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	2019-08-12	NEW ISSUE	
B	2019-08-26	MODIFY B/L	

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

TITEM	STANDARD VALUES	UNITS
LCD type	3.95"TFT	--
Dot arrangement	480(RGB)×480	dots
Color filter array	RGB vertical stripe	--
Display mode	IPS / Transmission / Normally Black	-
Gray Scale Inversion Direction	80/80/80/80 deg(U/D/L/R @ C/R>10)	--
Eyes Viewing Direction	ALL	
Driver IC	ST7701S	--
Module size	74.83(W)×78.98(H)×2.12(T)	mm
Active area	71.85(W)×70.17(H)	mm
Dot pitch	0.1462(W)×0.1497(H)	mm
Interface	3/4-wire + 16/18/24 bit RGB interface	--
Operating temperature	-20 ~ +70	°C
Storage temperature	-30 ~ +80	°C
Back Light	10 White LEDS	--

3. External Dimensions

NOTES:
1. DISPLAY TYPE:3.95" TFT/IPS
2. VIEWING DIRECTION: 80/80/80/80
3. LCD DRIVE IC:ST7701S
4. POLARIZER MODE: TRANSMISSIVE/NEGATIVE
5. OPERATING TEMP: -20°C~+70°C
6. STORAGE TEMP: -30°C~+80°C
7. UNMARKER TOLERANCE: ±0.20
8. REQUIREMENTS ON ENVIRONMENTAL PROTECTION: RoHS

3.95" TFT
480x3(RGB)x480 DOTS
VIEWING DIRECTION

BL CIRCUIT DIAGRAM
VF=12.8V, IF=40mA
LEDA — LEDK

RoHS

Pin	Name	Pin	Name
1	LEDK	28	R0
2	LEDK	29	R1
3	LEDA	30	R2
4	LEDA	31	R3
5	YU	32	R4
6	XR	33	R5
7	NC	34	R6
8	RESET	35	R7
9	CS	36	HSYNC
10	SCK	37	VSYNC
11	SDA	38	DCLK
12	B0	39	NC
13	B1	40	NC
14	B2	41	VCC
15	B3	42	VCC
16	B4	43	YD
17	B5	44	XL
18	B6	45	NC
19	B7	46	NC
20	G0	47	NC
21	G1	48	IF2
22	G2	49	IF1
23	G3	50	IF0
24	G4	51	NC
25	G5	52	NC
26	G6	53	GND
27	G7	54	GND

SMY. | DESCRIPTION OF REVISION | REASON | REVISED BY | DATE
first issue | A | XG,SU | 2019/08/08

TITLE: OUTLINE DIMENSION
DRAWN BY:
CHECKED BY:
APPROVED BY:
D/N:AM480480-040B
Rev:A
SCALE 1:1
SHEET NO: 1 OF 1
UNIT: mm

于都上晴电子有限公司
YU DU AMSON ELECTRONICS Co.,Ltd.

4. Interface Description

PIN NO.	PIN NAME	DESCRIPTION
1~2	LEDK	LED backlight cathode
3~4	LEDA	LED backlight anode
5	YU	RTP (No connection)
6	XR	RTP (No connection)
7	NC	No connection
8	RESET	Reset signal input terminal, active at 'L'
9	CS	Chip select signal input terminal, Active at 'L'
10	SCK	Write signal input terminal, Active at 'L'. Synchronizing clock signal in SPI mode.
11	SDA	SPI interface input pin.
12~19	B0~B7	Data bus
20~27	G0~G7	Data bus
28~35	R0~R7	Data bus
36	HSYNC	Line synchronizing signal for RGB interface operation.
37	VSYNC	Frame synchronizing signal for RGB interface operation.
38	DCLK	Dot clock signal for RGB interface operation.
39,40	NC	No connection
41,42	VCC	System power supply.
43	YD	RTP (No connection)
44	XL	RTP (No connection)
45~47	NC	No connection
48	IM3	Interface select
49	IM1	Interface select
50	IM0	Interface select
51	NC	No connection
52	DE	Data ENEABLE signal for RGB interface operation.
53,54	GND	Power ground

Note:

IM3	IM2	IM1	IM0	MPU Interface Mode
0	0	0	1	RGB+8b SPI(fall)
0	0	1	0	RGB+9b SPI(fall)
0	0	1	1	RGB+16b SPI(rise)
1	0	0	1	RGB+8b SPI(rise)
1	0	1	0	RGB+9b SPI(rise)
1	0	1	1	RGB+16b SPI(fall)

