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	2019-04-12	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

LCM

TITEM	STANDARD VALUES	UNITS
LCD type	3.5"TFT	--
Dot arrangement	480(RGB)×640	dots
Color filter array	RGB vertical stripe	--
Display mode	Transflective / Normally Black	-
Gray Scale Inversion Direction	80/80/80/80 deg(U/D/L/R @ C/R>10)	--
Eyes Viewing Direction	ALL	
Driver IC	HX8363A	--
Module size	66.10(W)×88.90(H)×5.13(T)	mm
Active area	53.568W)×71.424(H)	mm
Dot pitch	0.116(W)×0.116(H)	mm
Interface	3-wire SPI + RGB interface	--
Operating temperature	-20 ~ +70	°C
Storage temperature	-30 ~ +80	°C
Back Light	8 White LEDS	--
Weight	TBD	g

Note 1: Viewing direction for best image quality is different from TFT definition, there is a 180 degree shift.
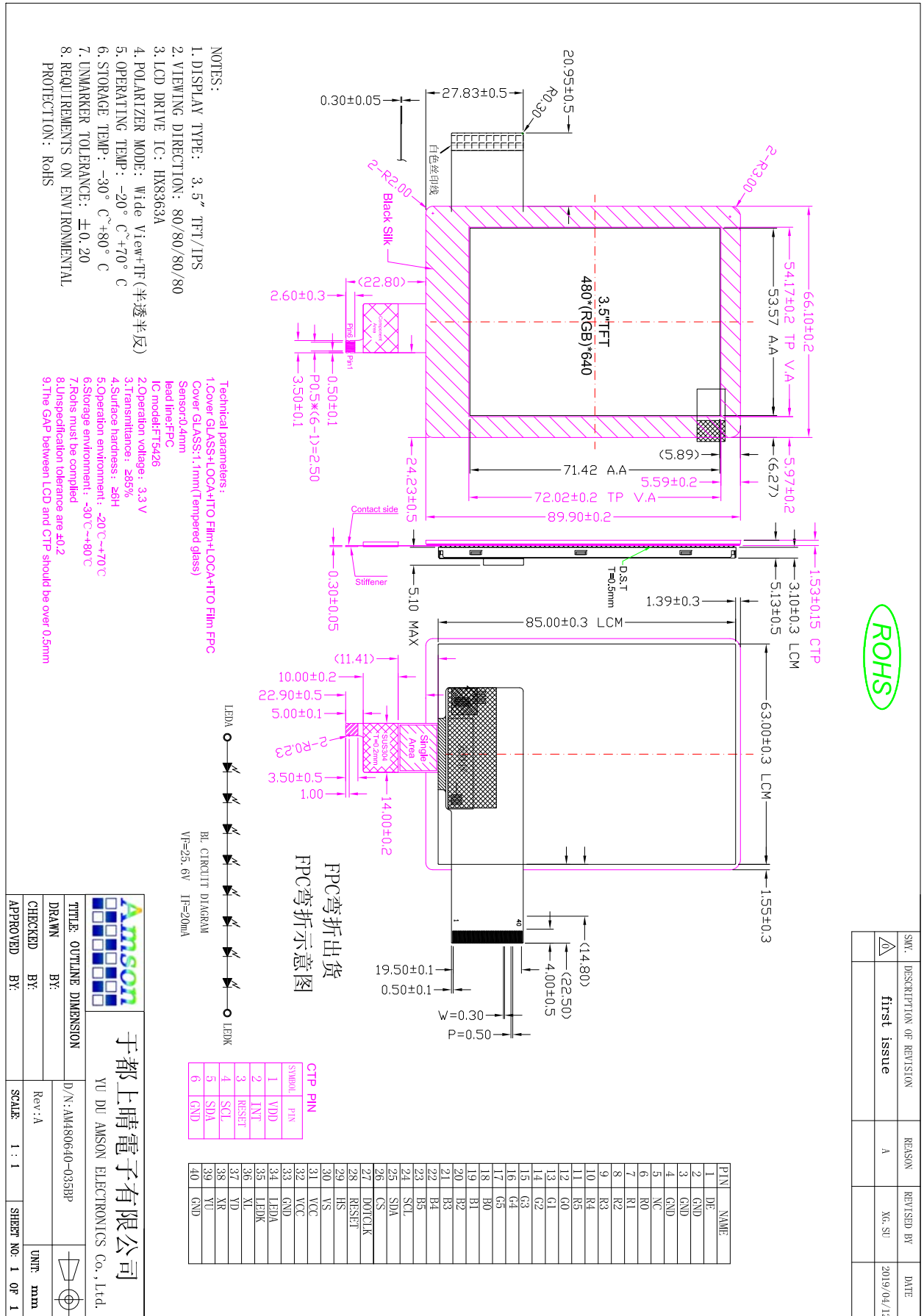
Note 2: Requirements on Environmental Protection: RoHS

