Specification for Approval

Customer:_____

Model Name:_____

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

Revision Record

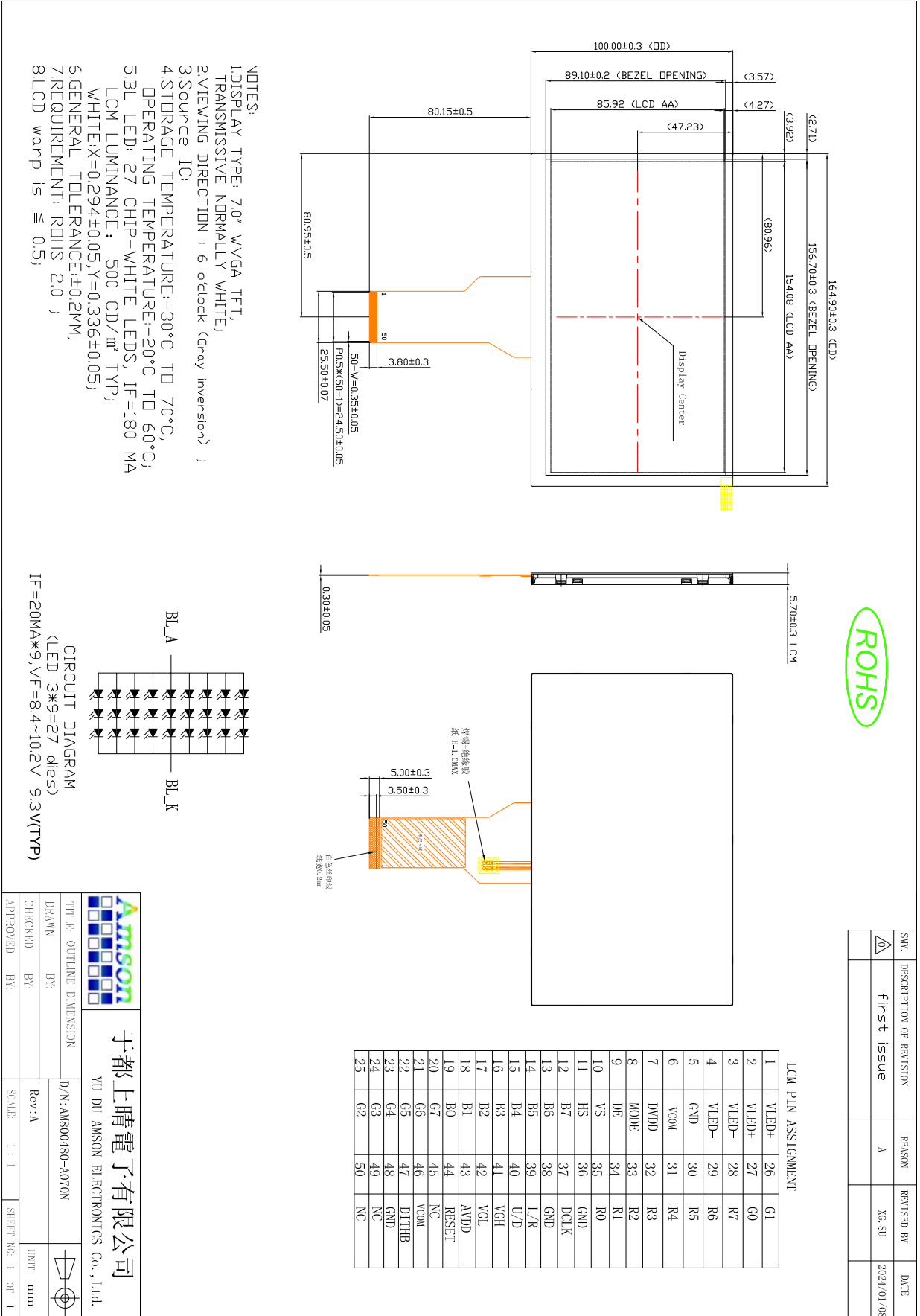| REV NO.	REV DATE	CONTENTS	Note
A	2024-01-08	NEW ISSUE	
B	2024-02-27	ADD 15. LOT MARK	P.27
C	2024-07-10	ADD VCOM DATA	P.6

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

Features	Details	Unit
Display Size(Diagonal)	7.0"	
LCD type	TN TFT	
DisplayMode	Transmissive /Normal white	
Resolution	800RGBx 480	Pixels
ViewDirection	12O'clock	BestImage
Gray ScaleInversionDirection	6O'clock	
Module Outline	164.9(H) x100(V) x 5.7(T) (Note1)	mm
ActiveArea	154.08(H) x85.92(V)	mm
PixelSize	192.6(H) x179(V)	um
PixelArrangement	R.G.BStripe	
Polarizer Surface Treatment	Anti-glare	
Display Colors	16.7M	
Interface	24BitRGB	
With or Without TouchPanel	Without	
Operating Temperature	-20～60	ºC
Storage Temperature	-30～70	ºC
Weight	150	g

3. External Dimensions

NOTES:
1. DISPLAY TYPE: 7.0" WVGA TFT, TRANSMISSIVE NORMALLY WHITE;
2. VIEWING DIRECTION: 6 o'clock (Gray inversion);
3. Source IC;
4. STORAGE TEMPERATURE:-30°C TO 70°C, OPERATING TEMPERATURE:-20°C TO 60°C;
5. BL LED: 27 CHIP-WHITE LEDS, IF=180 MA
   LCM LUMINANCE: 500 CD/m² TYP;
   WHITE:X=0.294±0.05,Y=0.336±0.05;
6. GENERAL TOLERANCE:±0.2MM;
7. REQUIREMENT: ROHS 2.0;
8. LCD warp is ≦ 0.5;

CIRCUIT DIAGRAM
(LED 3*9=27 dies)
IF=20MA*9,VF=8.4~10.2V 9.3V(TYP)