5. Absolute Maximum Ratings

Item	Symbol	Min.	Max.	Unit
Logic Supply Voltage	IOVCC	-0.3	3.6	V
Analog Supply Voltage	VCI	-0.3	3.6	V
CTP Supply Voltage	VCC	-0.3	3.6	V
Input Voltage	Vin	-0.3	IOVCC+0.3	V
Operating Temperature	T_{OP}	-20	70	°C
Storage Temperature	T_{ST}	-30	80	°C
Storage Humidity	HD	20	90	%RH

6. DC Characteristics

Item	Symbol	Min.	Typ.	Max.	Unit	Remark
Logic Supply Voltage	IOVCC	1.65	1.8/2.8	3.3	V	-
Analog Supply Voltage	VCI	2.5	2.8	3.3	V	-
CTP Supply Voltage	VCC	2.5	-	3.3	V	-
Input High Voltage	V_{IH}	0.7IOVCC	-	IOVCC	V	-
Input Low Voltage	V_{IL}	GND	-	0.3IOVCC	V	-
Output High Voltage	V_{OH}	0.8IOVCC	-	IOVCC	V	-
Output Low Voltage	V_{OL}	GND	-	0.2IOVCC	V	-
I/O Leak Current	I_{LI}	-1	-	1	uA	-

7. Timing Characteristics

7.1 Display Serial Interface Timing Characteristics

3-Line serial
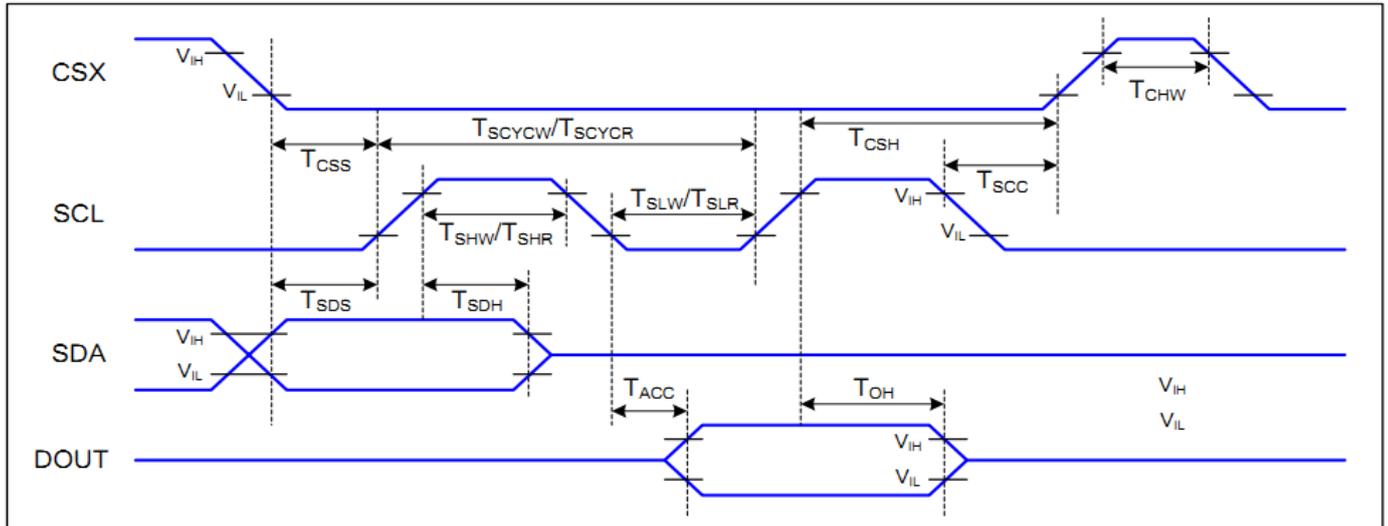

3-line serial Interface Timing Characteristics

Signal	Symbol	Parameter	Min	Max	Unit	Description
CSX	T_{CSS}	Chip select setup time (write)	15		ns	
	T_{CSH}	Chip select hold time (write)	15		ns	
	T_{CSS}	Chip select setup time (read)	60		ns	
	T_{SCC}	Chip select hold time (read)	60		ns	
	T_{CHW}	Chip select "H" pulse width	40		ns	
SCL	T_{SCYCW}	Serial clock cycle (Write)	66		ns	
	T_{SHW}	SCL "H" pulse width (Write)	15		ns	
	T_{SLW}	SCL "L" pulse width (Write)	15		ns	
	T_{SCYCR}	Serial clock cycle (Read)	150		ns	
	T_{SHR}	SCL "H" pulse width (Read)	60		ns	
	T_{SLR}	SCL "L" pulse width (Read)	60		ns	
SDA (DIN)	T_{SDS}	Data setup time	10		ns	
	T_{SDH}	Data hold time	10		ns	

