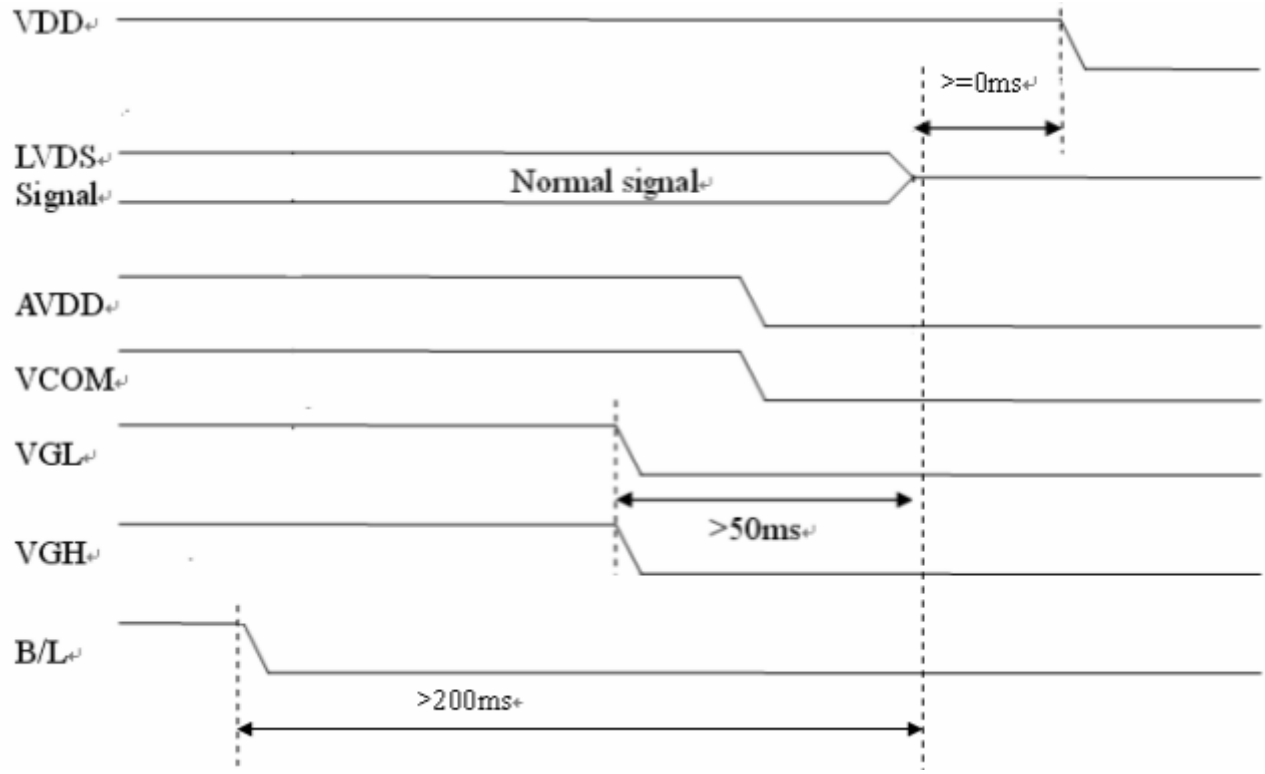
Item	Symbol	Values			Unit	Remark
		Min	Typ	Max		
Current for Driver	I_{GH}	–	0.3	0.40	mA	V_{GH} =22V
	I_{GL}	–	0.31	0.41	mA	V_{GL} = -7.0V
	IVDD	–	26.3	34.2	mA	V_{CC} =3.3V
	IAV_{DD}	–	19.5	25.35	mA	AV_{DD} =8.8V

6. Power Sequence

a. Power on:



b. Power off:

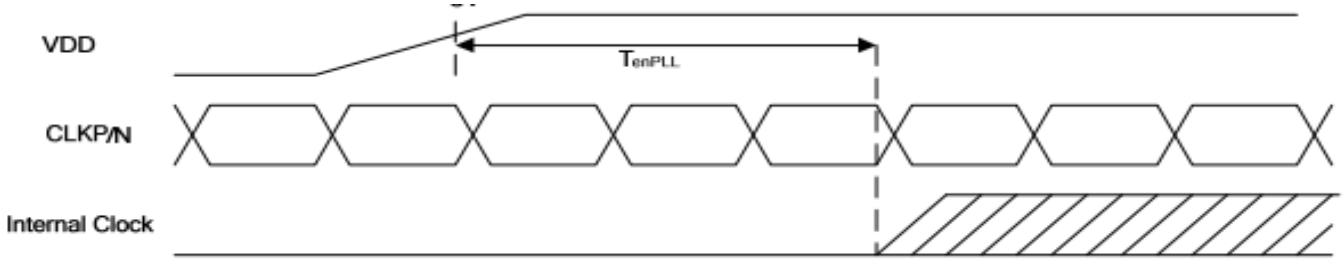


7. Timing Characteristics

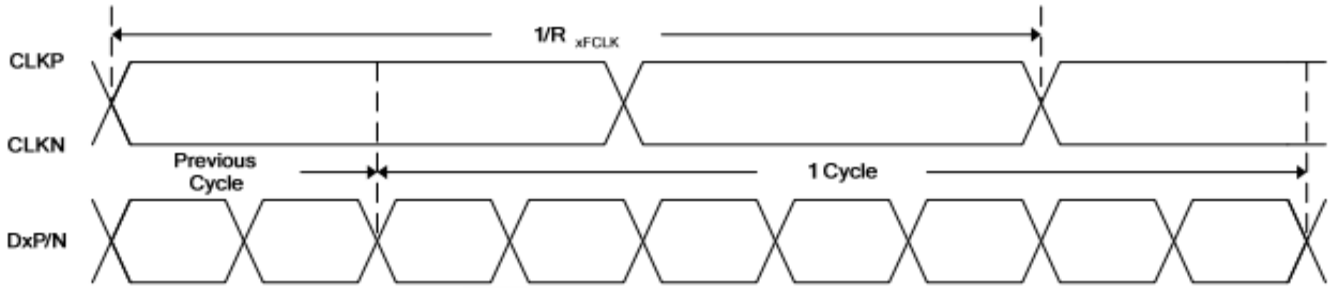
7.1. AC Electrical Characteristics

(VDD= 3.3V, AVDD= 8 .8V, GND=AGND= 0V, TA= -20 to +85°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition
Clock frequency	R_{xFCLK}	30	-	85	MHz	Refer to input timing table for each display resolution.
Input data skew margin	T_{RSKM}	500	-	-	pS	$\|V_{ID}\|$ = 200mV R_{xVCM} = 1.2V R_{xFCLK} = 81 MHz
Clock high time	T_{LVCH}	-	4/(7* R_{xFCLK})	-	ns	
Clock low time	T_{LVCL}	-	3/(7* R_{xFCLK})	-	ns	
PLL wake-up time	T_{enPLL}	-	-	150	uS	



