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	2022-08-30	NEW ISSUE	

Table of Contents

1. Scope

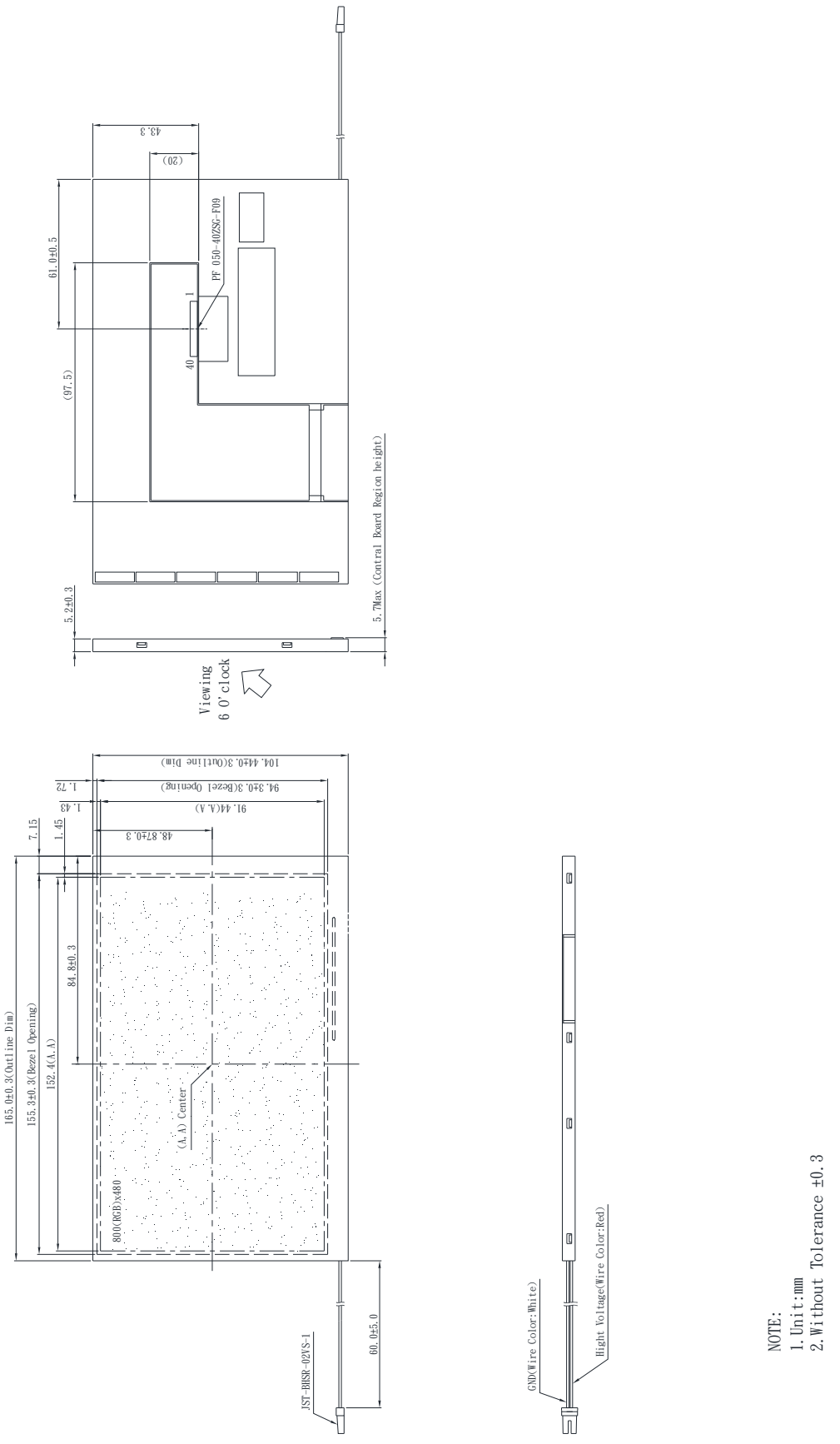
This specification defines general provisions as well as inspection standards for TFT module supplied by AMSON electronics.

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) 480	dots
Color filter array	RGB vertical stripe	--
Display mode	TN / Transmissive / Normally white	--
Gray Scale Inversion Direction	6 o’clock	--
Eyes Viewing Direction	12 O’clock	--
Polarizer Model	Anti-glare	--
Module size	165.0(W) 104.44(H) 5.2(T)	mm
Active area	152.4(W) 91.44(H)	mm
Dot pitch	0.1905(W) 0.1905(H)	mm
Interface	24-bit Parallel RGB Interface	--
Operating temperature	-20 ~ +70	°C
Storage temperature	-30 ~ +80	°C
Back Light	24 White LED	--
Module Weight	(127)	g

3. External Dimensions



4. Interface Description

4.1 LCM Panel Driving Section

PIN NO.	SYMBOL	FUNCTION
1	GND	Ground.
2	GND	Ground.
3	NC	No connection.
4	VCC	Power supply.
5	VCC	Power supply.
6	VCC	Power supply.
7	VCC	Power supply.
8	NC	No connection.
9	DE	Data enable input. Active high to enable the input data bus.
10	GND	Ground.
11	GND	Ground.
12	GND	Ground.
13	B5	Blue Data.
14	B4	Blue Data.
15	B3	Blue Data.
16	GND	Ground.
17	B2	Blue Data.
18	B1	Blue Data.
19	B0	Blue Data.
20	GND	Ground.
21	G5	Green Data.
22	G4	Green Data.
23	G3	Green Data.
24	GND	Ground.
25	G2	Green Data.
26	G1	Green Data.
27	G0	Green Data.
28	GND	Ground.
29	R5	Red Data.
30	R4	Red Data.
31	R3	Red Data.
32	GND	Ground.