BL_A / BL_K

Dimensions: 100.00±0.3 (OD); 89.10±0.2 (BEZEL OPENING); 85.92 (LCD AA); (47.23); (3.57); (4.27); (2.71); (3.92); 80.15±0.5; 80.95±0.5; (80.96); 156.70±0.3 (BEZEL OPENING); 154.08 (LCD AA); 164.90±0.3 (OD); Display Center; 25.50±0.07; 50-W=0.35±0.05; P0.5*(50-1)=24.50±0.05; 3.80±0.3; 0.30±0.05; 5.70±0.3 LCM; 5.00±0.3; 3.50±0.3

LCM PIN ASSIGNMENT

No.	Signal	No.	Signal
1	VLED+	26	G1
2	VLED+	27	G0
3	VLED-	28	R7
4	VLED-	29	R6
5	GND	30	R5
6	VCOM	31	R4
7	DVDD	32	R3
8	MODE	33	R2
9	DE	34	R1
10	VS	35	R0
11	HS	36	GND
12	B7	37	DCLK
13	B6	38	GND
14	B5	39	L/R
15	B4	40	U/D
16	B3	41	VGH
17	B2	42	VGL
18	B1	43	AVDD
19	B0	44	RESET
20	G7	45	NC
21	G6	46	VCOM
22	G5	47	DITHB
23	G4	48	GND
24	G3	49	NC
25	G2	50	NC

SM:	DESCRIPTION OF REVISION	REASON	REVISED BY	DATE
	first issue	A	XG.SU	2024/01/08

TITLE: OUTLINE DIMENSION
D/N:AM800480-A070N
Rev:A
SCALE 1:1
UNIT: mm
SHEET NO. 1 OF 1

DRAWN BY: / CHECKED BY: / APPROVED BY:

于都上晴電子有限公司
YU DU AMSON ELECTRONICS Co., Ltd.

4. Interface Description

PIN	PIN NAME	DESCRIPTION
1	LEDA	LED backlight (Anode).
2	LEDA	
3	LEDK	LED backlight (Cathode).
4	LEDK	
5	GND	Power ground
6	VCOM	Common Voltage
7	DVDD	Digital Power.
8	MODE	DE/SYNC mode select. Normally pull high. H: DE mode. L: HSD/VSD mode.
9	DE	Data Enable signal.
10	VS	Vertical sync input. Negative polarity.
11	HS	Horizontal sync input. Negative polarity.
12~19	B7~B0	Blue Data Input
20~27	G7~G0	Green Data Input
28~35	R7~R0	Red Data Input
36	GND	Power ground.
37	DCLK	Clock input.
38	GND	Power ground.
39	L/R	Left or Right Display Control.
40	U/D	Up / Down Display Control.
41	VGH	Positive Power for TFT.
42	VGL	Negative Power for TFT.
43	AVDD	Analog Power.
44	RESET	Global reset pin. Active low to enter reset state. Suggest to connecting with an RC reset circuit for stability. Normally pull high.(R=10KΩ, C=1µF)
45	NC.	Not connect.
46	VCOM	Common Voltage
47	DITHB	Dithering function enable control. (Normally pull high) DITHB="L", to enable internal dithering function. DITHB="H", to disable internal dithering function.
48	GND	Power ground.

49	NC.	Not connect.
50	NC.	Not connect.

【Note1】L/R：left or right setting
　　　　U/D：up or down setting

L/R	U/D	Data shifting
DVDD	GND	Left → Right，Up → Down(default)
GND	GND	Right → Left，Up → Down
DVDD	DVDD	Left → Right，Down → Up
GND	DVDD	Right → Left，Down → Up

Definition of scanning direction:
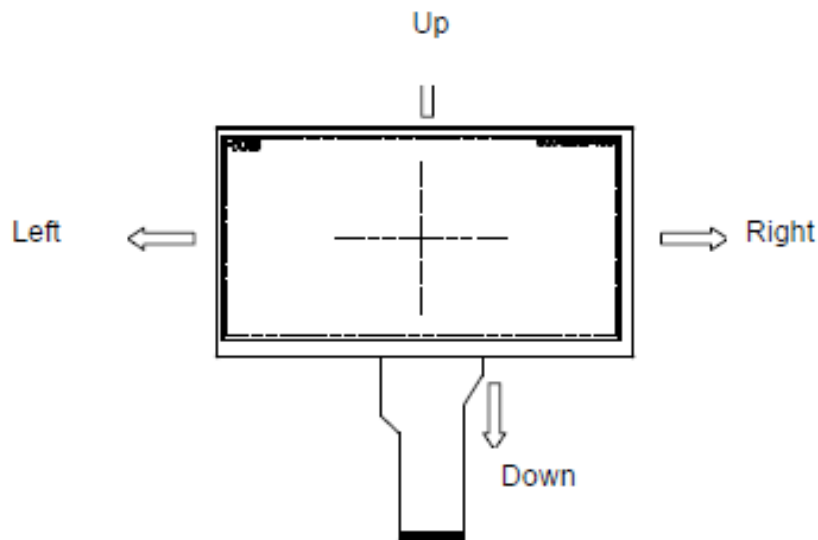
5. Absolute Maximum Ratings

VSS=0V, Ta=25ºC

Item	Symbol	Min.	Max.	Unit
Supply Voltage	VCC	-0.3	5.0	V
Storage temperature	TSTG	-30	70	ºC
Operating temperature	TOP	-20	60	ºC

6. DC Characteristics

Item	Symbol	Min.	Typ.	Max.	Unit
Digital Power Supply Voltage	DVDD	3.0	3.3	3.6	V
Analog Power Supply Voltage	AVDD	10.2	10.4	10.6	V
TFT Device on Voltage	VGH	14.5	15.0	15.5	V
TFT Device off Voltage	VGL	-10.5	-10.0	-9.5	V
Common Electrode Driving Voltage	VCOM	3.54	4.04	4.54	V
Low LevelInput Voltage	VIL	0	-	0.3*DVDD	V
High LevelInput Voltage	VIH	0.7*DVDD	-	DVDD	V