Relationship between VDD, LVDS clock, and internal clock

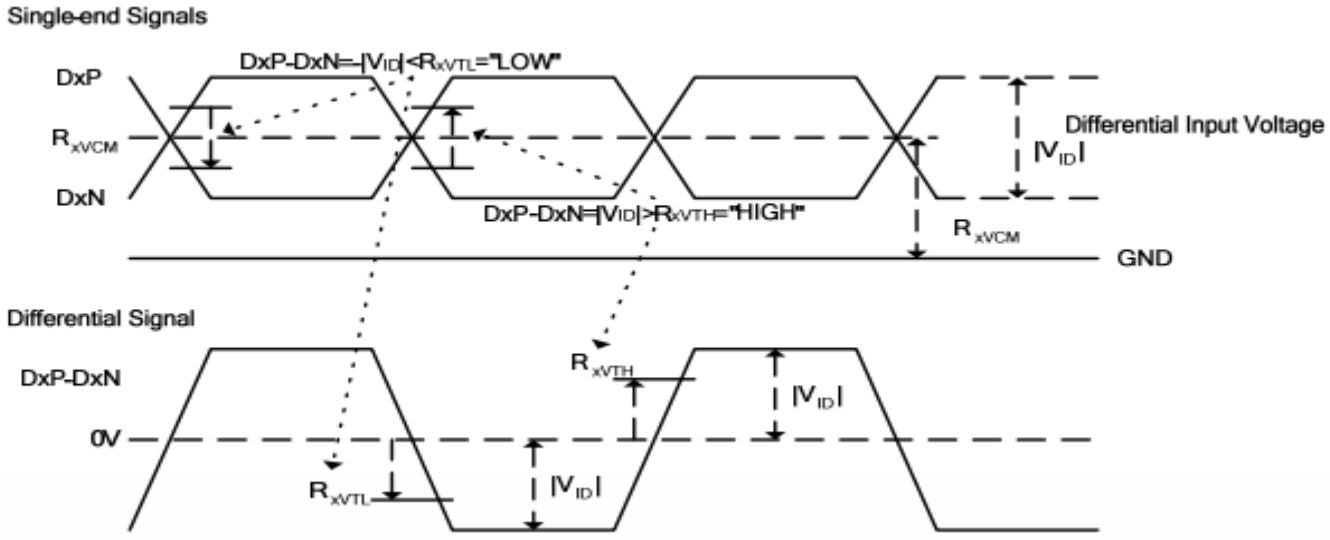


1 cycle time of LVDS

7.2 . DC Electrical Characteristics

(VDD= 3.3 V, AVDD= 8.8 V, GND=AGND= 0V, TA= -20 to +85°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition
Differential input high threshold voltage	R_{xVTH}	+0.1	0.2	0.3	V	R_{xVCM} =1.2V
Differential input low threshold voltage	R_{xVTL}	-0.3	-0.2	-0.1	V	
Input voltage range (singled-end)	R_{XVIN}	0.7	-	1.7	V	
Differential input common mode voltage	R_{xVCM}	1	1.2	1.4	V	$\|V_{ID}\|$=0.2V
Differential input impedance	Z_{ID}	80	100	125	ohm	
Differential input voltage	$\|V_{ID}\|$	0.2	-	0.6	V	
Differential input leakage current	I_{LCLVDS}	-10	-	+10	uA	
LVDS Digital Operating Current	$I_{VDDLVDS}$	-	15	20	mA	VDD=3.3V, F_{DCLK}=80MHz, Input pattern: 55h->AAh->55h->AAh
LVDS Digital Stand-by Current	I_{STLVDS}	-	-	250	uA	Clock & all Functions are stopped



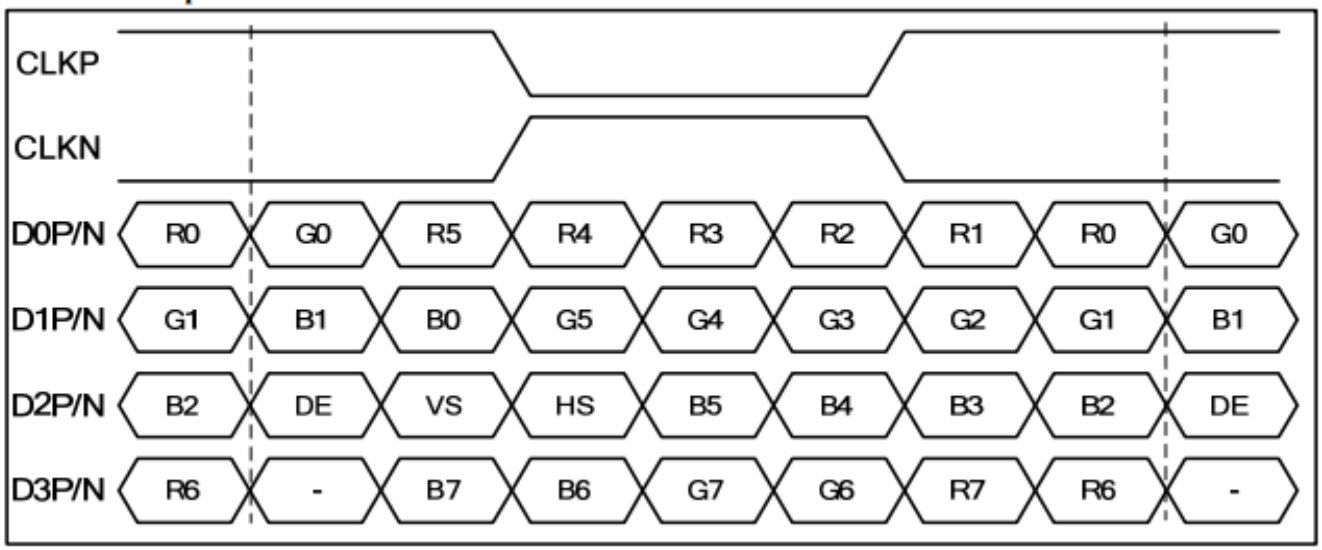
7.3. Timing

DE mode for 800RGBx1280

Parameter	Symbol	Min.	Typ.	Max.	Unit
DCLK frequency	F_{DCLK}	30	66.8	85	MHz
Horizontal display area	T_{HD}		800		DCLK
HSD period time	T_H	860	864	1344	DCLK
HSD blanking	$T_{HBP}+T_{HFP}$	60	64	544	DCLK
Vertical display area	T_{VD}		1280		H
VSD period time	T_V	1286	1288	1510	H
VSD blanking	$T_{VBP}+T_{VFP}$	6	8	230	H