33	R2	Red Data.
34	R1	Red Data.
35	R0	Red Data.
36	GND	Ground.
37	GND	Ground.
38	DCLK	Clock input.
39	GND	Ground.
40	GND	Ground.

Note: User's connector part number is PF050-40ZSG-F09-S manufactured by UJU or equivalent.

4.2 Backlight Driving

PIN NO.	SYMBOL	FUNCTION
1	VLED+	Red, LED_ Anode
2	VLED-	White, LED_ Cathode

Note: The backlight interface connector is a model BHSR-02VS-1 manufactured by JST or equivalent. The matching connector part number is SM02B-BHSS-1-TB manufactured by JST or equivalent.

5. Absolute Maximum Ratings

Item	Symbol	Min.	Max.	Unit
Digital Supply Voltage	VDD	-0.3	5.0	V
Operating Temperature	TOP	-20	70	°C
Storage Temperature	TST	-30	80	°C
Storage Humidity	HD	20	90	%RH

6. DC Characteristics

Item	Symbol	Min.	Typ.	Max.	Unit	Remark
Digital Supply Voltage	VDD	3.0	3.3	3.6	V	-
Logic Input Voltage	VIH	0.7VDD	-	VDD	V	-
	VIL	GND	-	0.3DVDD	V	-

7. Timing Characteristics

7.1 AC Electrical Characteristics

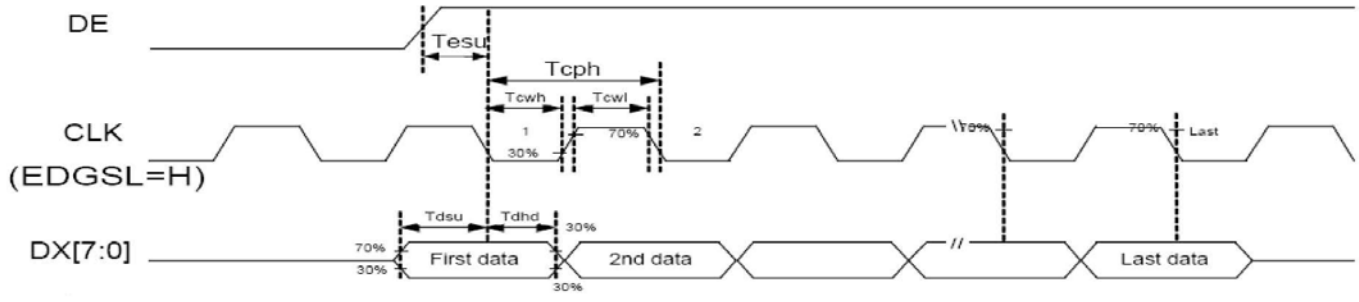
Frame rate range : 60Hz~65Hz

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT
Data setup	Tdsu	6	-	-	ns
Data hold time	Tdhd	6	-	-	ns
DE setup time	Tesu	6	-	-	ns
CLK frequency	FCPH	29.40	33.26	42.48	MHz
CLK period	TCPH	23.54	30.06	34.01	ns
CLK pulse duty	TCWH	40	50	60	%
CLK pulse duty	TCWL	40	50	60	%
DE period	TDEH+TDEL	1000	1056	1200	TCPH
DE pulse width	TDEH	-	800	-	TCPH
DE frame blanking	TDEB	10	45	110	TDEH+TDEL
DE frame width	TDE	-	480	-	TDEH+TDEL