7. Timing Characteristics

7.1 Power sequence

a. Power on:
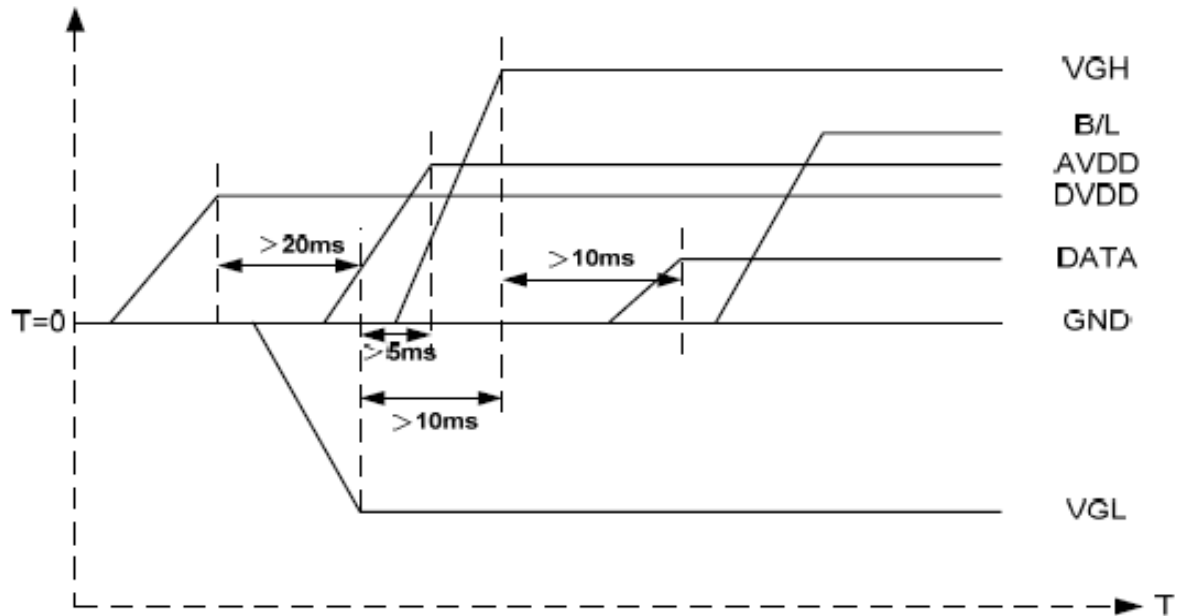
$$DV_{DD} \rightarrow VGL \rightarrow VGH \rightarrow Data \rightarrow B/L$$

b. Power off:
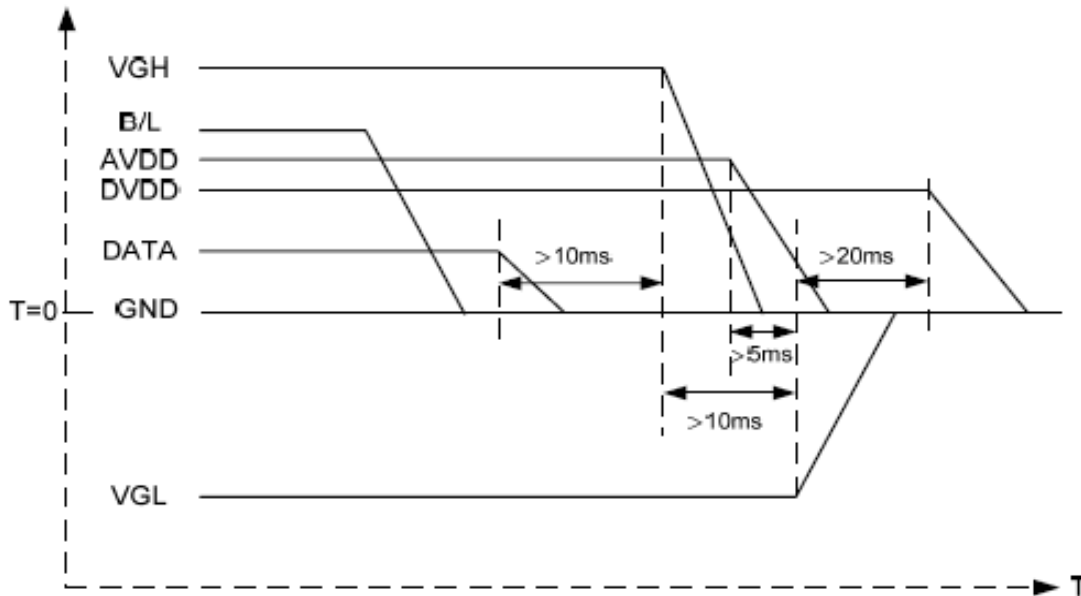
$$B/L \rightarrow Data \rightarrow VGH \rightarrow VGL \rightarrow DV_{DD}$$

Note: Data include R0~R7, B0~B7, G0~G7, U/D, L/R, DCLK, HS,VS,DE.

