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	2024-03-11	NEW ISSUE	
B	2024-05-20	MODIFY 10. Reliability Test Conditions and Methods	P.16

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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.
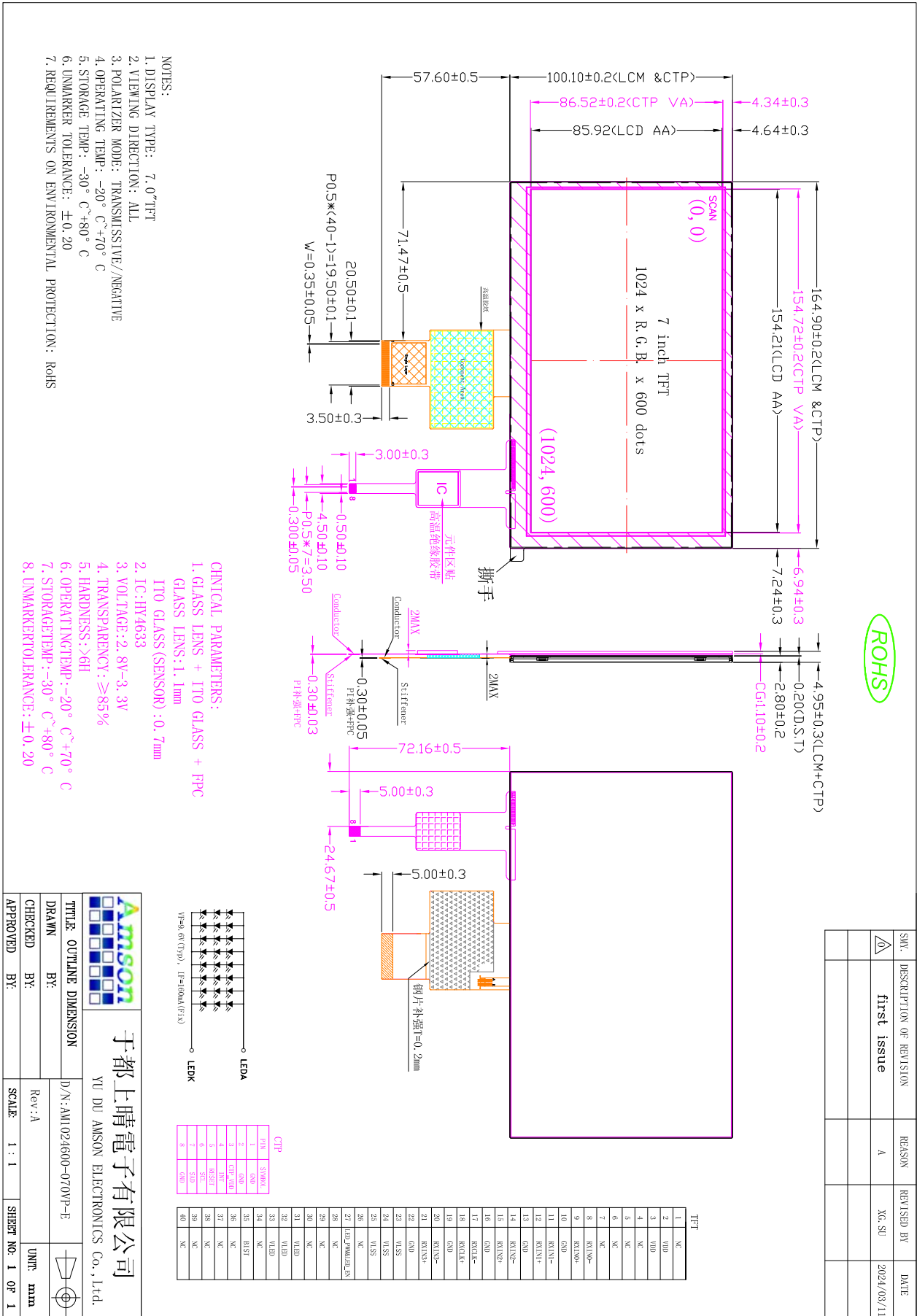
2. General Information

LCM

TITEM	STANDARD VALUES	UNITS
LCD type	7.0"TFT	--
Dot arrangement	1024(RGB)×600	dots
Color filter array	RGB vertical stripe	--
Display mode	Normally Black , Transmissive	-
Gray Scale Inversion Direction	ALL	--
Eyes　Viewing Direction	85/85/85/85	
Module size	164.90(W)×100.00(H)×4.95(T)	mm
Active area	154.21(W)×85.92(H)	mm
Dot pitch	0.1506(W)×0.1432(H)	mm
Interface	LVDS	--
Operating temperature	-20 ~ +70	°C
Storage temperature	-30 ~ +80	°C
Back Light	24White LED	--

CTP

ITEM	STANDARD VALUES	UNITS
CTP type	Cover Lens + sensor + FPC	--
CTP Driver IC	HY4633	--
Transmittance	≥85％	--
The cover hardness	6H	--
CTP size	164.90(W)×100.1(H)×1.85(T)	mm
CTP Viewing area	154.72(W)×86.52(H)	mm
CTP Interface	I2C	