Note 3: LCM weight tolerance: +/- 5%

CTP

ITEM	STANDARD VALUES	UNITS
CTP type	Cover Lens + sensor + FPC	--
CTP Driver IC	FT5426	--
Surface Treatment	6H	--
Transmittance	≥85％	--
The cover hardness	6H	--
CTP size	66.10(W)×88.90(H)×1.53(T)	mm
CTP Active area	53.37(W)×71.42(H)	mm
CTP Interface	I2C	
response time	10	ms

3. External Dimensions

NOTES:
1.DISPLAY TYPE: 3.5″ TFT/IPS
2.VIEWING DIRECTION: 80/80/80/80
3.LCD DRIVE IC: HX8363A
4.POLARIZER MODE: Wide View+TF(半透半反)
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

Technical parameters:
1.Cover GLASS+LOCA+ITO Film+LOCA+ITO Film FPC
Cover GLASS:1.1mm(Tempered glass)
Sensor:0.4mm
lead line:FPC
IC model:FT5426
2.Operation voltage: 3.3V
3.Transmittance: ≥85%
4.Surface hardness: ≥6H
5.Operation environment: −20℃~+70℃
6.Storage environment: −30℃~+80℃
7.Rohs must be compiled
8.Unspecification tolerance are ±0.2
9.The GAP between LCD and CTP should be over 0.5mm

3.5″TFT 480*(RGB)*640

BL CIRCUIT DIAGRAM
VF=25.6V IF=20mA

LEDA
LEDK

FPC弯折出货
FPC弯折示意图

CTP PIN	
SYMBOL	PIN
1	VDD
2	INT
3	RESET
4	SCL
5	SDA
6	GND

PIN	NAME
1	DE
2	GND
3	GND
4	GND
5	NC
6	NC
7	R0
8	R1
9	R2
10	R3
11	R4
12	R5
13	G0
14	G1
15	G2
16	G3
17	G4
18	G5
19	B0
20	B1
21	B2
22	B3
23	B4
24	B5
25	CS
26	SDA
27	SCL
28	RESET
29	DOTCLK
30	HS
31	VS
32	VCC
33	VCC
34	GND
35	LEDA
36	LEDK
37	XL
38	YD
39	XR
40	YU
	GND

TITLE: OUTLINE DIMENSION
DRAWN BY:
CHECKED BY:
APPROVED BY:

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

D/N:AM480640-035BP
Rev:A
SCALE: 1:1
SHEET NO: 1 OF 1
UNIT: mm

SMK	DESCRIPTION OF REVISION	REASON	REVISED BY	DATE
A	first issue	A	XG.SU	2019/04/12

4. Interface Description

PIN	PIN NAME	DESCRIPTION
1	ENABLE	Data enable signal in RGB I/F mode
2-4	GND	Power ground
5	NC	NC
6-11	R0-R5	RED DATE
12-17	G0-G5	GREEN DATE
18-23	B0-B5	BIUE DATE
24	SCL	Serial clock input in SPI interface
25	SDI	Serial input signal in SPI I/F.
26	CS	Chip Select pin for Serial Mode Interface
27	DOTCLK	Pixel clock signal in RGB I/F.
28	RESET	Reset pin
29	HS	Horizontal sync signal in RGB I/F.
30	VS	Vertical sync signal in RGB I/F.
31-32	VCI	A supply voltage to the analog circuit.
33	GND	Power ground
34	LEDK	LED backlight (Cathode).
35	LEDA	LED backlight (Anode).
36	NC	NC
36	NC	NC
36	NC	NC
36	NC	NC
40	GND	Power ground