4-Line serial

4-line serial Interface Timing Characteristics

VDDI=1.8,VDD=2.8, AGND=DGND=0V, Ta=25 ℃

Signal	Symbol	Parameter	MIN	MAX	Unit	Description
CSX	T$_{CSS}$	Chip select setup time (write)	15		ns	
	T$_{CSH}$	Chip select hold time (write)	15		ns	
	T$_{CSS}$	Chip select setup time (read)	60		ns	
	T$_{SCC}$	Chip select hold time (read)	65		ns	
	T$_{CHW}$	Chip select "H" pulse width	40		ns	
SCL	T$_{SCYCW}$	Serial clock cycle (Write)	66		ns	-write command & data ram
	T$_{SHW}$	SCL "H" pulse width (Write)	15		ns	
	T$_{SLW}$	SCL "L" pulse width (Write)	15		ns	
	T$_{SCYCR}$	Serial clock cycle (Read)	150		ns	-read command & data ram
	T$_{SHR}$	SCL "H" pulse width (Read)	60		ns	
	T$_{SLR}$	SCL "L" pulse width (Read)	60		ns	
D/CX	T$_{DCS}$	D/CX setup time	10		ns	
	T$_{DCH}$	D/CX hold time	10		ns	
SDA (DIN)	T$_{SDS}$	Data setup time	10		ns	
	T$_{SDH}$	Data hold time	10		ns	

RGB Interface Characteristics :
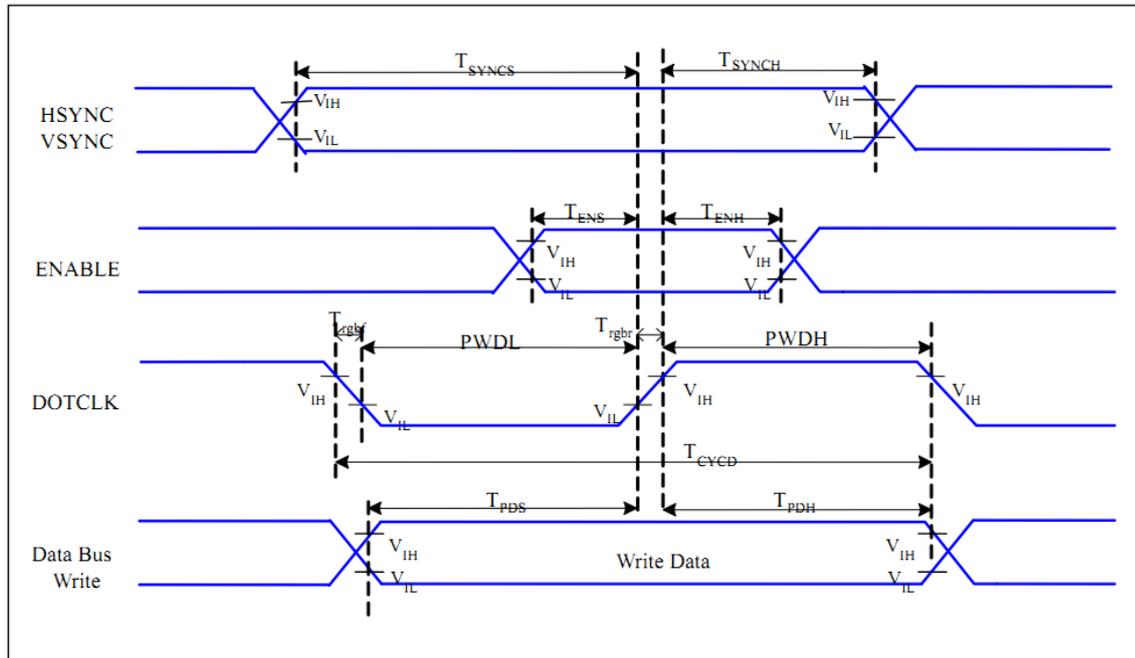
RGB Interface Timing Characteristics:

VDDI=1.8, VDD=2.8, AGND=DGND=0V, Ta=25 ℃

| Signal	Symbol	Parameter	MIN	MAX	Unit	Description
HSYNC, VSYNC	T_{SYNCS}	VSYNC, HSYNC Setup Time	5	-	ns	
ENABLE	T_{ENS}	Enable Setup Time	5	-	ns	
	T_{ENH}	Enable Hold Time	5	-	ns	
DOTCLK	PWDH	DOTCLK High-level Pulse Width	15	-	ns	
	PWDL	DOTCLK Low-level Pulse Width	15	-	ns	
	T_{CYCD}	DOTCLK Cycle Time	33	-	ns	
	Trghr, Trghf	DOTCLK Rise/Fall time	-	15	ns	
DB	T_{PDS}	PD Data Setup Time	5	-	ns	
	T_{PDH}	PD Data Hold Time	5	-	ns	

Table 6 18/16 Bits RGB Interface Timing Characteristics

7.2 Reset Timing:
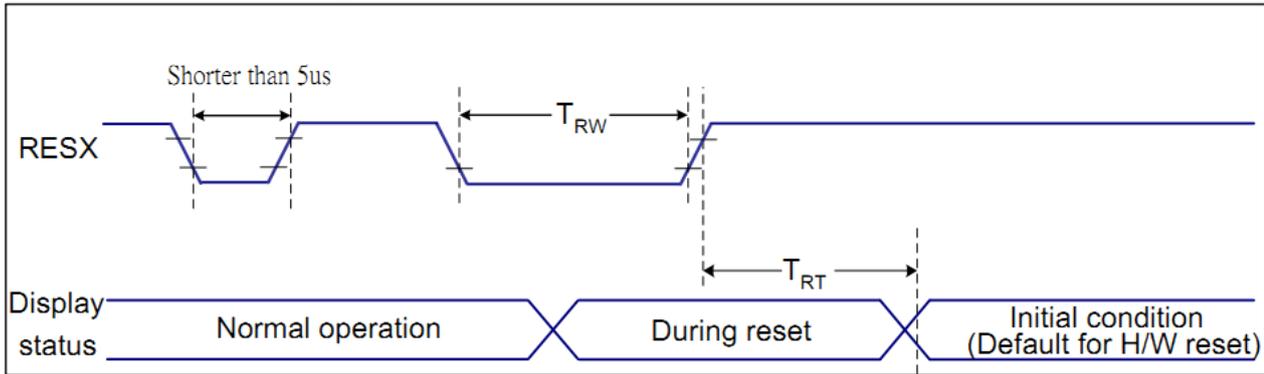
VDDI=1.8,VDD=2.8, AGND=DGND=0V, Ta=25 ℃

Related Pins	Symbol	Parameter	MIN	MAX	Unit
RESX	TRW	Reset pulse duration	10	-	us
	TRT	Reset cancel	-	5 (Note 1, 5)	ms
				120(Note 1, 6, 7)	ms

8. Backlight Characteristic
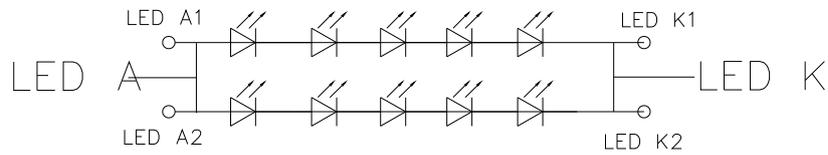
Item	Symbol	MIN	TYP	MAX	UNIT	Test Condition
Supply Voltage	Vf	14	15.6	17	V	If=40mA
Supply Current	If	-	40	-	mA	-
Luminous Intensity for LCM	-	250	300	-	cd/m^2	If=40mA
Uniformity for LCM	-	80	-	-	％	If=40mA
Life Time	-	-	50000	-	Hr	If=40mA
Backlight Color	White					

9. Optical Characteristics

Item	Conditions		Min.	Typ.	Max.	Unit	Note
Viewing Angle (CR>10)	Horizontal	θL	70	80	-	degree	(1),(2),(6)
		θR	70	80	-		
	Vertical	θT	70	80	-		
		θB	70	80	-		
Contrast Ratio	Center		650	800	-	-	(1),(3),(6)
Response Time	Rising + Falling		35		40	ms	(1),(4),(6)
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			TBD		-	
	White y			TBD		-	