3. External Dimensions

NOTES:
1. DISPLAY TYPE: 7.0"TFT
2. VIEWING DIRECTION: ALL
3. POLARIZER MODE: TRANSMISSIVE/NEGATIVE
4. OPERATING TEMP: -20°C~+70°C
5. STORAGE TEMP: -30°C~+80°C
6. UNMARKER TOLERANCE: ±0.20
7. REQUIREMENTS ON ENVIRONMENTAL PROTECTION: RoHS

CINICAL PARAMETERS:
1. GLASS LENS + ITO GLASS + FPC
   GLASS LENS:1.1mm
   ITO GLASS (SENSOR):0.7mm
2. IC:HY4633
3. VOLTAGE:2.8V-3.3V
4. TRANSPARENCY:≥85%
5. HARDNESS:>6H
6. OPERATINGTEMP:-20°C~70°C
7. STORAGETEMP:-30°C~+80°C
8. UNMARKERTOLERANCE:±0.20

TITLE: OUTLINE DIMENSION

D/N:AM1024600-070VP-E

Rev:A

SCALE 1:1   SHEET NO. 1 OF 1   UNIT: mm

4. Interface Description

TFT

PIN	PIN NAME	DESCRIPTION	Remark
1	NC	No connection	
2	VDD	Power Supply	
3	VDD		
4	NC	No connection	
5	NC		
6	NC		
7	NC		
8	RXIN0-	-LVDS Differential Data Input	R0~R5,G0
9	RXIN 0+	+LVDS Differential Data Input	
10	GND	Ground	
11	RXIN 1-	-LVDS Differential Data Input	G1~G5,B0, B1
12	RXIN 1+	+LVDS Differential Data Input	
13	GND	Ground	
14	RXIN 2-	-LVDS Differential Data Input	B2~B5,HS, VS,DE
15	RXIN 2+	+LVDS Differential Data Input	
16	GND	Ground	
17	RXCLK-	-LVDS Differential Clock Input	LVDS CLK
18	RXCLK+	+LVDS Differential Clock Input	
19	GND	Ground	
20	RXIN 3-	-LVDS Differential Data Input	R6,R7,G6,G7, B6,B7
21	RXIN 3+	+LVDS Differential Data Input	
22	GND	Ground	
23	VLSS	Ground	
24	VLSS		
25	VLSS		
26	NC	No connection	
27	LED_PWM& LED_EN	controller signal for backlight	
28	NC	No connection	
29	NC	No connection	
30	NC	No connection	
31	VLED	Power Supply for LED Backlight Driver	
32	VLED		
33	VLED		
34	NC	No connection	
35	BIST	No connection	
36	NC	No connection	
37	NC	No connection	
38	NC	No connection	
39	NC	No connection	
40	NC	No connection	

CTP

Pin	Symbol	Description.
1~2	GND	Power ground
3	CTP_VDD	Power supply.
4	INT	CTP interruption signal.
5	RESET	CTP reset pin. Active low to enter reset state.
6	SCL	CTP I2C_clock.
7	SAD	CTP I2C_data.
8	GND	Power ground

5. Absolute Maximum Ratings

Item	Symbol	Min.	Max.	Unit	Remark
Digital Supply Voltage	VDD	-0.3	4.0	V	
VIN Voltage	VLED	-0.3	7.5	V	
Operating Temperature	T$_{OP}$	-20	70	°C	
Storage Temperature	T$_{ST}$	-30	80	°C	

5.1 Power supply for LCM
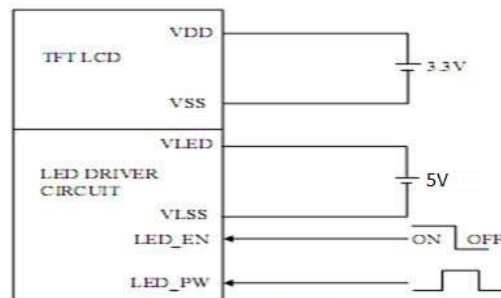
NOTE (1) : ADJUST THE PWM SIGNAL IN ORDER TO CONTROL LED BACKLIGHT'S BRIGHTNESS. THE HIGHER THE DUTY CYCLE, THE HIGHER THE BRIGHTNESS LUMINANCE
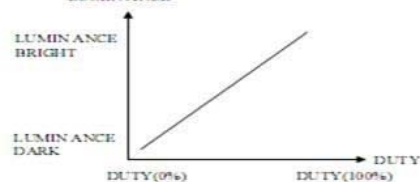
NOTE (2) : PWM SIGNAL=0~3.3V , OPERATION FREQUENCY : 100~30000 Hz
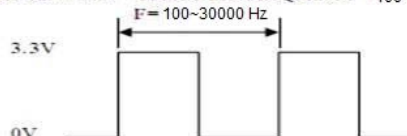
6. DC Characteristics
6.1 LCM Parameters