7.2 Timing characteristics
7.2.1 AC Electrical Characteristics

Item	Symbol	Min.	Typ.	Max.	Unit	Remark
HS setup time	T_{hst}	8	-	-	ns	
HS hold time	T_{hhd}	8	-	-	ns	
VS setup time	T_{vst}	8	-	-	ns	
VS hold time	T_{vhd}	8	⊢	-	ns	
Data setup time	T_{dsu}	8	-	-	ns	
Data hole time	T_{dhd}	8	-	-	ns	
DE setup time	T_{esu}	8	-	-	ns	
DE hole time	T_{ehd}	8	-	-	ns	
DV_{DD} Power On Slew rate	T_{POR}	-	-	20	ms	From 0 to 90% DV_{DD}
RESET pulse width	T_{Rst}	1	-	-	ms	
DCLK cycle time	T_{coh}	20	-	-	ns	
DCLK pulse duty	T_{cwh}	40	50	60	%	
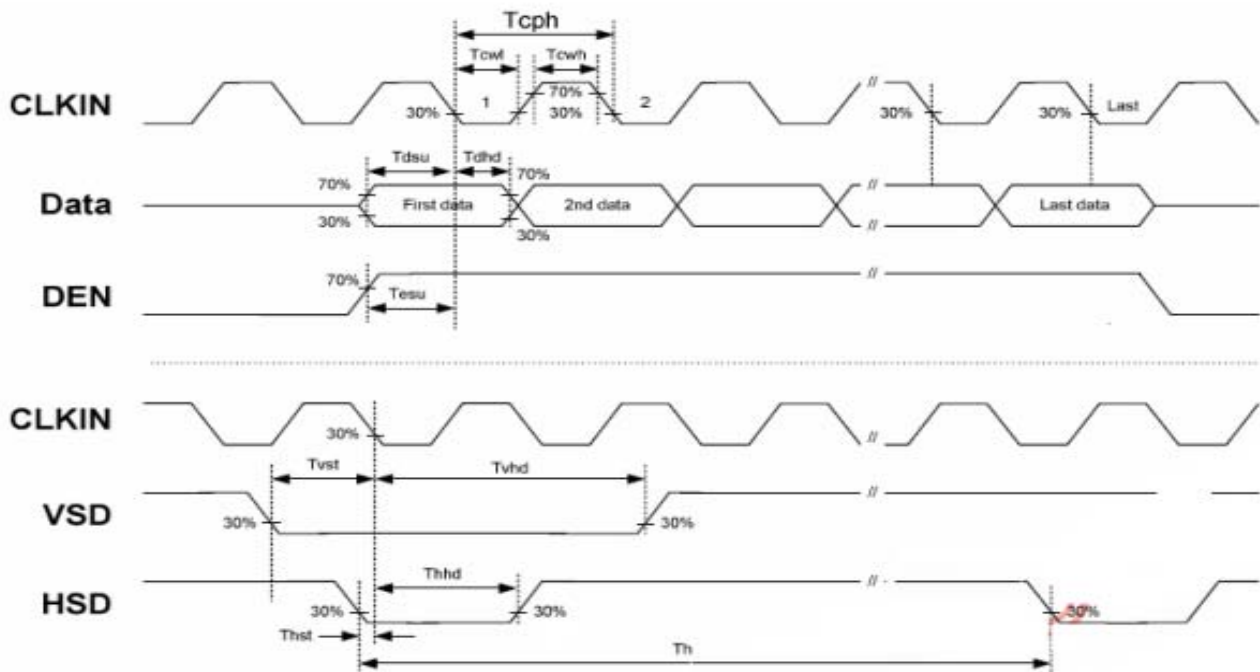
7.2.2 Data Input Format

Horizontal input timing diagram
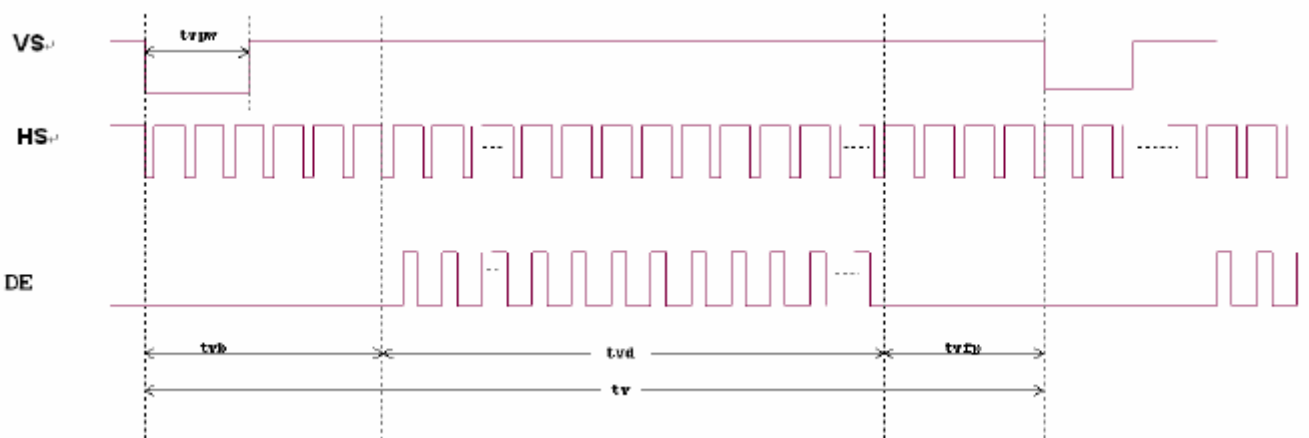
Vertical input timing diagram

7.2.3 Timing

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Horizontal Display Area	thd	-	800	-	DCLK	
DCLK Frequency	fclk	26.4	33.3	46.8	MHz	
One Horizontal Line	th	862	1056	1200	DCLK	
HS pulse width	thpw	1	-	40	DCLK	
HS Blanking	thb	46	46	46	DCLK	
HS Front Porch	thfp	16	210	354	DCLK	

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Vertical Display Area	tvd	-	480	-	TH	
VS period time	tv	510	525	650	TH	
VS pulse width	tvpw	1	-	20	TH	
VS Blanking	tvb	23	23	23	TH	
VS Front Porch	tvfp	7	22	147	TH	

8. Backlight Characteristic
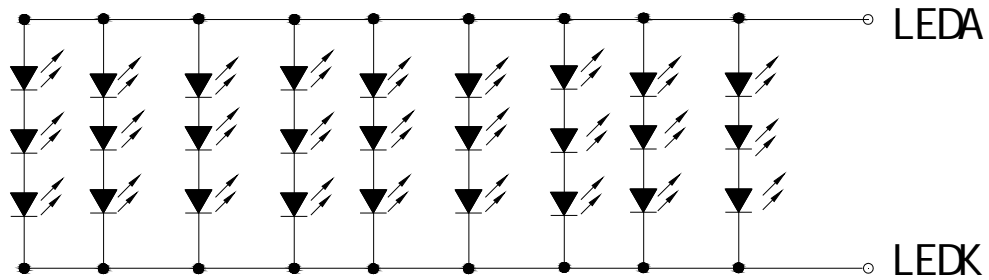
Item	Symbol	MIN	TYP	MAX	UNIT	Test Condition
Supply Voltage	Vf	8.4	9.3	10.2	V	If=180mA
Supply Current	If	-	180		mA	-
Luminous Intensity for LCM	-	-	500	-	cd/m^2	If=180mA
Uniformity for LCM	-	70	75	-	％	If=180mA
Life Time	-	-	30000	-	Hr	If=180mA
Backlight Color	White					