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.
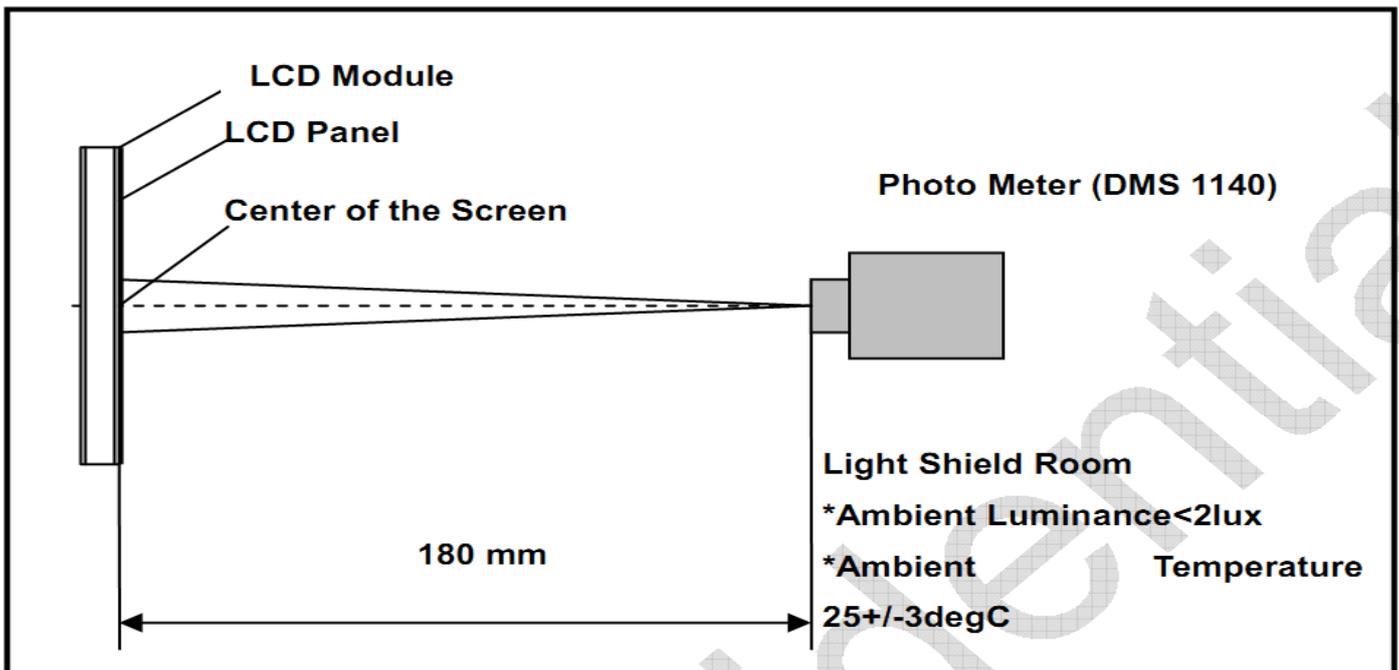
Note (2) Definition of Viewing Angle
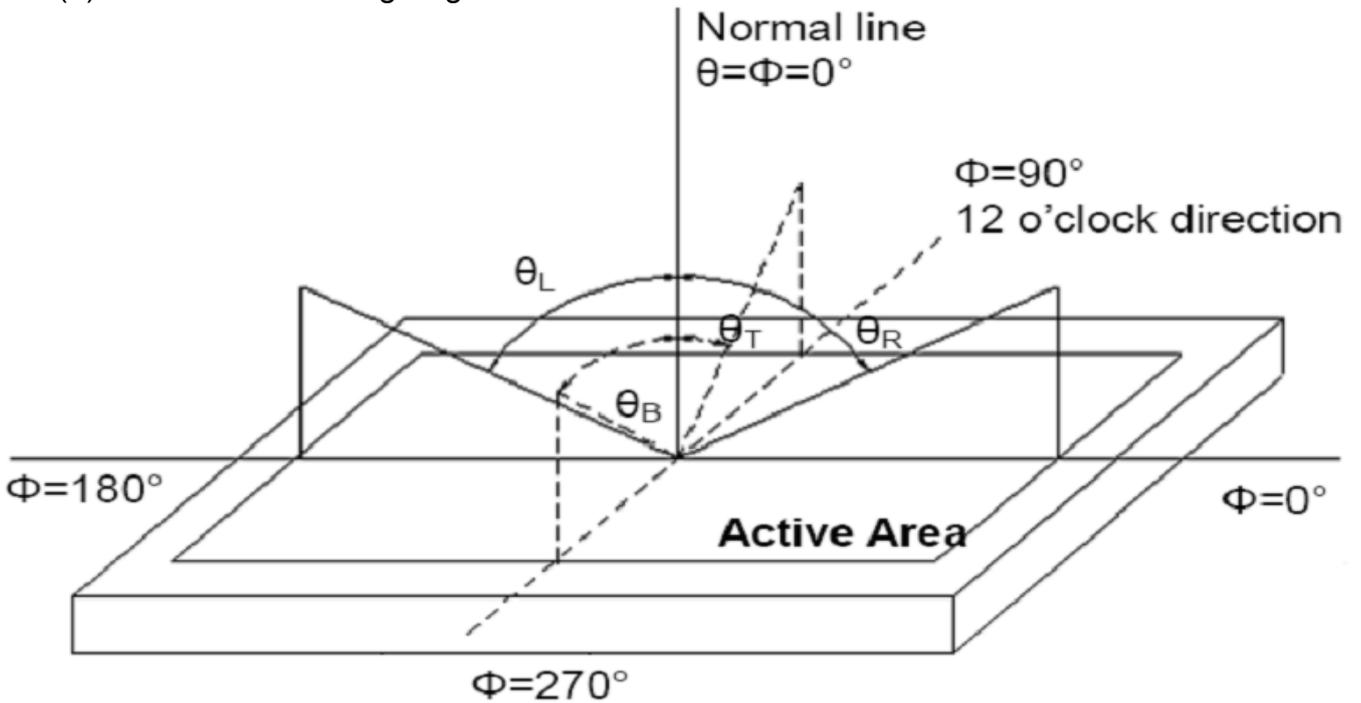
Note (3) Definition of Contrast Ratio (CR)
The contrast ratio can be calculated by the following expression
Contrast Ratio (CR) = L63 / L0