Data Input Format

8bit LVDS input



Note: Support DE timing mode only, SYNC mode not supported

8. Backlight Characteristic

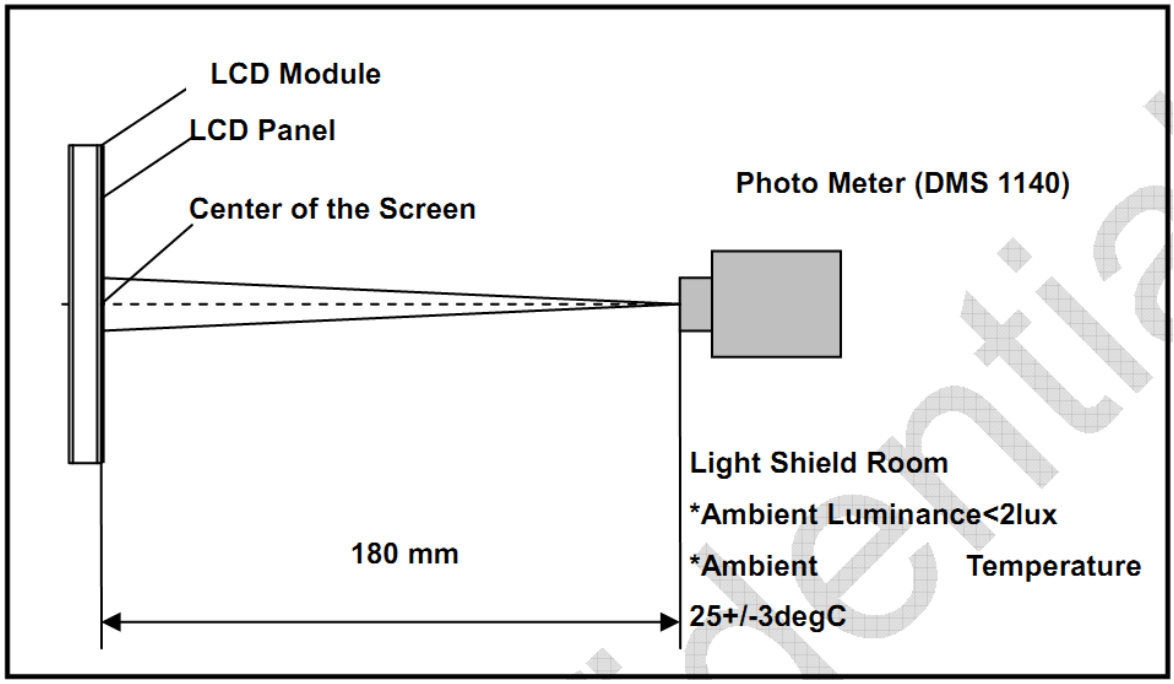
Item	Symbol	MIN	TYP	MAX	UNIT	Test Condition
Supply Voltage	VF	9.0	9.6	10.6	V	If=160
Supply Current	If	145	160	175	mA	-
Luminous Intensity for LCM	-	350	400	-	Cd/m^2	If=160
Uniformity for LCM	-	70	75	-	%	If=160
Life Time	15000		-	-	Hr	If=160
Backlight Color	White					

Note 1: The LED Supply Voltage is defined by the number of LED at Ta=25°C and I_L =160mA.
Note 2: The “LED life time” is defined as the module brightness decrease to 50% original brightness at Ta=25°C and I_L =160mA. The LED lifetime could be decreased if operating I_L is larger than 160mA