9. Optical Characteristics

Item	Conditions		Min.	Typ.	Max.	Unit	Note
Viewing Angle (CR>10)	Horizontal	θL	60	70	-	degree	(1),(2),(6)
		θR	60	70	-		
	Vertical	θT	40	50	-		
		θB	60	70	-		
Contrast Ratio	Center		-	500	-	-	(1),(3),(6)
Response Time	TR		-	10	20	ms	(1),(4),(6)
	TF		-	15	30		
CF Color Chromaticity (CIE1931)	Red x		Typ. -0.05	0.581	Typ. +0.05	-	Chromaticity measuring machine: CFT-01. Reference Only
	Red y			0.311		-	
	Green x			0.311		-	
	Green y			0.555		-	
	Blue x			0.136		-	
	Blue y			0.119		-	
	White x			0.310		-	
	White y			0.330		-	

[1]Transmittance (T %)

The transmittance of the panel including polarizer is measured with electrical driving.
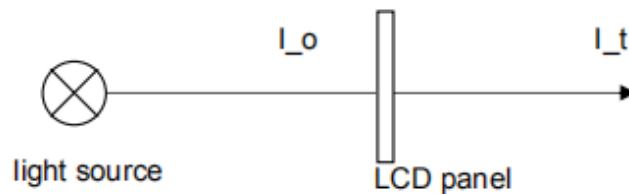
The Transmittance is defined as:

$$Tr = \frac{I\_t}{I\_o} \times 100\%$$

here,

    I_o: the brightness of the light source.

    I_t : the brightness after panel transmission.

[2] Response Time(Tr、Tf)

The rise time 'Tr' is defined as the time for luminance to change from 90% to 10% as a result of a change of the electrical condition. The fall time 'Tf' is defined as the time for luminance to change from 10% to 90% as a result of a change of the electrical condition.
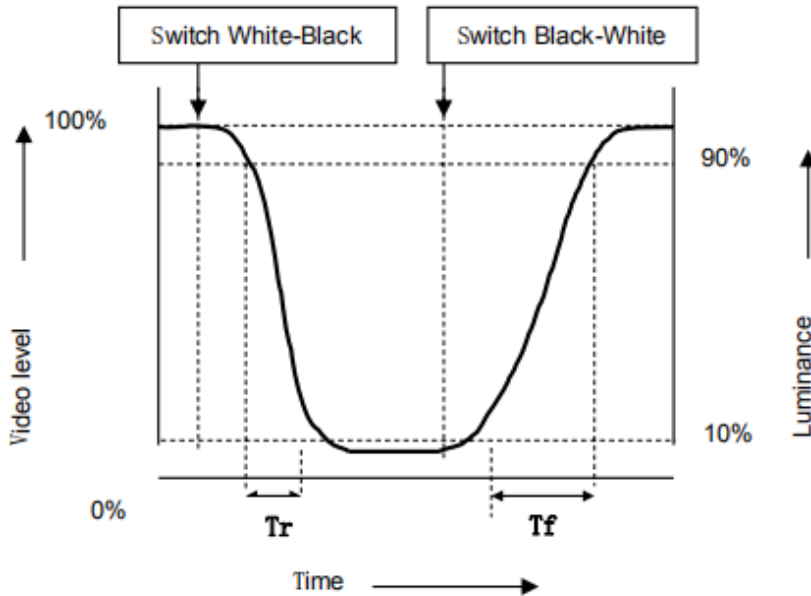
[3] Contrast ratio (Cr)

The contrast ratio (Cr), measured on a module, is the ratio between the luminance (L_w) in a full white area (R=G=B=1) and the luminance (L_d) in a dark area (R=G=B=0):

$$Cr = \frac{L\_w}{L\_d}$$

[4] Viewing angle diagram
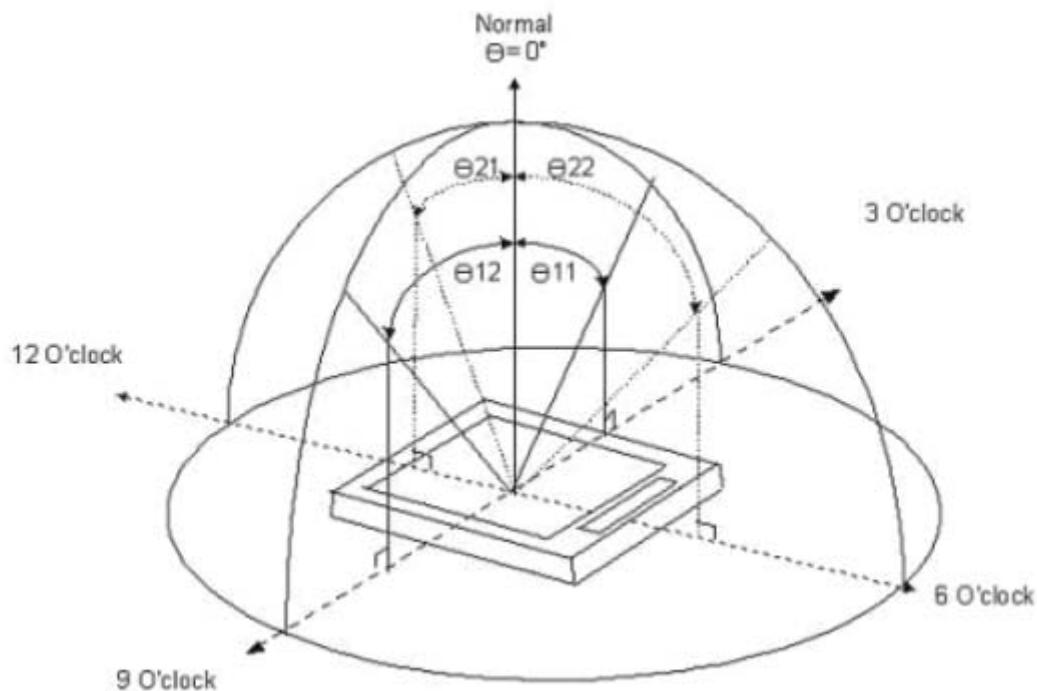
[5] Definition of color gamut
Measuring machine:CFT-01. NTSC'S Primaries: R(x,y,Y)、G(x,y,Y)、B(x,y,Y)