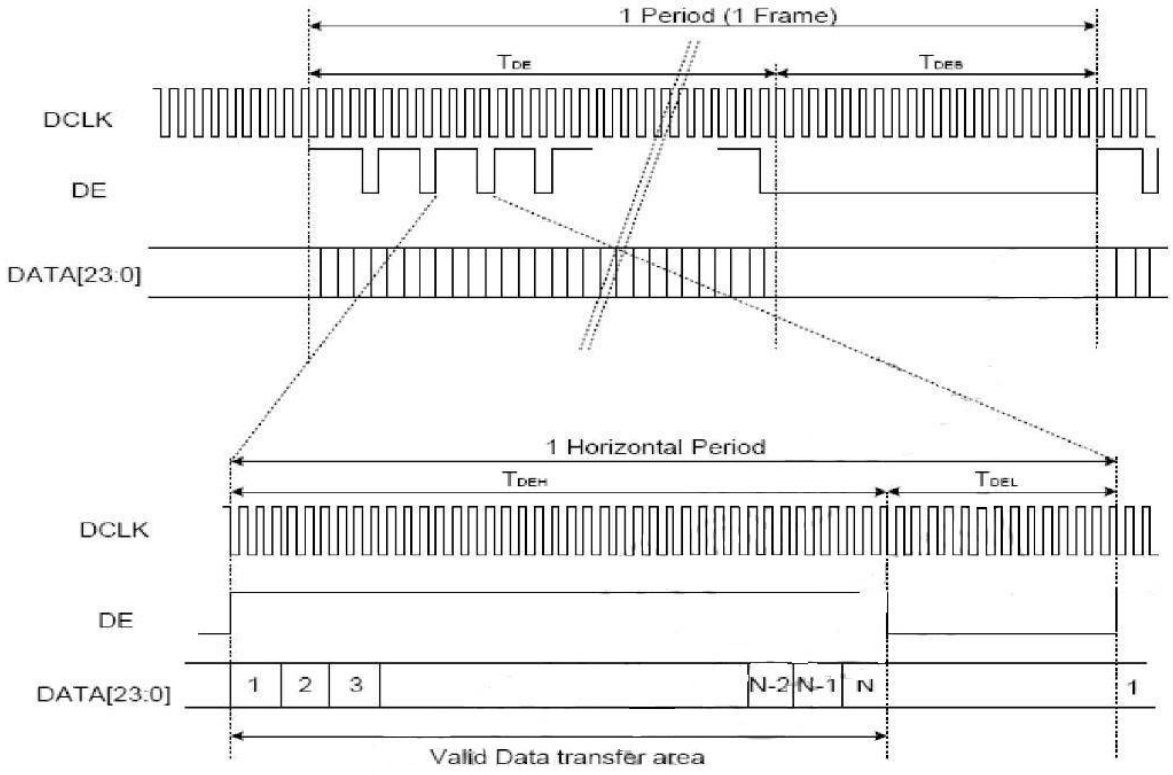
Note : We suggest using the typical value , so it can have better performance.

7.2 Timing Controller Timing Chart

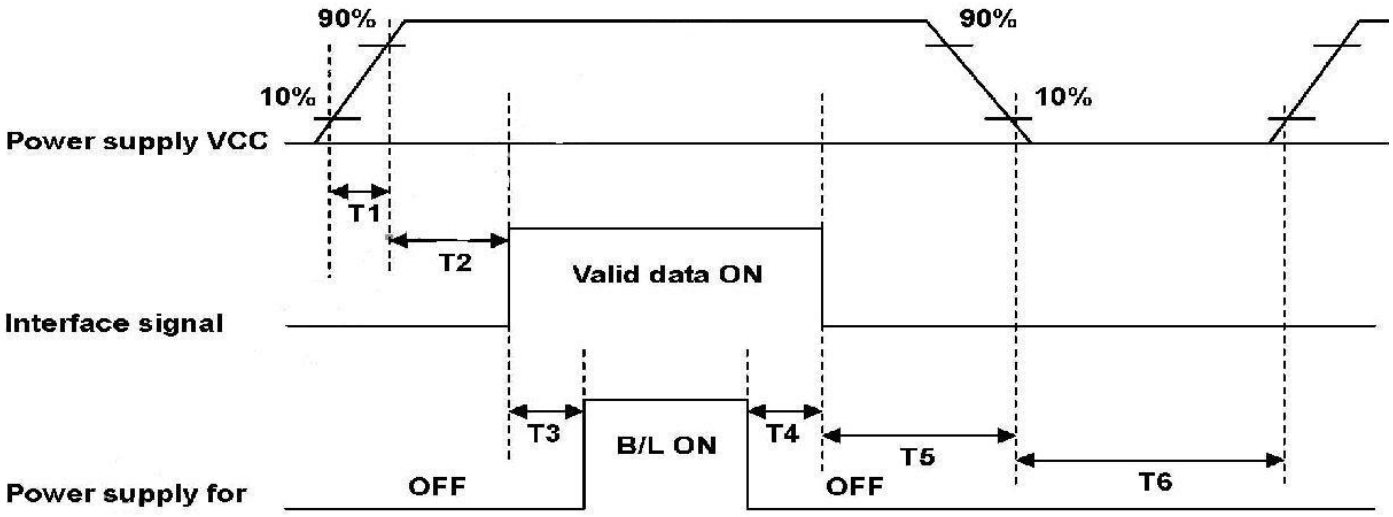
Clock and Data input waveforms



7.3 Data Input Format

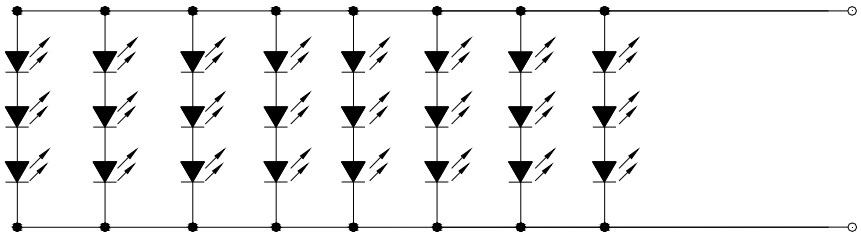


7.4 Power ON/OFF Sequence



PARAMETER	MIN.	TYP.	MAX.	UNIT
T1	1	-	2	ms
T2	0	60	-	ms
T3	200	-	-	ms
T4	200	-	-	ms
T5	1	-	-	ms
T6	1000	-	-	ms