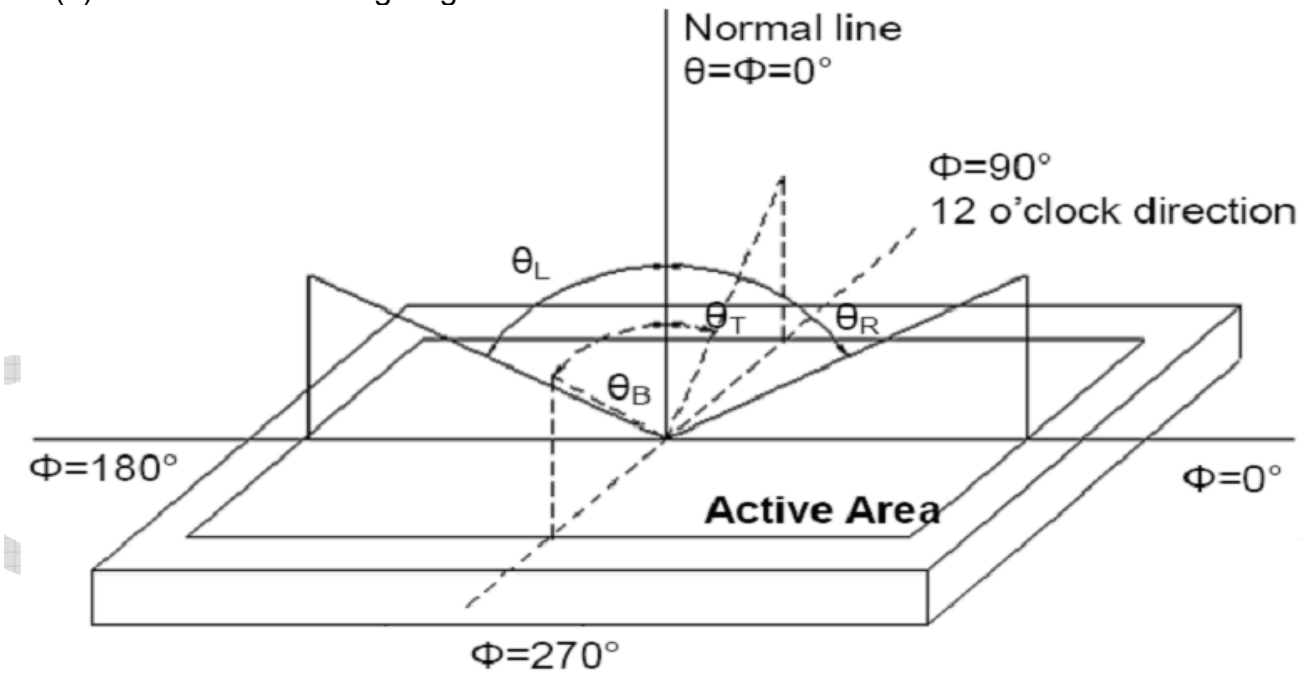
9. Optical Characteristics

Item	Conditions		Min.	Typ.	Max.	Unit	Note
Viewing Angle (CR>10)	Horizontal	θ_L	80	85	-	degree	(1),(2),(6)
		θ_R	80	85	-		
	Vertical	θ_T	80	85	-		
		θ_B	80	85	-		
Contrast Ratio	Center		600	800	-	-	(1),(3),(6)
LCM Luminance	Center point		350	400	-	Cd/m^2	
Response Time	TON		-	15	20	msec	(1),(4),(6)
	TOFF			20	30	msec	
Color chromaticity	White x		0.25	0.30	0.35	-	
	White y		0.27	0.32	0.37	-	
NTSC	CIE1931		50	60	-	%	(1),(6)

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



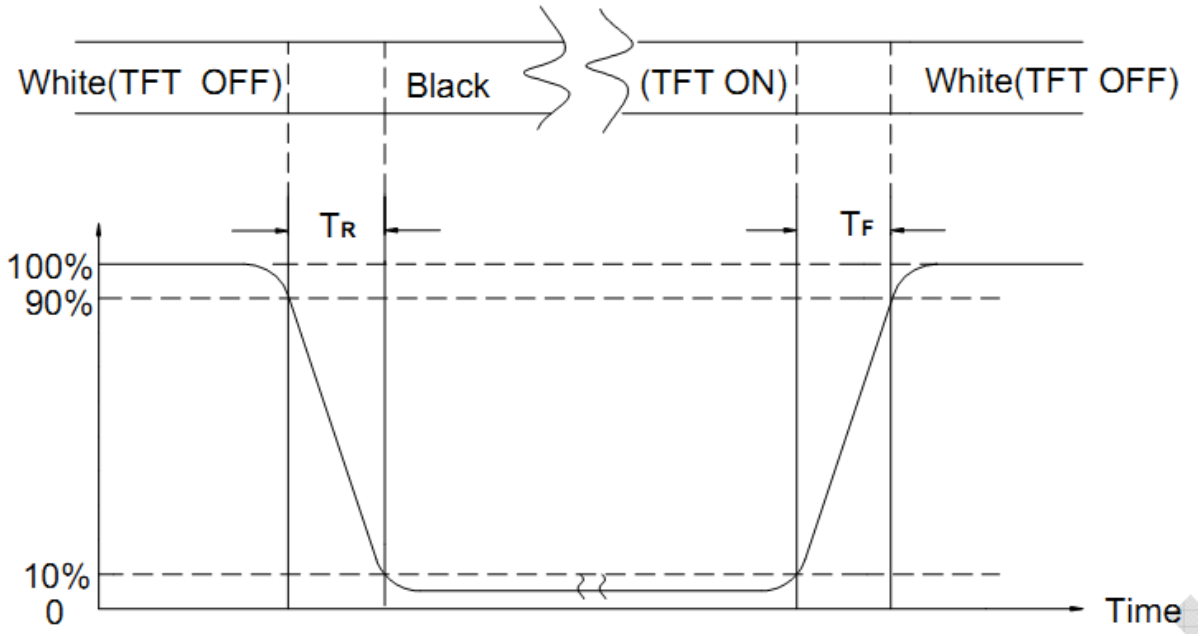
Note (3) Definition of Contrast Ratio (CR)