CIE 1931 Chromaticity Diagram
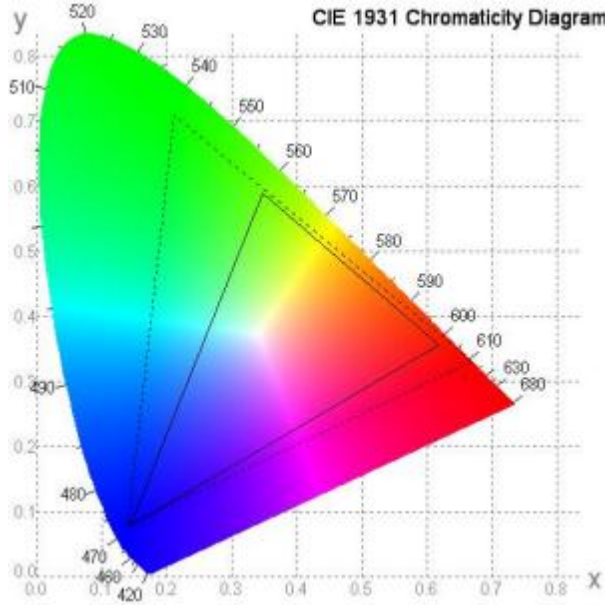
10. Reliability Test Conditions and Methods

No	Item	Condition	Quantity	Criteria
1	High Temperature Operating	60℃, 96Hrs	2	GB/T2423.2-2008
2	Low Temperature Operating	-20℃, 96Hrs	2	GB/T2423.1-2008
3	HighHumidity	50℃, 90%RH, 96Hrs	2	GB/T2423.3-2006
4	High Temperature Storage	70℃, 96Hrs	2	GB/T2423.2-2008
5	Low Temperature Storage	-30℃, 96Hrs	2	GB/T2423.1-2008
6	Thermal Cycling Test	-30℃, 60min~70℃, 60min, 20cycles.	2	GB/T2423.22-2012
7	Packing vibration	Frequencyrange:10Hz~50Hz Accelerationofgravity:5G X, Y, Z 30minforeachdirection.	2	GB/T5170.14-2009
8	Electrical StaticDischarge	Air:±8KV150pF/330Ω 5 times Contact:±4KV150pF/330Ω 5 times	2	GB/T17626.2-2006
9	Drop Test (Packaged)	Height:80 cm,1 corner,3 edges, 6 surfaces.	2	GB/T2423.8-1995

11. Inspection Standard

11.1 Purpose

This standard for Quality Assurance assures the quality of LCD module products supplied to customer.

11.2 Standard for Quality Test

11.2.1 Sampling Plan:

GB2828.1-2012.

Single sampling, normal inspection.

11.2.2 Sampling Criteria:

Visual inspection: AQL1.5%

Electrical functional: AQL 0.65%.

11.2.3 Reliability Test:

Detailed requirement refer to Reliability Test Specification.

11.3 Nonconforming Analysis & Disposition

11.3.1 Nonconforming analysis:

11.3.1.1 Customer should provide overall information of non-conforming sample for their complaints.

11.3.1.2 After receipt of detailed information from customer, the analysis of nonconforming parts usually should be finished in one week.

11.3.1.3 If can not finish the analysis on time, customer will be notified with the progress status.

11.3.2 Disposition of nonconforming:

11.3.2.1 Non-conforming product over PPM level will be replaced.

11.3.2.2 The cause of non-conformance will be analyzed. Corrective action will be discussed and implemented.

11.4 Agreement Items

Shall negotiate with customer if the following situation occurs:

11.4.1 There is any discrepancy in standard of quality assurance.

11.4.2 Additional requirement to be added in product specification.

11.4.3 Any other special problem.

11.5 Standard of the Product Visual Inspection

11.5.1 Appearance inspection:

11.5.1.1 The inspection must be under illumination about 1000-1500lx, and the distance of view must be at 30cm±2cm.

11.5.1.2 The viewing angle should be 45° from the vertical line without reflection light or follows customer's viewing angle specifications.