8. Backlight Characteristic

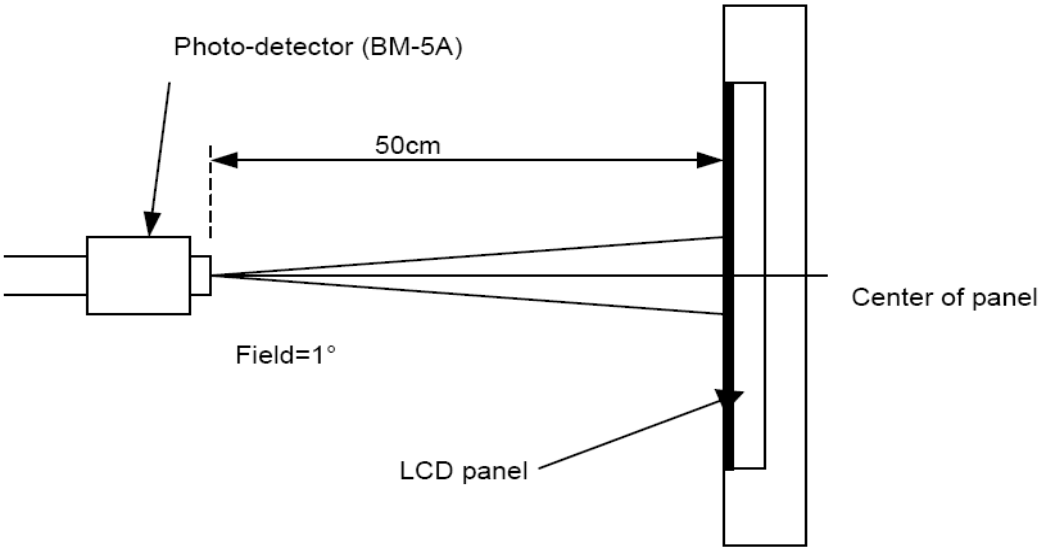


Item	Symbol	MIN	TYP	MAX	UNIT	Test Condition
Supply Voltage	Vf	-	9.9	-	V	If=160mA
Supply Current	If	-	160	-	mA	-
Luminous Intensity for LCM	-	450	500	-	cd/m^2	If=160mA
Uniformity for LCM	-	70	75	-		If=160mA
Life Time	-	10000	20000	-	Hr	If=160mA
Backlight Color	White					