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

NO.	TEST ITEMS	TEST CONDITION	INSPECTION AFTER TEST
□	High Temperature Storage	60°C±2°C×120Hours	Inspection after 2~4hours storage at room temperature, the samples should be free from defects: 1, Air bubble in the LCD. 2, Seal leak. 3, Non-display. 4, Missing segments. 5, Glass crack. 6, Current IDD is twice higher than initial value. 7, The surface shall be free from damage. 8, The electric characteristic requirements shall be satisfied.
□	Low Temperature Storage	-20°C±2°C×120Hours	
□	High Temperature Operating	50°C±2°C×120Hours	
□	Low Temperature Operating	-10°C±2°C×120Hours	
□	Temperature Cycle(Storage)	-10°C ⟺ 25°C ⟺ 50°C (30min) (5min) (30min) 1cycle Total 10cycle	
□	Damp Proof Test (Storage)	40°C±5°C×90%RH×120Hours	
□	Vibration Test	Frequency range: 10~55Hz Stroke: 1.5mm Sweep: 10Hz~ 55Hz~10Hz 2 hours for each direction of X. Y. Z. (6 hours for total)	
□	Drooping Test	Height: 60 cm 1 comer, 3 edges, 6 surfaces	
□	ESD Test	Voltage:±2KV, Human body Mode, 100pF/15000Ω	

REMARK:
1, The Test samples should be applied to only one test item.
2, Sample side for each test item is 5~10pcs.
3,For Damp Proof Test, Pure water(Resistance＞10MΩ)should be used.
4,In case of malfunction defect caused by ESD damage, if it would be recovered to normal state after resetting, it would be judge as a good part.
5, EL evaluation should be accepted from reliability test with humidity and temperature: Some defects such as black spot/blemish can happen by natural chemical reaction with humidity and Fluorescence EL has.
6, Failure Judgment Criterion: Basic Specification Electrical Characteristic, Mechanical Characteristic, Optical Characteristic.

11. Inspection Standard

11.1. QUALITY :

THE QUALITY OF GOODS SUPPLIED TO PURCHASER SHALL COME UP TO THE FOLLOWING STANDARD.

11.1.1. THE METHOD OF PRESERVING GOODS

AFTER DELIVERY OF GOODS FROM AMSON TO PURCHASER. PURCHASER SHALL CONTROL THE LCM AT -10℃ TO 40℃ ,AND IT MIGHT BE DESIRABLE TO KEEP AT THE NORMAL ROOM TEMPERATURE AND HUMIDITY UNTIL INCOMING INSPECTION OR THROWING INTO PROCESS LINE.

11.1.2. INCOMING INSPECTION

(A) THE METHOD OF INSPECTION

IF PURCHASER MAKE AN INCOMING INSPECTION , A SAMPLING PLAN SHALL BE APPLIED ON THE CONDITION THAT QUALITY OF ONE DELIVERY SHALL BE REGARDED AS ONE LOT.

(B) THE STANDARD OF QUALITY

ISO-2859-1 (SAME AS MIL-STD-105E) , LEVEL Ⅱ SINGLE PLAN.

CLASS	AQL(%)
CRITICAL	0.4 %
MAJOR	0.65 %
MINOR	1.5 %
TOTAL	1.5 %

EVERY ITEM SHALL BE INSPECTED ACCORDING TO THE CLASS.

(C) MEASURE

IF AS THE RESULT OF ABOVE RECEIVING INSPECTION , A LOT OUT IS DISCOVERED. PURCHASER SHALL BE INFORM SELLER OF IT WITHIN SEVEN DAYS. BUT FIRST SHIPMENT WITHIN FOURTEEN DAYS.

11.1.3. WARRANTY POLICY

AMSON WILL PROVIDE ONE-YEAR WARRANTY FOR THE PRODUCTS ONLY IF UNDER SPECIFICATION OPERATING CONDITIONS. AMSON WILL REPLACE NEW PRODUCTS FOR THESE DEFECT PRODUCTS WHICH UNDER WARRANTY PERIOD AND BELONG TO THE RESPONSIBILITY OF AMSON.