11.5.1.3 Definition of area: A Zone: Active Area, B Zone: Viewing Area,
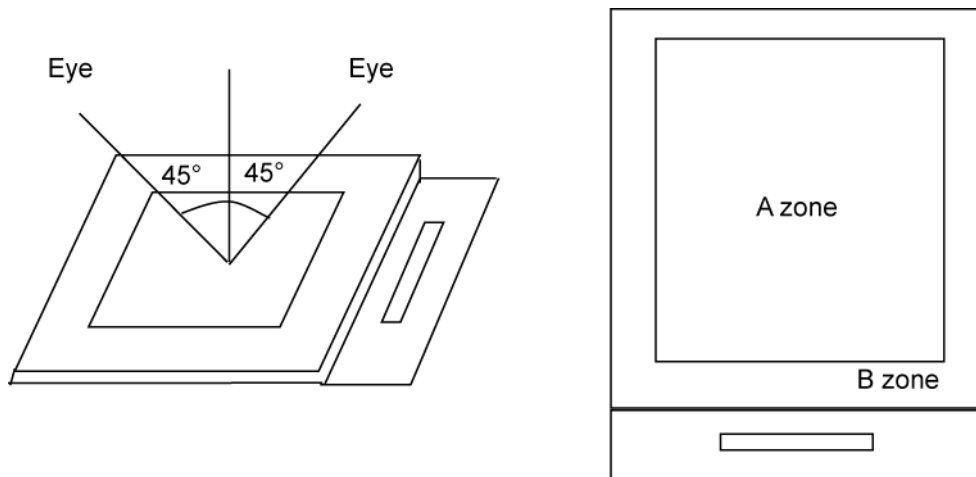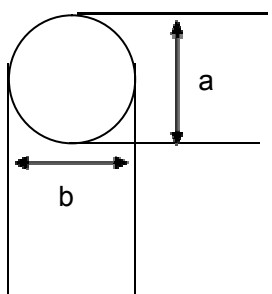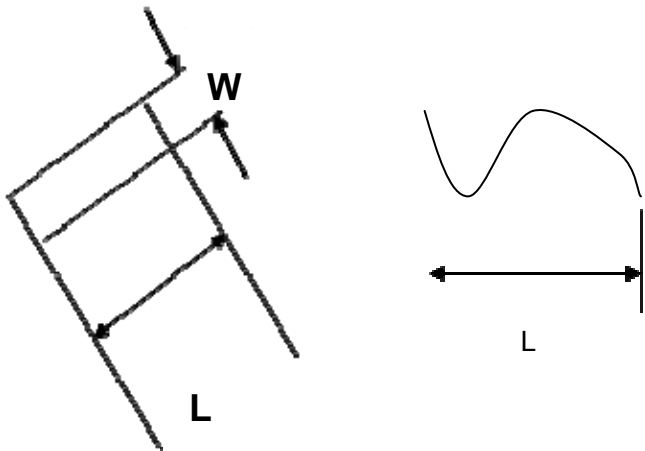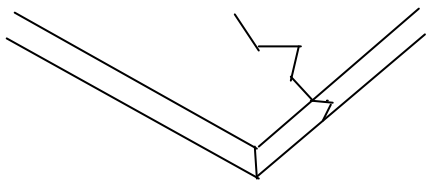
11.5.2 Basic principle:
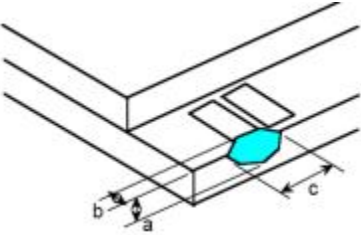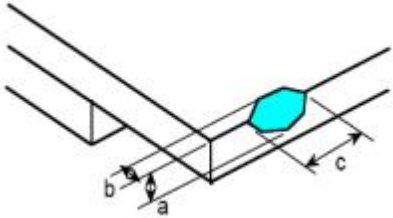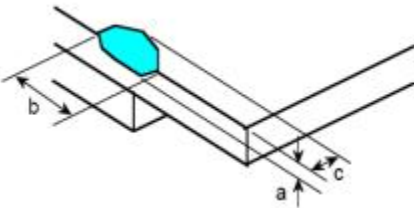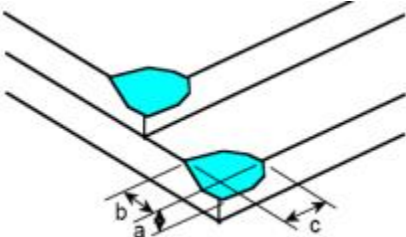
11.5.2.1 A set of sample to indicate the limit of acceptable quality level must be discussed by both us and customer when there is any dispute happened.
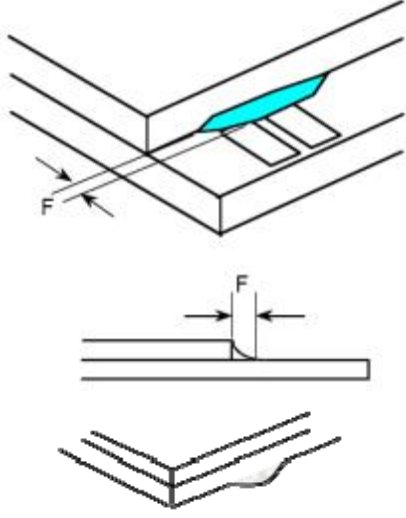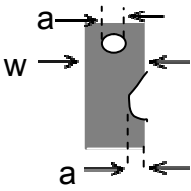
11.5.2.2 New item must be added on time when it is necessary.

11.6 InspectionSpecification

No.	Item	Criteria (Unit:mm)		
01	Black / White spot Foreign material (Round type) Pinholes Stain Particles inside cell. (Minor defect)	$\varphi = (a + b) /2$ Distance between 2 defects should more than 5mm apart.		

Table within criteria:

Size \ Area	Acc. Qty
φ≤0.20	Ignore
0.20<φ≤0.50	N≤3
0.50<φ	0

02	Electrical Defect (Minor defect)	Bright dot	Display Area	Total	Note1
			N≤2	N≤2	
		Dark dot	N≤4	N≤4	
		Total dot	N≤4	N≤4	
		Mura	Not visible through 5％ ND filters.		Note 2

Remark:
1. Bright dot caused by scratch and foreign object accords to item 1.

| 03 | Black and White line　　　Scratch　Foreign material (Line type) (Minor defect) |

Length	Width	Acc. Qty
/	W ≦ 0.1	Ignore
L ≦ 2.5	0.1 ＜ W ≦ 0.2	3
L＞2.5	0.2 ＜ W	0
Total		3

Distance between 2 defects should more than 3mm apart. Scratches not viewable through the back of the display are acceptable. |

| 04 | Glass Crack (Minor defect) |

Crack is potential to enlarge, any type is not allowed. |

05	Glass Chipping Pad Area: (Minor defect)		Length and Width	Acc. Qty
			---	---
			c > 3.0, b< 1.0	1
			c< 3.0, b< 1.0	3
			a＜Glass Thickness	

06	Glass Chipping Rear of Pad Area: (Minor defect)		Length and Width	Acc. Qty
			---	---
			c > 3.0, b< 1.0	1
			c< 3.0, b< 1.0	2
			c< 3.0, b< 0.5	4
			a＜Glass Thickness	

07	Glass Chipping Except Pad Area: (Minor defect)		Length and Width	Acc. Qty
			---	---
			c > 3.0, b< 1.0	1
			c< 3.0, b< 1.0	2
			c< 3.0, b< 0.5	4
			a＜Glass Thickness	

08	Glass Corner Chipping: (Minor defect)		Length and Width	Acc. Qty
			---	---
			c < 3.0, b< 3.0	Ignore
			a＜Glass Thickness	

09	Glass Burr: (Minor defect) 		
		Length	**Acc. Qty**
		F < 1.0	Ignore
		Glass burr don't affect assemble and module dimension.	