Item	Symbol	Min.	Typ.	Max.	Unit	Remark
Digital Supply Voltage	VDD	2.75	3.3	3.6	V	-
Backlight Power Voltage	VLED	3.3	5	7.5	V	
Digital Supply Current	IDD	-	200	300	mA	VDD=3.3V
Backlight Power Current	I-VLED	-	220	350	mA	VLED=12V
Input logic high voltage	V_{IH}	0.8*VDD	-	VDD	V	-
Input logic low voltage	V_{IL}	GND	-	0.2*VDD	V	
LED_EN Control Level	V_{IH}	1.9	-	VLED	V	-
	V_{IL}	GND	-	0.8	V	-
LED_PWM Control Level	V_{IH}	1.9	-	VLED	V	-
	V_{IL}	GND	-	0.8	V	-
PWM Frequency	LED_PWM	100	-	30000	Hz	-

6.2 CTP Parameters

Item	Symbol	Min.	Typ.	Max.	Unit	Remark
Power Voltage	CTP_VDD	3.0	3.3	3.6	V	-
	VBUS	4.5	5	5.5	V	-
Input logic high voltage	V_{IH}	0.6* CTP_VDD	-	CTP_VDD+0.5	V	-
Input logic low voltage	V_{IL}	0	-	0.3* CTP_VDD	V	-
Output High Voltage	V_{OH}	0.7* CTP_VDD	-	-	V	-
Output Low Voltage	V_{OL}	-	-	0.3* CTP_VDD	V	-

7. Timing Characteristics
7.1 Power ON/OFF Sequence
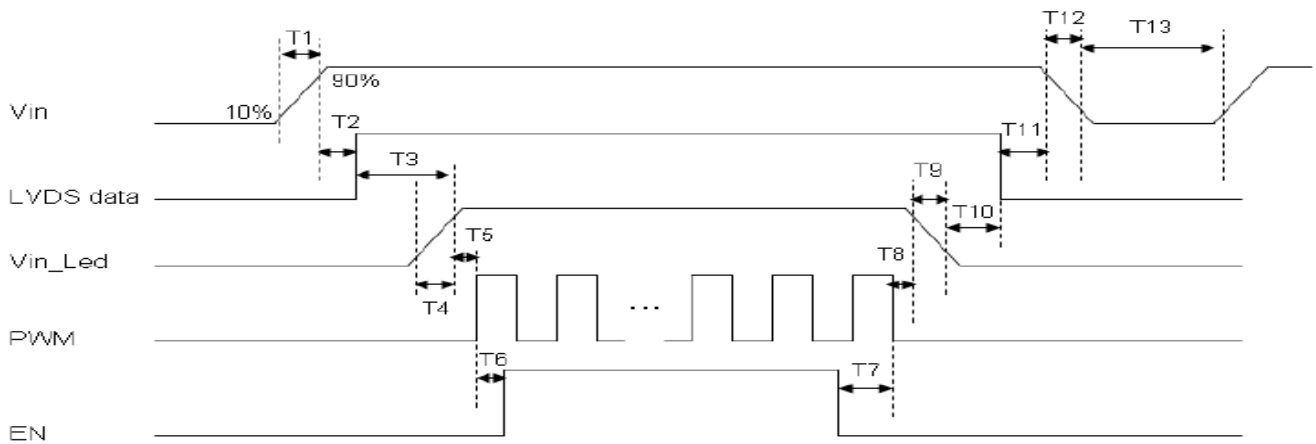
Parameter	Symbol	Min.	Typ	Max.	Unit
Vin rise time	T1	0.5	-	10	ms
Vin good to signal valid	T2	30	-	90	ms
Signal valid to backlight on	T3	200	-	-	ms
Backlight power on time	T4	0.5	-	-	ms
Backlight VDD good to system PWM on	T5	10	-	-	ms
System PWM on to backlight enable on	T6	10	-	-	ms
Backlight enable of to system PWM off	T7	0	-	-	ms
System PWM off to B/L power disable	T8	10	-	-	ms
Backlight power off time	T9	0.5	10	30	ms
Backlight off to signal disable	T10	200	-	-	ms
Signal disable to power down	T11	0	-	50	ms
VIN fall time	T12	0.5	10	30	ms
Power off	T13	500	-	-	ms

7.2 Input Signal Timing

7.2.1 DC electrical characteristics
TTL mode DC electrical characteristics

(VDD=3.0~3.6V, AVDD=6.5~13.5V, GND=AGND=0V, TA=-20℃~+85℃)