11.2. CHECKING CONDITION

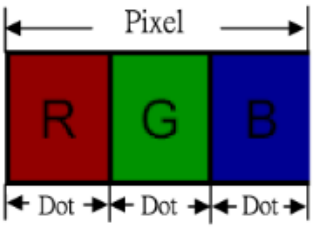
11.2.1.CHECKING DIRECTION SHALL BE IN THE 45 DEGREE AREA TO FACE THE SAMPLE.

11.2.2.CHECKER SHALL SEE OVER 300±25 mm. WITH BARE EYES FAR FROM SAMPLE AND USING 2 PCS. OF 20W FLUORESCENT LAMP.

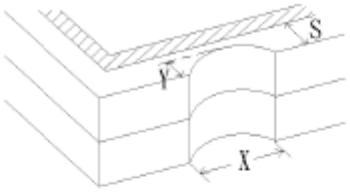
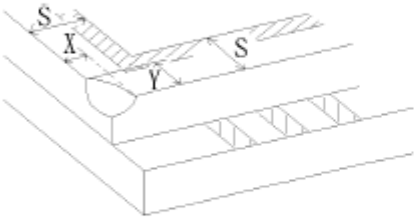
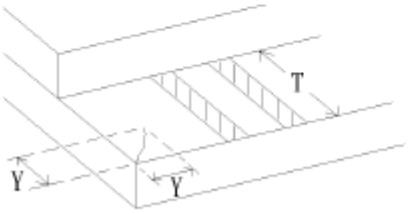
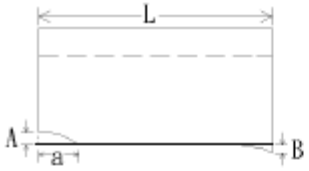
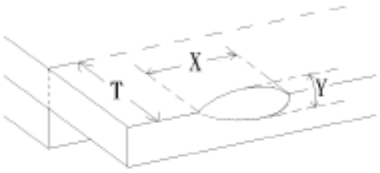
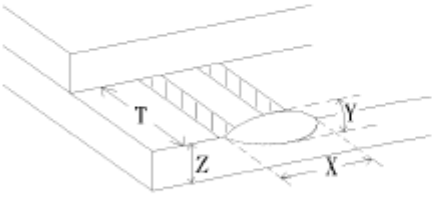
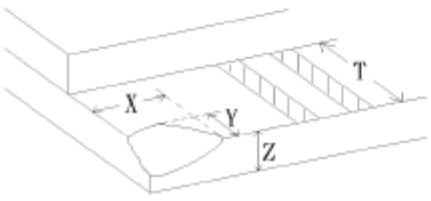
11.3. INSPECTION PLAN :

CLASS	ITEM	JUDGEMENT	CLASS
PACKING & INDICATE	1. OUTSIDE AND INSIDE PACKAGE	"MODEL NO." , "LOT NO." AND "QUANTITY" SHOULD INDICATE ON THE PACKAGE.	Minor
	2. MODEL MIXED AND QUANTITY	OTHER MODEL MIXED.....REJECTED QUANTITY SHORT OR OVER.....REJECTED	Critical
	3. PRODUCT INDICATION	"MODEL NO." SHOULD INDICATE ON THE PRODUCT	Major
ASSEMBLY	4. DIMENSION, LCD GLASS SCRATCH AND SCRIBE DEFECT.	ACCORDING TO SPECIFICATION OR DRAWING.	Major
APPEARANCE	5. VIEWING AREA	POLARIZER EDGE OR LCD'S SEALING LINE IS VISABLE IN THE VIEWING AREA .....REJECTED	Minor
	6. BLEMISH、BLACK SPOT、 WHITE SPOT IN THE LCD AND LCD GLASS CRACKS	ACCORDING TO STANDARD OF VISUAL INSPECTION(INSIDE VIEWING AREA)	Minor
	7. BLEMISH、BLACK SPOT WHITE SPOT AND SCRATCH ON THE POLARIZER	ACCORDING TO STANDARD OF VISUAL INSPECTION(INSIDE VIEWING AREA)	Minor
	8. BUBBLE IN POLARIZER	ACCORDING TO STANDARD OF VISUAL INSPECTION(INSIDE VIEWING AREA)	Minor
	9. LCD'S RAINBOW COLOR	STRONG DEVIATION COLOR (OR NEWTON RING) OF LCD.....REJECTED. OR ACCORDING TO LIMITED SAMPLE (IF NEEDED, AND INSIDE VIEWING AREA)	Minor
ELECTRICAL	10. ELECTRICAL AND OPTICAL CHARACTERISTICS (CONTRAST、VOP、 CHROMATICITY ... ETC)	ACCORDING TO SPECIFICATION OR DRAWING . (INSIDE VIEWING AREA)	Critical
	11.MISSING LINE	MISSING DOT、LINE、CHARACTER ....REJECTED	Critical
	12.SHORT CIRCUIT、 WRONG PATTERN DISPLAY	NO DISPLAY、WRONG PATTERN DISPLAY、CURRENT CONSUMPTION OUT OF SPECIFICATION..... REJECTED	Critical
	13. DOT DEFECT (FOR COLOR AND TFT)	ACCORDING TO STANDARD OF VISUAL INSPECTION	Minor