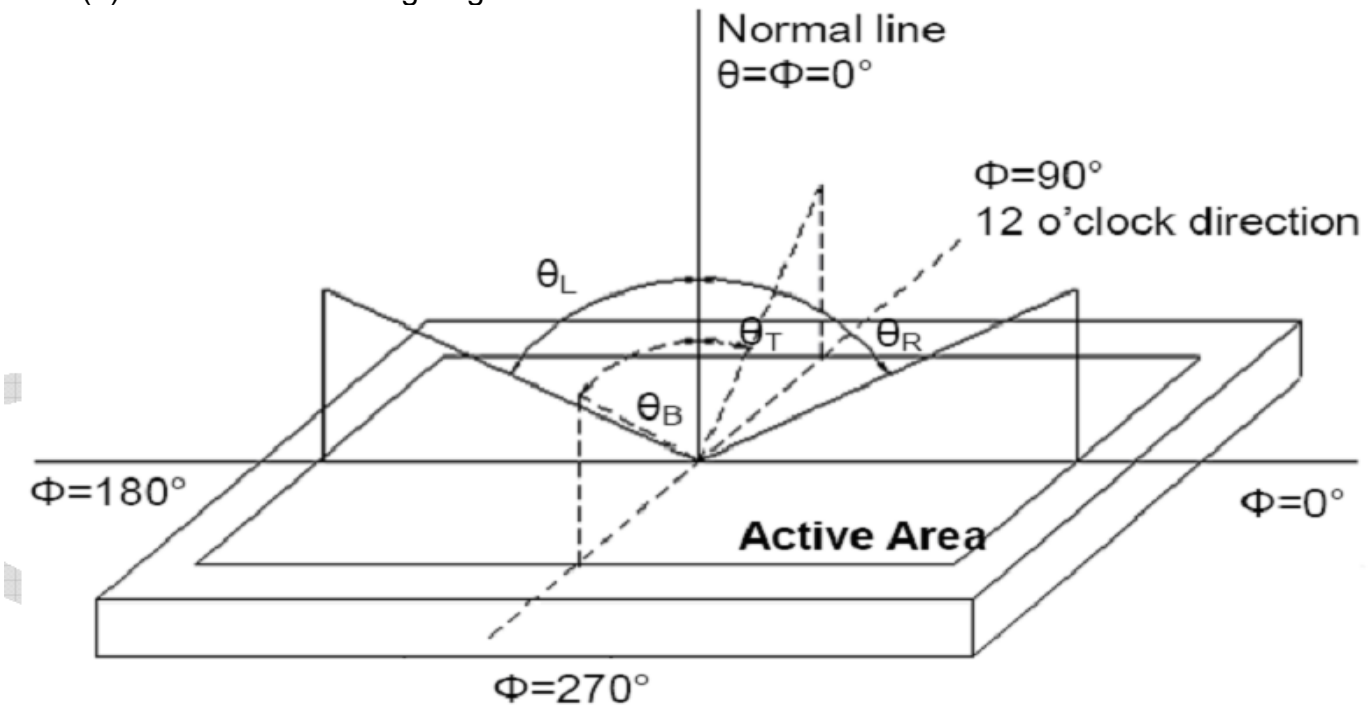
9. Optical Characteristics

Item	Conditions		Min.	Typ.	Max.	Unit	Note
Viewing Angle (CR>10)	Horizontal	θ_L	60	70	-	degree	(1),(2),(6)
		θ_R	60	70	-		
	Vertical	θ_T	50	60	-		
		θ_B	60	70	-		
Contrast Ratio	Center		250	400	-	-	(1),(3),(6)
Response Time	Rising		-	5	10	ms	(1),(4),(6)
	Falling		-	11	26		
CF Color Chromaticity (CIE1931)	Red x		Typ. -0.05	TBD	Typ. +0.05	-	(1), (6)
	Red y			TBD		-	
	Green x			TBD		-	
	Green y			TBD		-	
	Blue x			TBD		-	
	Blue y			TBD		-	
	White x			(0.299)		-	
	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



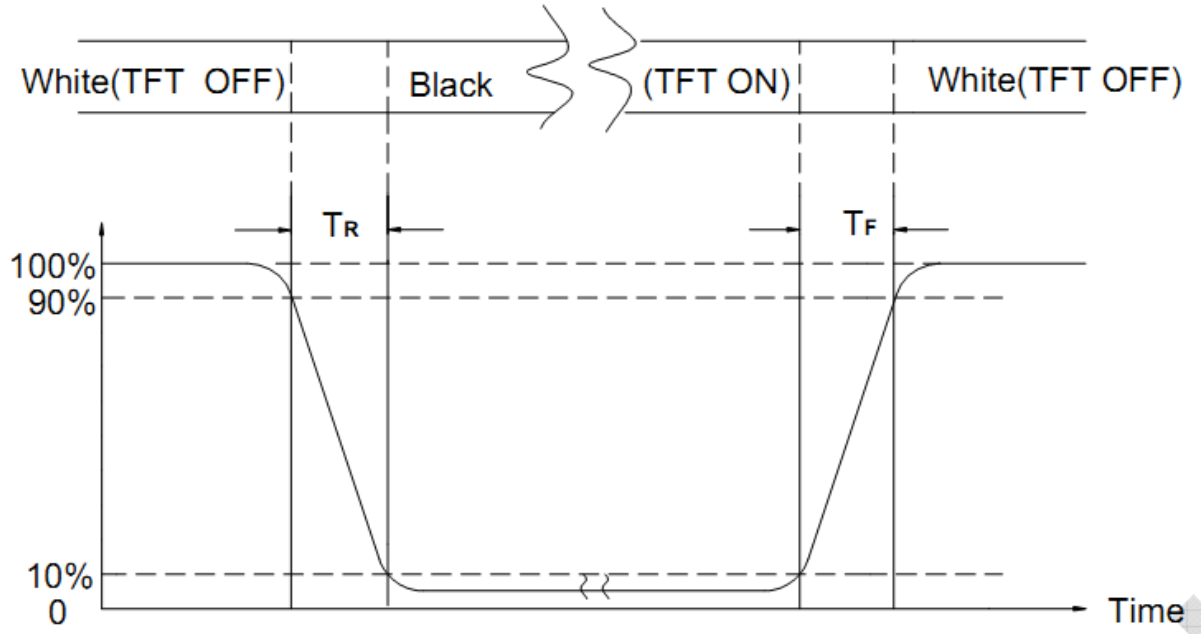
Note (3) Definition of Contrast Ratio (CR)

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

Ta = 25℃

ENVIRONMENTAL TEST					
NO.	**ITEM**	**CONDITIONS**	**TIME PERIOD**	**SAMPLE**	**REMARK**
1	High Temperature Storage	80℃	240HRS	3	
2	Low Temperature Storage	-30±3℃	240HRS	3	
3	High Temperature Humidity Storage	60℃ 90%RH	240HRS	3	NOTE(2)
4	High Temperature Operation	70℃	240HRS	3	NOTE(2)
5	Low Temperature Operation	-20℃	240HRS	3	NOTE(2)
6	Temperature Cycle	-20℃←25℃→70℃ (30min) (5min) (30min)	50CYCLE	3	NOTE(2)

※(Supply voltage for logic system=3.3V. Supply voltage for LCD system = Operating voltage at 25℃)

NOTE 1 : a. THE MODULE SHOULD WORK PROPERLY.
b. BEFORE AND AFTER FUNCTION TEST, THE DIFFERENCE OF CONSUMPTIVE CURRENT.SHOULD BE WITHIN 10%

NOTE 2 : a. THE MODULE SHOULD WORK PROPERLY.
b. THE MODLUE WON'T BE DEFORMATIVE, COLOR CHANGEABLE OR BROKEN.
c. THE MODULES CAN'T BE APART.