Parameter	Symbol	Spec.			Unit	Condition
		Min.	Typ.	Max.		
Power supply voltage	VDD	3.0	-	3.6	V	-
Power supply voltage	AVDD	6.5	-	13.5	V	-
Power supply voltage	AVDDL	6.5	-	13.5	V	Full range application
		-	V8+0.1	-	V	Half AVDD application
Power supply voltage	AGNDH		0		V	Full range application
		-	V7-0.1	-	V	Half AVDD application
AVDD regulate output	AVDDG	8.9	9	9.1	V	AVDD=10 V, VDD=3.3V, with Resistor loading ≧ 30K Ohm, and Capacitor loading ≧ 4.7uF
Low level input voltage	V_{IL}	0	-	0.3VDD	V	For digital circuit
High level input voltage	V_{IH}	0.7VDD	-	VDD	V	For digital circuit
Output low voltage	V_{OL}	-	-	GND+0.4	V	I_{OL}=400µA
Output high voltage	V_{OH}	VDD-0.4	-	-	V	I_{OH}=-400µA
Pull low/high resistance	R_i	200	250	300	kΩ	For the digital input pin @VDD=3.3V
Input leakage current	Ii	-	-	±1	uA	For digital circuit
Digital Operation current	Idd	-	12	20	mA	Fclk=50MHz, LD=48KHz,VDD=3.3V, No load
Digital stand-by current	Ist1	-	10	50	µA	Clock & all functions are stopped
Analog Operating current	Idda	-	8	10	mA	No load, Fclk=50MHz,LD=48KHz @ AVDD=10V, V1=8V, V14=0.4V
Analog Stand-by current	Ist2	-	10	50	µA	No load, clock & all functions are stopped
Input level of V1~V7	Vref1	0.4AVDD	-	AVDD-0.1	V	Gamma correction voltage input
Input level of V8~V14	Vref2	0.1	-	0.6AVDD	V	Gamma correction voltage input
Output Voltage deviation	Vod1	-	±20	±35	mV	Vo=AGND+0.1V~AGND+0.5V & Vo=AVDD-0.5V~AVDD-0.1V
Output Voltage deviation	Vod2	-	±15	±20	mV	Vo=AGND+0.5V~AVDD-0.5V
Output Voltage Offset between Chips	Voc	-	-	±20	mV	Vo=AGND+0.5V~AVDD-0.5V
Dynamic Range of Output	Vdr	0.1	-	AVDD-0.1	V	SO1~SO1200
Sinking Current of Outputs	IOLy	80	-	-	µA	SO1~SO1200; Vo=0.1V vs. 1.0V, AVDD=13.5V
Driving Current of Outputs	IOHy	80	-	-	µA	SO1~SO1200 ;Vo=0.1V vs. 12.5V, AVDD=13.5V
Resistance of Gamma Table	Rg	0.7*Rn	1.0*Rn	1.3*Rn	Ω	Rn: Internal gamma resistor

Table 9.2: DC electrical characteristics

7.2.2AC ELECTRICAL CHARACTERISTICS
TTL mode AC electrical characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition
VDD Power On Slew rate	T_{POR}	-	-	20	ms	From 0V to 90% VDD
GRB pulse width	T_{GRB}	50	-	-	µs	-
DCLK cycle time	T_{cph}	14	-	-	ns	-
DCLK pulse duty	T_{cwh}	40	50	60	%	-
VSD setup time	T_{vst}	5	-	-	ns	-
VSD hold time	T_{vhd}	5	-	-	ns	-
HSD setup time	T_{hst}	5	-	-	ns	-
HSD hold time	T_{hhd}	5	-	-	ns	-
Data set-up time	T_{dsu}	5	-	-	ns	D0[7:0], D1[7:0], D2[7:0] to DCLK
Data hold time	T_{dhd}	5	-	-	ns	D0[7:0], D1[7:0], D2[7:0] to DCLK
DE setup time	T_{esu}	5	-	-	ns	-
DE hold time	T_{ehd}	5	-	-	ns	-
Output stable time	T_{sst}	-	-	6	µs	10% to 90% target voltage. CL=90pF, R=10K ohm (Cascade)
				3		Dual gate

Table 10.1: TTL mode AC electrical characteristics

7.3 Parallel RGB Input Timing Table
DE mode (1024x600)

Parameter	Symbol	Min.	Typ.	Max.	Unit
DCLK Frequency	fclk	40.8	51.2	67.2	MHz
Horizontal Display Area	thd		1024		DCLK
HSD Period	th	1114	1344	1400	DCLK
HSD Blanking	thb+ thfp	90	320	376	DCLK
Vertical Display Area	tvd		600		T_H
VSD Period	tv	610	635	800	T_H
VSD Blanking	tvbp+ tvfp	10	35	200	T_H