10	FPC Defect: (Minor defect) 	10.1 Dent, pinhole width a<w/3. (w: circuitry width.) 10.2 Open circuit is unacceptable. 10.3 No oxidation, contamination and distortion.

11	Bubble on Polarizer (Minor defect)		
		Diameter	**Acc. Qty**
		φ≤0.30	Ignore
		0.30 <φ≤0.50	N≤2
		0.50 < φ	N=0

12	Dent on Polarizer (Minor defect)		
		Diameter	**Acc. Qty**
		φ≤0.25	Ignore
		0.25 <φ≤0.50	N≤4
		0.50 < φ	None

13	Bezel	13.1 No rust, distortion on the Bezel. 13.2 No visible fingerprints, stains or other contamination.

14	Touch Panel	D: Diameter W: width L: length 14.1 Spot: D<0.25 is acceptable 　　　　0.25≤D≤0.4 2dots are acceptable and the distance between defects should more than 10 mm. 　　　D>0.4 is unacceptable 14.2 Dent: D>0.40 is unacceptable 14.3 Scratch: W≤0.03, L≤10 is acceptable, 　　　0.03<W≤0.10, L≤10 is acceptable Distance between 2 defects should more than 10 mm. 　　　W>0.10 is unacceptable.
15	PCB	15.1 No distortion or contamination on PCB terminals. 15.2 All components on PCB must same as documented on the BOM/component layout. 15.3 Follow IPC-A-600F.
16	Soldering	Follow IPC-A-610C standard
17	Electrical Defect (Major defect)	The below defects must be rejected. 17.1 Missing vertical / horizontal segment, 17.2 Abnormal Display. 17.3 No function or no display. 17.4 Current exceeds product specifications. 17.5 LCD viewing angle defect. 17.6 No Backlight. 17.7 Dark Backlight. 17.8 Touch Panel no function.

Remark: LCD Panel Broken shall be rejected. Defect out of LCD viewing area is acceptable.

11.7 Classification of Defects

11.7.1 Visual defects (Except no / wrong label) are treated as minor defect and electrical defect is major. 10.7.2 Two minor defects are equal to one major in lot sampling inspection.

11.8 Identification/marking criteria

Any unit with illegible / wrong /double or no marking/ label shall be rejected.

11.9 Packing

11.9.1 There should be no damage of the outside carton box, each packaging box should have one identical label.

11.9.2 Modules inside package box should have compliant mark.

11.9.3 All direct package materials shall offer ESD protection

Note1: Bright dot is defined as the defective area of the dot is larger than 50% of one sub-pixel area.
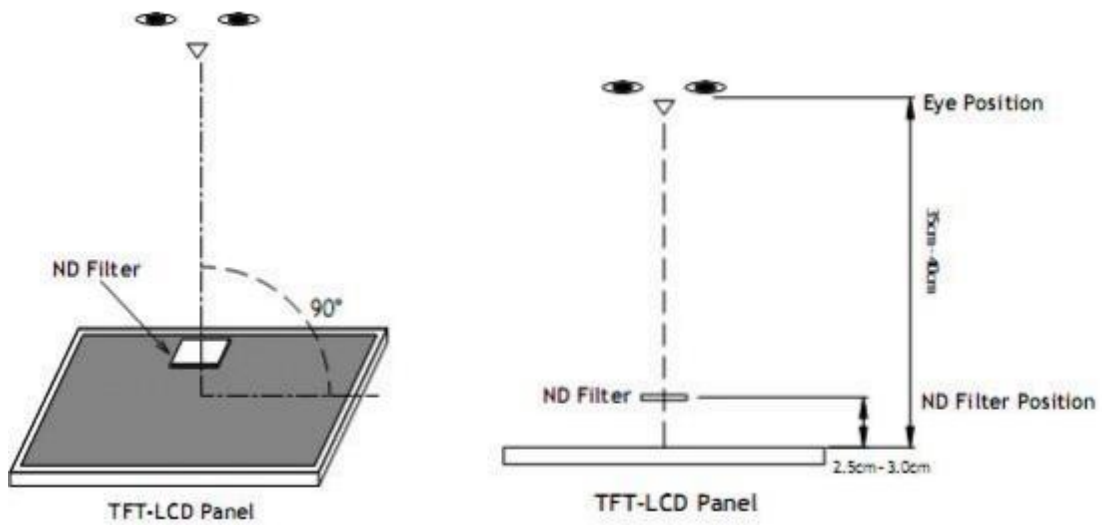
Bright dot: The bright dot size defect at black display pattern. It can be recognized by 2% transparency of filter when the distance between eyes and panel is 350mm±50mm.

Dark dot: Cyan, Magenta or Yellow dot size defect at white display pattern. It can be recognized by 5% transparency of filter when the distance between eyes and panel is 350mm±50mm.

Note2: Mura on display which appears darker / brighter against background brightness on parts of display area.

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 (CI) , 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 (CI), 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.

AM-800480-A070N

15. Lot Mark
15.1 Lot Mark

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

Code 1, 2, 3, 4, 5, 6: AMSON model code.
Code 7, 8: production year.
Code 9, 10: production month.
Code 11, 12, 13, 14, 15: serial number.

15.2 Location of Lot Mark
The label is attached to the backside of the TFT LCD display module.