11. Inspection Standard

11.1 QUALITY LEVEL

INSPECTION PLAN:
SAMPLING LEVEL: II, normal inspection, single sampling inspection

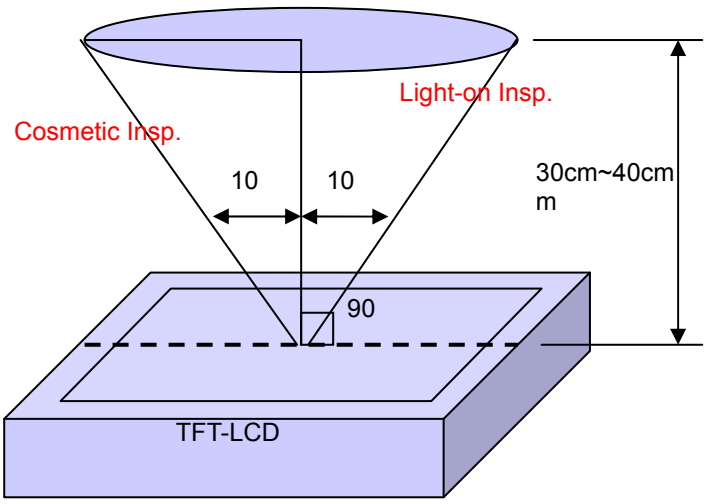
Sampling Plan		MIL-STD-105E
		Normal Inspection, Single Sampling
		Level II
AQL	Major Defect	0.65%
	Minor Defect	1.0%

11.2 ENVIRONMENT CONDITIONS:

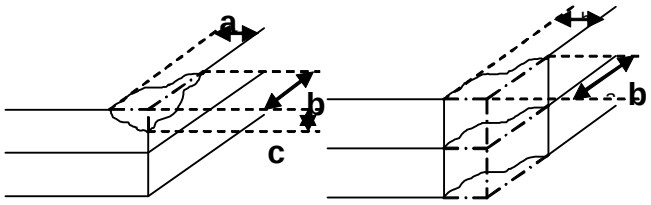
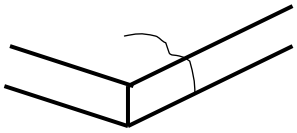
Ambient Temperature		25℃±5℃
Ambient Humidity		65±5%RH
Ambient Illumination	Cosmetic Inspection	300~700 Lux
	Functional Inspection	300~700 Lux

11.3 INSPECTION CONDITION:

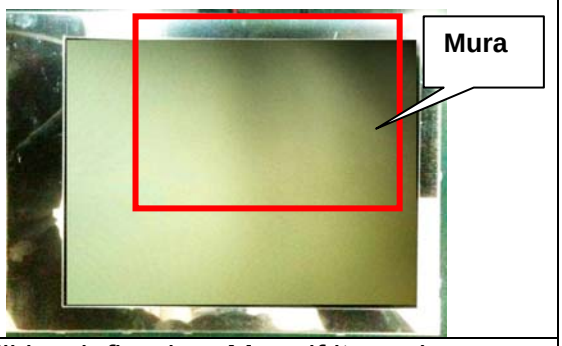
(1)Inspection Distance: 35cm ±5cm
(2)View Angle:
Light-on Inspection Angle: ±10°
Cosmetic Inspection Angle: ±10°