7.4 LVDS Data Mapping
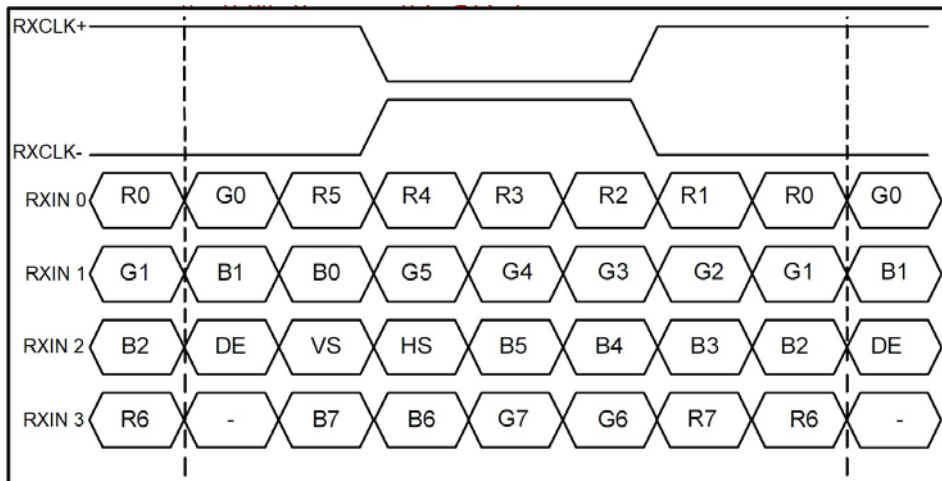
8-bit LVDS input (LVBIT = H)

7.5 Timing Diagram

Input Clock and Data Timing Diagram
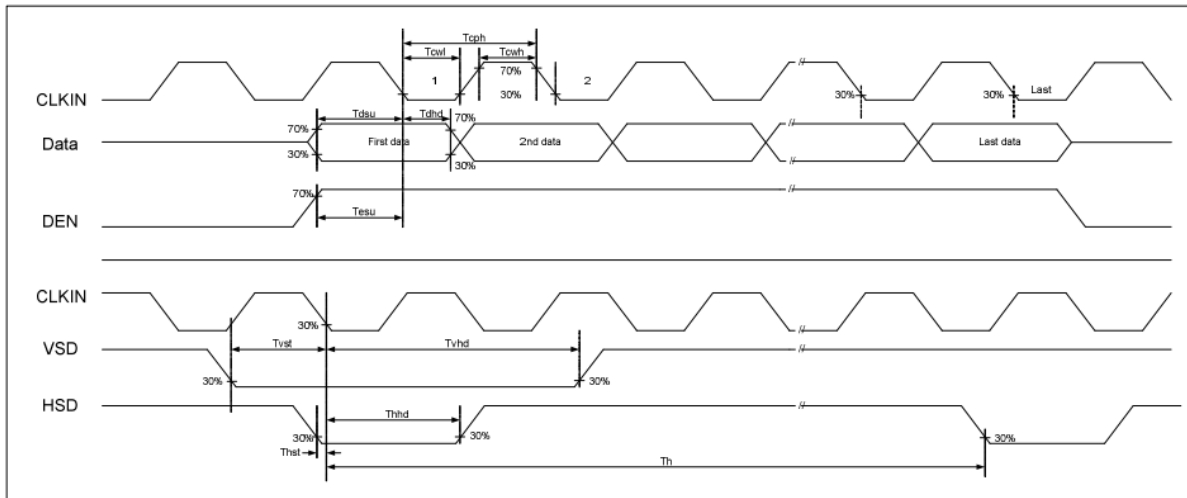
8. Backlight Characteristic

Item		Symbol	MIN	TYP	MAX	UNIT	NOTE
Backlight Power		LED_VCC	3.3	5	7.5	V	Ta = 25°C
Backlight Power		ILED_VCC	-	(0.5)	(0.7)	A	LED_VCC=5V
EN Signal Voltage	VIH	BL_CON	1.2	-	-	V	-
	VIL		GND	-	0.4	V	-
Lifetime		-	30000	-	-	Hr	-
Color		White					
Average Brightness		-	300	380	-	Cd/m2	-
Luminance uniformity		-	-	80	-	%	-

9. Optical Characteristics

Item	Conditions		Min.	Typ.	Max.	Unit	Note
Viewing Angle (CR>10)	Horizontal	θL	80	85	-	degree	(1),(2),(6)
		θR	80	85	-		
	Vertical	θT	80	85	-		
		θB	80	85	-		
Contrast Ratio	Center		600	800	-	-	(1),(3),(6)
Response Time	Rising + Falling		-	25	-	ms	(1),(4),(6)
CF Color Chromaticity (CIE1931)	Red x		Typ. -005	TBD	Typ. +0.05	-	(1), (6)
	Red y			TBD		-	
	Green x			TBD		-	
	Green y			TBD		-	
	Blue x			TBD		-	
	Blue y			TBD		-	
	White x			0.318		-	
	White y			0.342		-	