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

Note (4) Definition of response time
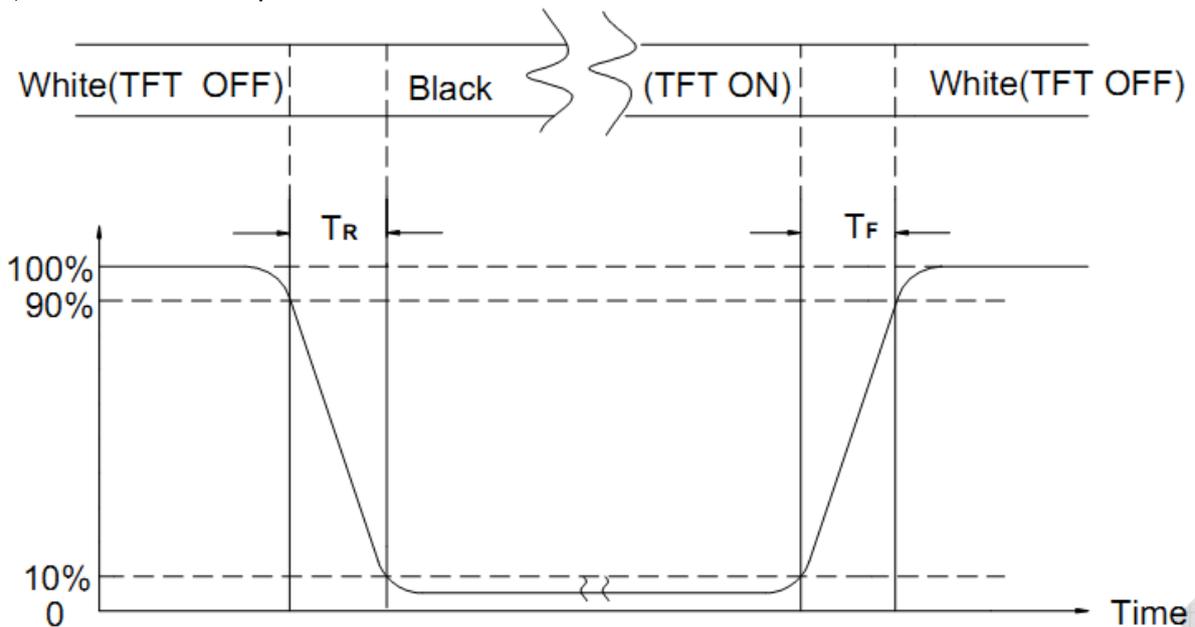
Note (5) Definition of Transmittance (Module is without signal input)
Transmittance = Center Luminance of LCD / Center Luminance of Back Light x 100%