11.4. STANDARD OF VISUAL INSPECTION

<table>
<tr><th>NO.</th><th>CLASS</th><th>ITEM</th><th>JUDGEMENT</th></tr>
<tr><td>11.4.1</td><td>MINOR</td><td>BLACK AND WHITE SPOT
FOREIGN MATERIEL
DUST IN THE CELL
BLEMISH
SCRATCH</td><td>(A) ROUND TYPE: unit : mm.
<table>
<tr><th>DIAMETER (mm.)</th><th>ACCEPTABLE Q'TY</th></tr>
<tr><td>Φ ≦ 0.1</td><td>DISREGARD</td></tr>
<tr><td>0.1 < Φ ≦ 0.25</td><td>3 (Distance>5mm)</td></tr>
<tr><td>0.25 < Φ</td><td>0</td></tr>
</table>
NOTE: Φ=(LENGTH+WIDTH)/2
(B) LINEAR TYPE: unit : mm.
<table>
<tr><th>LENGTH</th><th>WIDTH</th><th>ACCEPTABLE Q'TY</th></tr>
<tr><td>------</td><td>W ≦0.03</td><td>DISREGARD</td></tr>
<tr><td>L ≦ 5.0</td><td>0.03 < W ≦0.07</td><td>3 (Distance>5mm)</td></tr>
<tr><td>------</td><td>0.07 < W</td><td>FOLLOW ROUND TYPE</td></tr>
</table></td></tr>
<tr><td>11.4.2</td><td>MINOR</td><td>BUBBLE IN POLARIZER
DENT ON POLARIZER</td><td>unit : mm.
<table>
<tr><th>DIAMETER</th><th>ACCEPTABLE Q'TY</th></tr>
<tr><td>Φ ≦ 0.2</td><td>DISREGARD</td></tr>
<tr><td>0.2 < Φ ≦ 0.5</td><td>2 (Distance>5mm)</td></tr>
<tr><td>0.5 < Φ</td><td>0</td></tr>
</table></td></tr>
<tr><td>11.4.3</td><td>MINOR</td><td>Dot Defect</td><td>
<table>
<tr><th>Items</th><th>ACC. Q'TY</th></tr>
<tr><td>Bright dot</td><td>N≦ 4</td></tr>
<tr><td>Dark dot</td><td>N≦ 4</td></tr>
</table>
Pixel Define :
 

Note 1: The definition of dot: The size of a defective dot over 1/2 of whole dot is regarded as one defective dot.
Note 2: Bright dot: Dots appear bright and unchanged in size in which LCD panel is displaying under black pattern.
Note 3: Dark dot: Dots appear dark and unchanged in size in which LCD panel is displaying under pure red, green ,blue pattern.</td></tr>
</table>

NO.	CLASS	ITEM	JUDGEMENT
11.4.4	MINOR	LCD GLASS CHIPPING	 Y > S Reject
11.4.5	MINOR	LCD GLASS CHIPPING	 X or Y > S Reject
11.4.6	MAJOR	LCD GLASS GLASS CRACK	 Y > (1/2) T Reject
11.4.7	MAJOR	LCD GLASS SCRIBE DEFECT	 1. a> L/3 , A>1.5mm. Reject 2. B : ACCORDING TO DIMENSION
11.4.8	MINOR	LCD GLASS CHIPPING (ON THE TERMINAL AREA)	 Φ= (x+y)/2 > 2.5 mm Reject
11.4.9	MINOR	LCD GLASS CHIPPING (ON THE TERMINAL SURFACE)	 Y > (1/3) T Reject
11.4.10	MINOR	LCD GLASS CHIPPING	 Y > T Reject

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 this is not specified in this specification.
- 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