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.
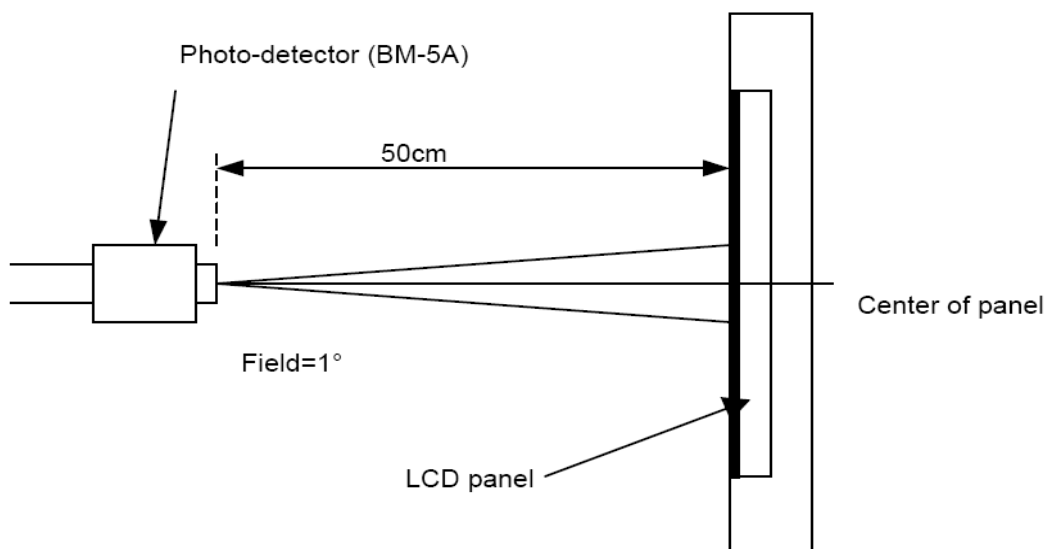
Note (2) Definition of Viewing Angle
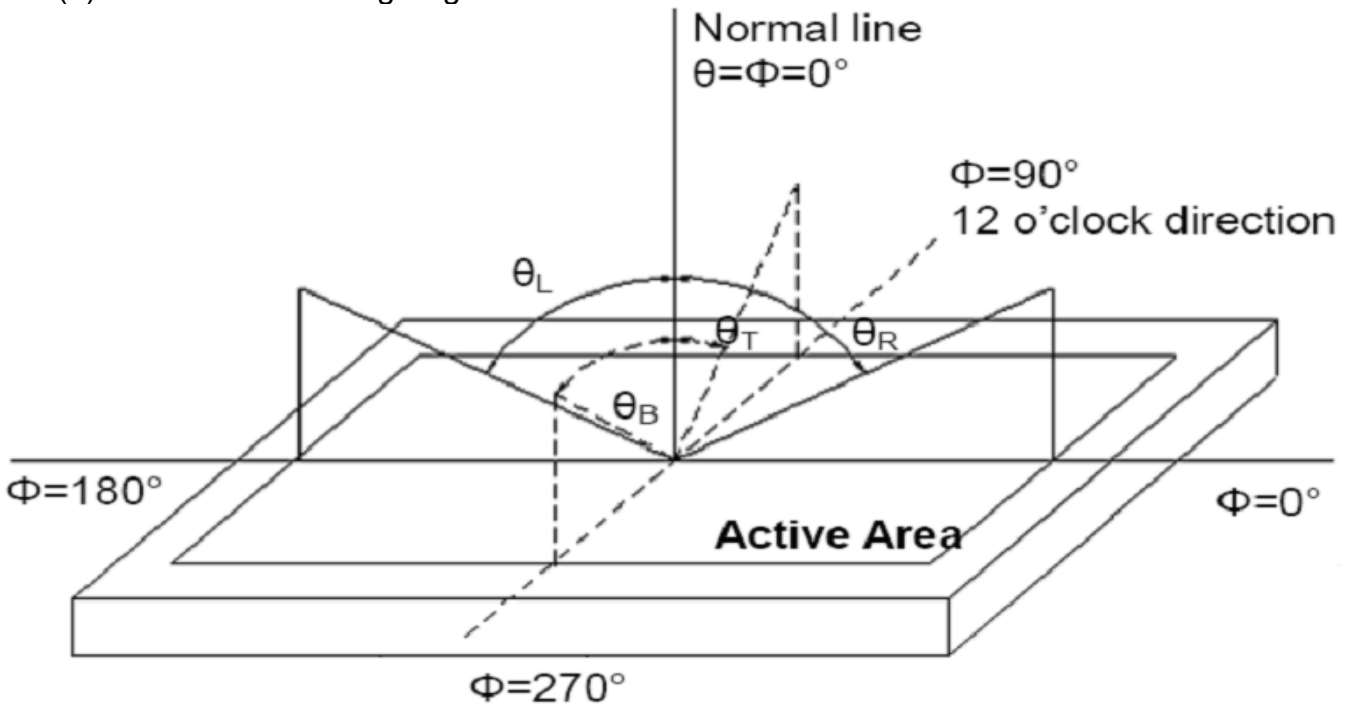
Note (3) Definition of Contrast Ratio (CR)