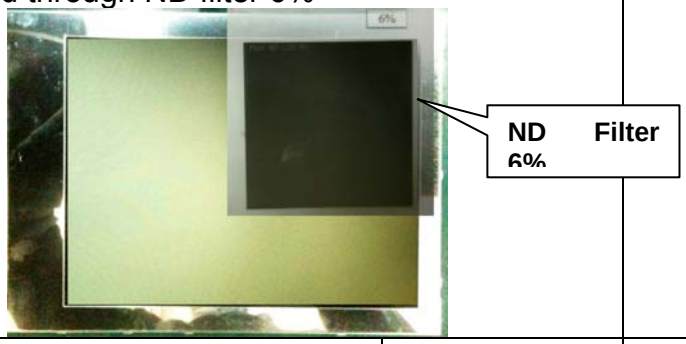


12.4 COSMETIC INSPECTION (PANEL):

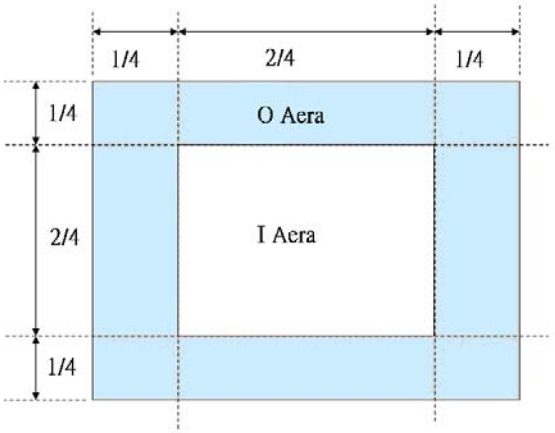
ITEM	JUDGMENT CRITERIA	CLASSIFICATION
Chipping on Panel/Touch Panel	 a≦3.0mm、b≦3.0mm、c≦t (Bottom glass thickness)	MA
Scratch on Panel/Touch Panel *Note-2	W≦0.05mm and L≦8mm: Ignored 0.05mm<W≦0.1mm and L≦8mm: N≦3 W>0.1mm or L>8mm, Not allowed	MI
Bubble or Dent on Panel/Touch Panel *Note-3	D≦0.2mm: Ignored 0.2mm<D≦0.6mm: N≦4 D>0.3mm: Not allowed	MI
Panel/Touch Panel Crack	 Not Allowed crack	MA
Bezel Deformation	Obvious deformation is not allowed	MI
Bezel Oxidation	Not allowed if it rusts continuously over 1 cm (It is out of warranty with rusted tin plate)	MI
Bezel Scratch	L≦20mm , W≦0.3 mm , N≦7	MI
Metal Squash Dent /Flange(Front Side)	D(W)≦1 mm,L≦3,N≦4;	MI
B/L High Voltage Wire Denudation	Not allowed	MA
Polarizer flaw or leak out resin	Defect is defined as the active area.	MI
Outline Dimension	Must in Spec, refer to related product spec.	MI

12.5 FUNCTIONAL INSPECTION:

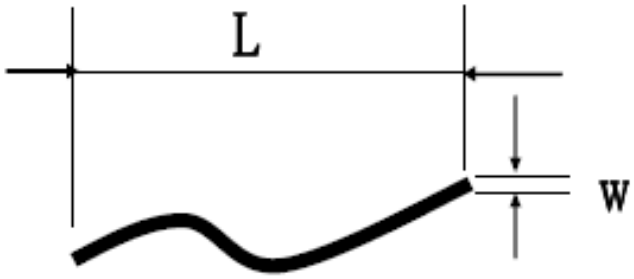
<table>
<tr><th>ITEM</th><th colspan="3">JUDGMENT CRITERIA</th><th>CLASSIFICATION</th></tr>
<tr><td rowspan="5">Point Defect</td><td rowspan="2">Bright dot</td><td>Random</td><td>2</td><td rowspan="5">MI</td></tr>
<tr><td>2 dots adjacent</td><td>1</td></tr>
<tr><td rowspan="2">Dark dot</td><td>Random</td><td>3</td></tr>
<tr><td>2 dots adjacent</td><td>1</td></tr>
<tr><td colspan="2">Total Dot Defect</td><td>4</td></tr>
<tr><td>Line Defect</td><td colspan="3">Obvious vertical or horizontal line defect is not allowed.</td><td>MA</td></tr>
<tr><td>Mura</td><td colspan="3">1. Under the normal examination angle of view, the picture has the non-uniform phenomenon.
 

2. Weak defect will be defined as Mura if it can be Observed through ND filter 6%
 
</td><td>MI</td></tr>
<tr><td rowspan="3">Foreign Material in spot shape *Note-3</td><td colspan="2">D 0.25 mm</td><td>Ignored</td><td rowspan="3">MI</td></tr>
<tr><td colspan="2">0.25mm < D . 0.5mm</td><td>N . 3</td></tr>
<tr><td colspan="2">D > 0.5mm</td><td>N=0</td></tr>
<tr><td rowspan="3">Foreign Material in line or spiral shape *Note-4</td><td colspan="2">W . 0.01 mm</td><td>Ignored</td><td rowspan="3">MI</td></tr>
<tr><td colspan="2">0.01mm<W . 0.05mm and L . 3mm</td><td>N . 3</td></tr>
<tr><td colspan="2">W > 0.05mm or L > 3 mm</td><td>N=0</td></tr>
<tr><td>Display Function Abnormal</td><td colspan="3">No Malfunction can be allowed</td><td>MA</td></tr>
</table>