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 ±5℃ 240 hrs Surrounding temperature, then storage at normal condition 4hrs.	
②	Low Temperature Storage	Keep in -30°C ±5℃ 240 hrs Surrounding temperature, then storage at normal condition 4hrs.	
③	High Temperature / High Humidity Storage Test	Keep in 60 ℃ / 90% R.H duration for 240 hrs Surrounding temperature, then storage at normal condition 4hrs. (Excluding the polarizer)	
④	Temperature Cycling Storage Test	-30°C → +25℃ → 80°C → +25℃ (30mins) (5mins) (30mins) (5mins) 30 Cycle Surrounding temperature, then storage at normal condition 4hrs.	
⑤	ESD Test	Air Discharge: Apply 2 KV with 5 times Discharge for each polarity +/-	Contact Discharge: Apply 250 V with 5 times discharge for each polarity +/-
		1. Temperature ambiance : 15℃～35℃ 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%)	
⑥	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 2 Hrs	
⑦	Drop Test (Packaged)	<table><tr><td>Packing Weight (Kg)</td><td>Drop Height (cm)</td></tr><tr><td>0 ~ 45.4</td><td>122</td></tr><tr><td>45.4 ~ 90.8</td><td>76</td></tr><tr><td>90.8 ~ 454</td><td>61</td></tr><tr><td>Over 454</td><td>46</td></tr></table> Drop Direction :※1 corner / 3 edges / 6 sides each 1time	

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：

$\longrightarrow$

11.2.5. Inspection should be carried out with
rope electrostatic ring and static finger cover
(both hands except small fingers must be worn)

END SEAL

可视区
显示区
边框
电极
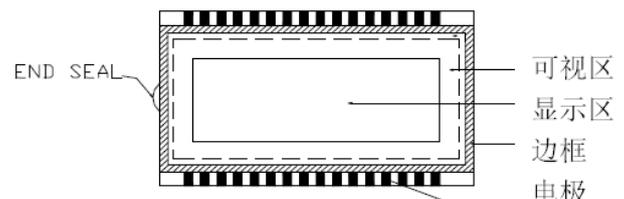
11.2.6. The inspector may make a visual inspection or a comparative examination with a film ruler and a magnifying eyepiece. Individual defects shall be determined according to the limited samples.

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).
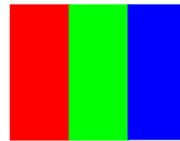
Dot:
Any of the sub-pixels
(Red or Green or Blue).

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

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.
11.4.2	MINOR	BUBBLE IN POLARIZER DENT ON POLARIZER	
11.4.3	MINOR	Dot Defect	
11.4.4	MINOR	Mura	Not visible thriugh 5% ND filter in 50% gray or judge by limit sample if necessary

11.4.1 JUDGEMENT

(A) ROUND TYPE: unit : mm.

DIAMETER (mm.)		ACCEPTABLE Q'TY
$\Phi \leqq 0.15$		Distance≥1mm
$0.15 < \Phi \leqq 0.4$		3 (Distance>15mm)
$0.4 < \Phi$		0

NOTE: Φ=(LENGTH+WIDTH)/2

(B) LINEAR TYPE: unit : mm.

LENGTH	WIDTH	ACCEPTABLE Q'TY
------	$W \leqq 0.03$	Distance≥1mm
$L \leqq 4.0$	$0.03 < W \leqq 0.05$	3 (Distance>15mm)
------	$0.05 < W$	FOLLOW ROUND TYPE

11.4.2 JUDGEMENT

unit : mm.

DIAMETER		ACCEPTABLE Q'TY
$\Phi \leqq 0.2$		Distance≥1mm
$0.2 < \Phi \leqq 0.3$		3 (Distance>15mm)
$0.3 < \Phi$		0

11.4.3 JUDGEMENT

Items	ACC. Q'TY
Bright dot	N≦2 (Distance≥15mm)
Dark dot	N≦3 (Distance≥15mm)

Pixel Define :
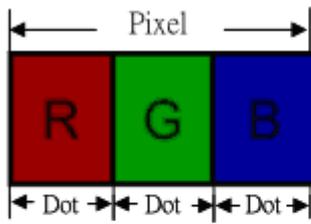
Note 1: The definition of dot: The size of a defective dot over 1/2 of whole dot is regarded as one defective dot. Definittion:<1/2dot and visible by 5% ND filter N≦5

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.