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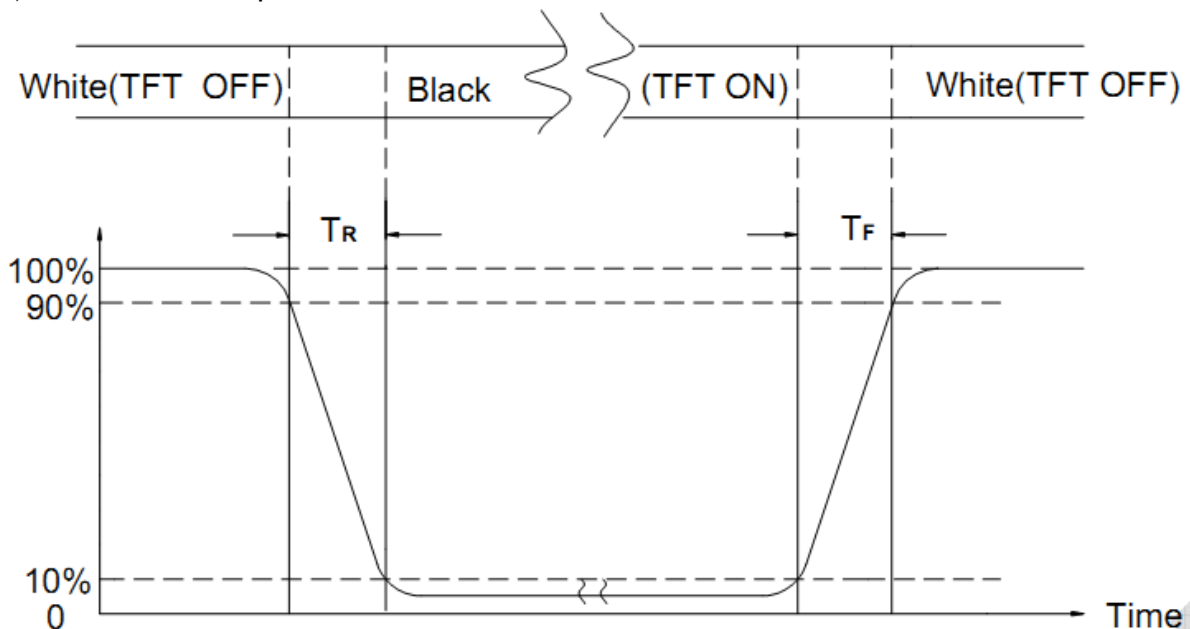
Note (5) Definition of Transmittance (Module is without signal input)

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
①	High Temperature Storage	Keep in 80°C±2°C×96Hrs Surrounding temperature, then storage at normal condition 4hrs.
②	Low Temperature Storage	Keep in -30°C±2°C×96Hrs Surrounding temperature, then storage at normal condition 4hrs.
③	High Temperature Operating Test	Keep in 70°C±2°C×96Hrs Surrounding temperature, then storage at normal condition 4hrs.
④	Low Temperature Operating Test	Keep in -20°C±2°C×96Hrs Surrounding temperature, then storage at normal condition 4hrs.
⑤	High Temperature / High Humidity Storage Test	Keep in 60°C±5°C×90%RH×96Hrs Surrounding temperature, then storage at normal condition 4hrs.
⑥	Temperature Cycling Storage Test	-30°C → +25°C → 80°C → +25°C (30mins) (5mins) (30mins) (5mins) 30 Cycle Surrounding temperature, then storage at normal condition 4hrs.
⑦	ESD Test	Air Discharge: Apply 6 KV with 5 times Discharge for each polarity +/- Contact Discharge: Apply 4 KV with 5 times discharge for each polarity +/- 1. Temperature ambiance : 15°C～35°C 2. Humidity relative : 30%～60% 3. Energy Storage Capacitance (Cs + Cd): 150pF±10% 4. Discharge Resistance (Rd): 330Ω±10% 5. Discharge, mode of operation: Single Discharge (time between successive discharges at least 1 sec) (Tolerance if the output voltage indication : ±5%)
⑧	Vibration Test (Packaged)	1. Sine wave 10～55 Hz frequency (1 min/sweep) 2. The amplitude of vibration :1.5 mm 3. Each direction (X、Y、Z) duration for 2Hrs
⑨	Drop Test (Packaged)	*(table below)* Drop Direction: ※1 corner / 3 edges / 6 sides each 1time

Packing Weight (Kg)	Drop Height (cm)
0 ~ 45	122
45.4 ~ 90.8	76
90.8 ~ 454	61
Over 454	46

11. Inspection Standard
11.1. QUALITY :
THE QUALITY OF GOODS SUPPLIED TO PURCHASER SHALL COME UP TO THE FOLLOWING STANDARD.

11.1.1. INSPECTIONTOOLS AND INSTRUMENTS
Vernier calipers, film scales, multimeter, magnifying eyepiece, ND5%, luminance meter and so on.

11.1.2. 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.

11.1.3. 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

CLASS	AQL(%)
CRITICAL	0.4 %
MAJOR	0.65 %
MINOR	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.

11.1.4. 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

11.2.3. Ambient Illumination:
0 ~30 Lux for functional inspection
500 ~ 1200 Lux for external appearance inspection.

11.2.4. TEST AREA：
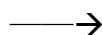
11.2.5. Inspection should be carried out with rope electrostatic ring and static finger cover (both hands except small fingers must be worn)
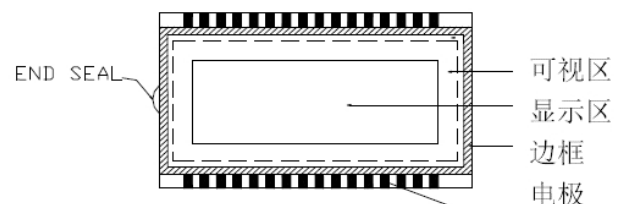
11.2.6. The inspector may make a visual inspection or a comparative examination with a film ruler and a magnifying eyepiece. Individual defects shall be determined according to the limited samples.

11.2.7. Functional testing uses electrical testing fixtures or test fixtures required by customers.

11.2.8. the ion fan should be used when testing.

11.2.9. the principle of judgment

11.3.1   If the defect outside the visual area does
  not affect the assembly and display,
    it will be judged as a good product.