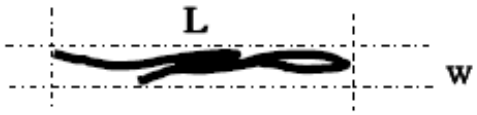
Note 1：/O Area Definition



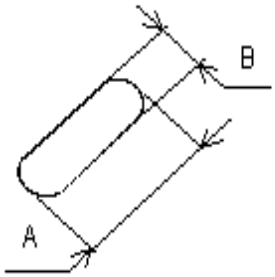
Note 2：Polarizer Scratch



Note 3：Line or Spiral Foreign Material

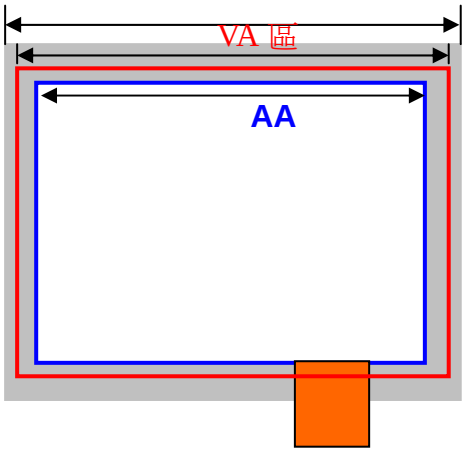


Note 4：Spot Foreign Material

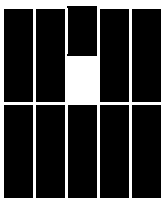


$$D = \frac{A+B}{2}$$

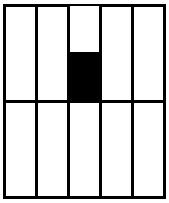
Note 5：TP Inspection Area Definition



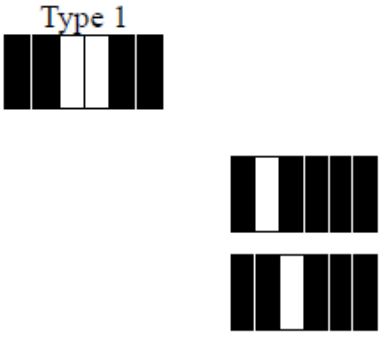
Note 6 : Bright dot defect description:



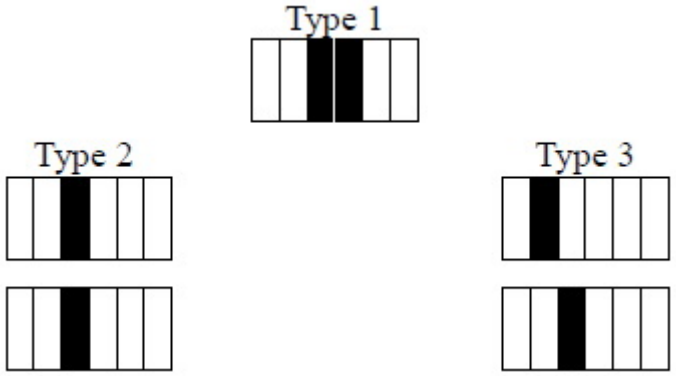
Note 7 : Dark dot defect description:



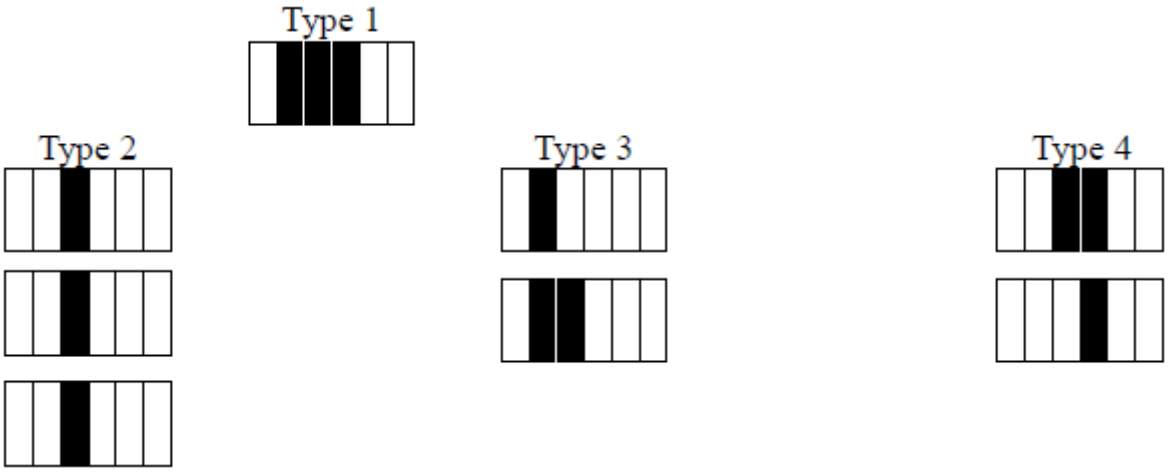
Note 8 : Bright dot defect description- Two adjacent.



Note 9 : Dark dot defect description- Two adjacent.

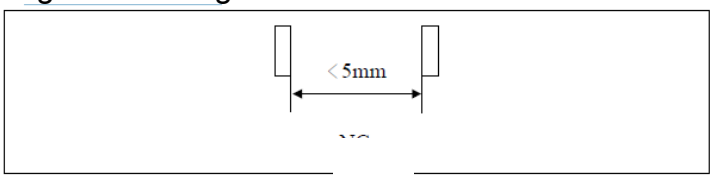


Note 10 : Dark dot defect description- Three adjacent.

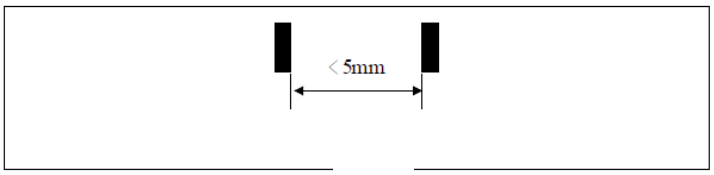


Note 11 : Minimum distance between dot defects

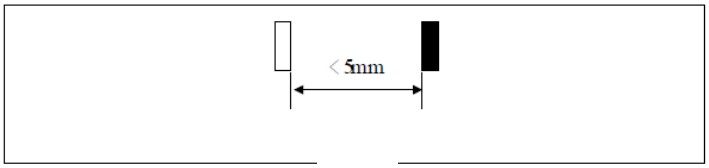
Bright dot to bright dot.



Dark dot to dark dot



Bright dot to dark dot



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