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
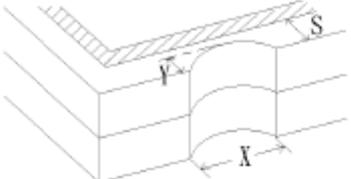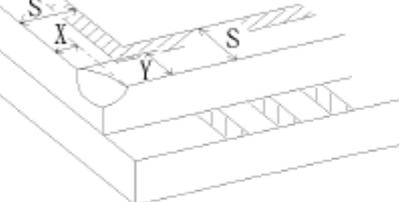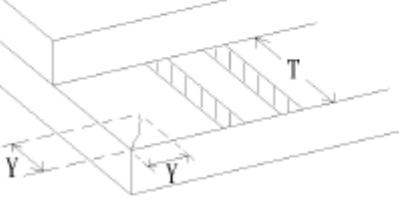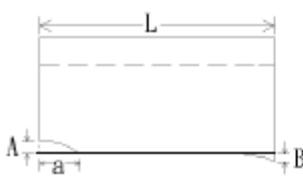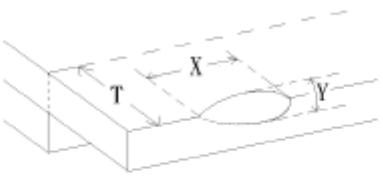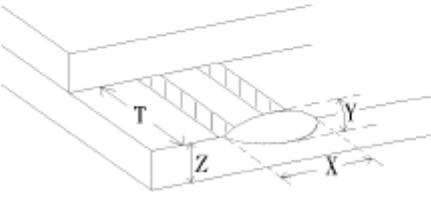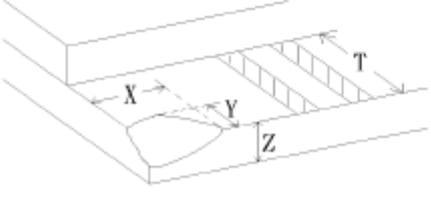
12. Handling Precautions
12.1 Mounting method

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 (Cl) , Sulfur (S)

If goods were sent without being silicon coated on the pad, ITO patterns could be damaged due to the corrosion as time goes on.

If ITO corrosion happen by miss-handling or using some materials such as Chlorine (Cl), Sulfur (S) from customer, Responsibility is on customer.

12.3 Caution against static charge

The LCD module use C-MOS LSI drivers, so we recommended that you:

Connect any unused input terminal to power or ground, do not input any signals before power is turned on, and ground your body, work/assembly areas, and assembly equipment to protect against static electricity.

12.4 packing

- Module employs LCD elements and must be treated as such.
- Avoid intense shock and falls from a height.
- To prevent modules from degradation, do not operate or store them exposed direct to sunshine or high temperature/humidity

12.5 Caution for operation

- It is an indispensable condition to drive LCD's within the specified voltage limit since the higher voltage then the limit cause the shorter LCD life.
- An electrochemical reaction due to direct current causes LCD's undesirable deterioration, so that the use of direct current drive should be avoided.
- Response time will be extremely delayed at lower temperature then the operating temperature range and on the other hand at higher temperature LCD's how dark color in them. However those phenomena do not mean malfunction or out of order with LCD's, which will come back in the specified operation temperature.
- If the display area is pushed hard during operation, some font will be abnormally displayed but it resumes normal condition after turning off once.
- Slight dew depositing on terminals is a cause for electro-chemical reaction resulting in terminal open circuit.
Usage under the maximum operating temperature, 50%Rh or less is required.

12.6 storing

In the case of storing for a long period of time for instance, for years for the purpose or replacement use, the following ways are recommended.

- Storage in a polyethylene bag with the opening sealed so as not to enter fresh air outside in it. And with no desiccant.
- Placing in a dark place where neither exposure to direct sunlight nor light's keeping the storage temperature range.
- Storing with no touch on polarizer surface by the anything else.
  [It is recommended to store them as they have been contained in the inner container at the time of delivery from us

12.7 Safety

- It is recommendable to crash damaged or unnecessary LCD's into pieces and wash off liquid crystal by either of solvents such as acetone and ethanol, which should be burned up later.
- When any liquid leaked out of a damaged glass cell comes in contact with your hands, please wash it off well with soap and water

13. Precaution for Use

13.1

A limit sample should be provided by the both parties on an occasion when the both parties agreed its necessity. Judgment by a limit sample shall take effect after the limit sample has been established and confirmed by the both parties.

13.2

On the following occasions, the handing of problem should be decided through discussion and agreement between responsible of the both parties.

- When a question is arisen in this specification
- When a new problem is arisen which is not specified in this specifications
- When an inspection specifications change or operating condition change in customer is reported to AMSON TFT , and some problem is arisen in this specification due to the change
- When a new problem is arisen at the customer's operating set for sample evaluation in the customer site.

14. Packing Method

TBD