11.3.2   Poor definition
Pixel:
A combination of three sub-pixels
  (Red + Green + Blue).
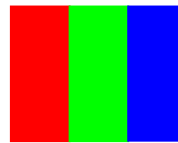
Dot:
Any of the sub-pixels
  (Red or Green or Blue).
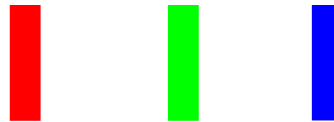
Bright and dark dots:
  A point pixel (sub-pixel: R, G, B pixels) is lit or turned off during the display function test.
Highlights:
  Usually considered to be shown on a black screen.
Dark spots:
  They are generally considered to be shown on R, G, B solid colors or white images.
Neighborhood:
  Two or three adjacent point pixels (dot: sub-pixel) connected together (R, G or G, B or B, R or RGB).
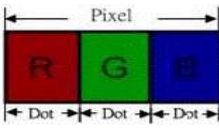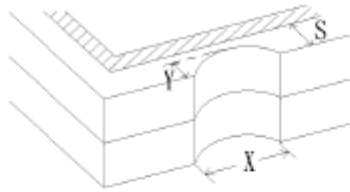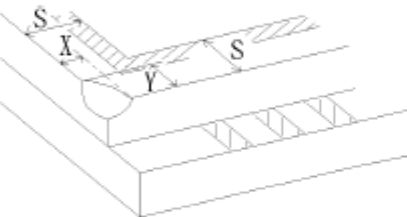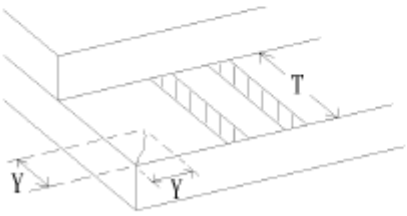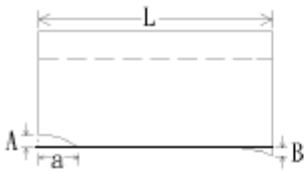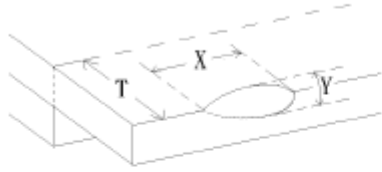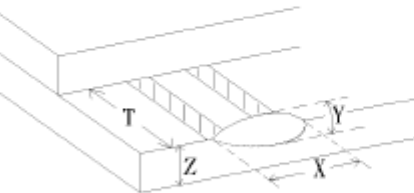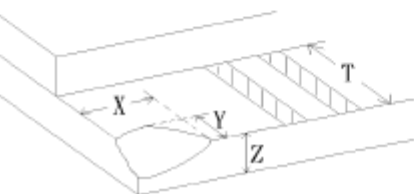
11.3. INSPECTION PLAN :

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

NO.	CLASS	ITEM	JUDGEMENT
11.4.1	MINOR	BLACK AND WHITE SPOT FOREIGN MATERIEL DUST IN THE CELL BLEMISH SCRATCH	(A) ROUND TYPE: unit: mm 	DIAMETER (mm.)	ACCEPTABLE Q'TY
---	---
∅≤0.2	Distances ≥ 1mm
0.2 < ∅ ≤ 0.3	3 (Distance ≥ 5mm)
0.3 < ∅ ≤ 0.4	2 (Distance ≥ 5mm)
0.4 < ∅	0 | NOTE: ∅=(LENGTH*WIDTH)/2 (S) LINE TYPE: unit: mm | LENGTH	WIDTH	ACCEPTABLE QTY
---	---	---
……	W≤ 0.03	Distance≥ 1mm
L ≤4.0	0.03 < W ≤ 0.05	3 (Distanced ≥ 15mm)
……	0.05 < W	FOLLOW ROUND TYPE	 NOTE: ∅=(LENGTH*WIDTH)/2
11.4.2	MINOR	BUBBLE IN POLARIZER DENT ON POLARIZER	unit: mm. 	DIAMETER	ACCEPTABLE Q'TY
---	---
∅<0.2	Distance≥1mm
0.2<∅≤ 0.3	4 (Distance≥ 15mm)
0.3<∅≤ 0.4	3 (Distance≥ 15mm)
0.4<∅	0	
11.4.3	MINOR	Dot Defect		Items	ACC. Q'TY
---	---
Bright dot	N ≤1 (Distance ≥ 15mm)
Dark dot	N ≤3 (Distance ≥ 15mm)	 Pixel Define : Note 1: The definition of dot: The size of a defective dot over 1 of whole dot is regarded as one defective dot. Definition:<1/2 dot and visible by 5% ND filter 2: Bright dot: Dots appear bright and unchanged in size m which LCD panel is displaying under black pattern. 3: Dark dot: Dots appear dark and unchanged in size in which LCD panel is displaying under pure red. green 、blue pattern.
11.4.4	MINOR	Mura	Not visible through 5% ND filter in 50% gray or judge by limit sample if necessary

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)	$\Phi = (x+y)/2 > 2.5$ 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 (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 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