CTP

Pin	Symbol	Description.
1	VDD 3.3V	Power supply.
2	INT	CTP interruption signal.
3	RST	CTP reset pin. Active low to enter reset state.
4	SCL	CTP I2C_clock.
5	SDA	CTP I2C_data.
6	GND	Power ground

Block Diagram
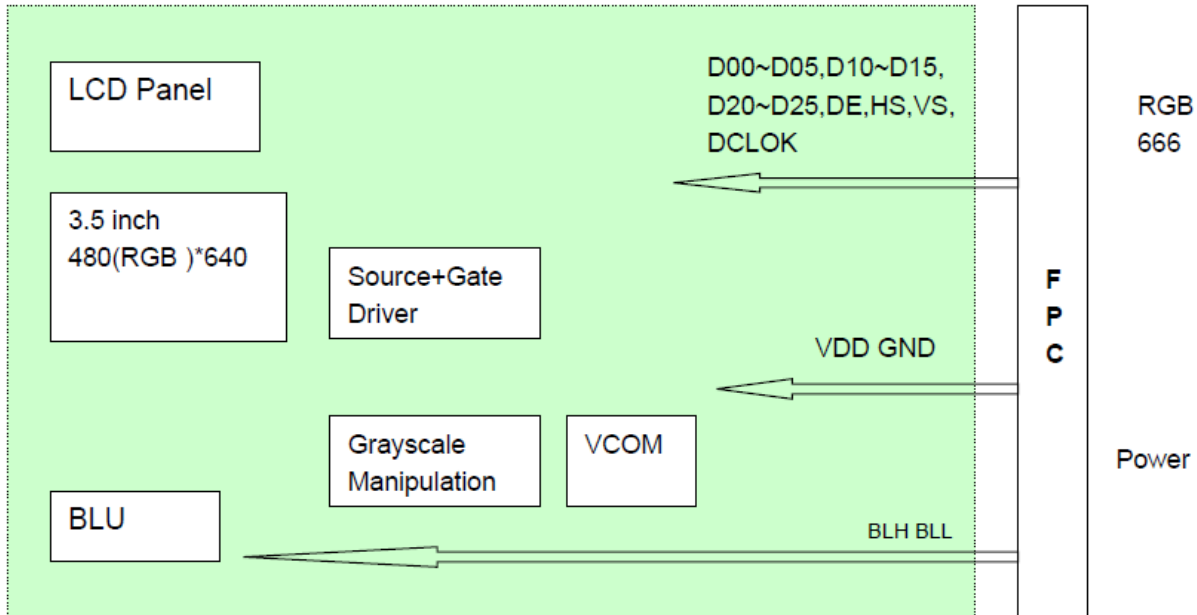
5. Absolute Maximum Ratings

Driving TFT LCD Panel

Item	Symbol	MIN	MAX	Unit	Remark
Supply Voltage	V_{DD}	-0.3	4.6	V	
Operating Temperature	T_{OPR}	-20	70	℃	
Storage Temperature	T_{STG}	-30	80	℃	

6. DC Characteristics

Item		Symbol	MIN	TYP	MAX	Unit	Remark
Supply Voltage		V_{cc}	2.5	3.0	3.3	V	
		IOVCC	1.65	3.0	3.3		
Input Signal Voltage	Low Leve	V_{IL}	0	-	0.3x IOVCC	V	
	High Level	V_{IH}	0.7x IOVCC	-	IOVCC	V	
Output Signal Voltage	Low Leve	V_{OL}	0	-	0.2*IOVCC	V	
	High Level	V_{OH}	0.8*IOVCC	-	IOVCC	V	

7. Timing Characteristics
7.1 RGB Interface Timing

Vertical Timings for RGB I/F
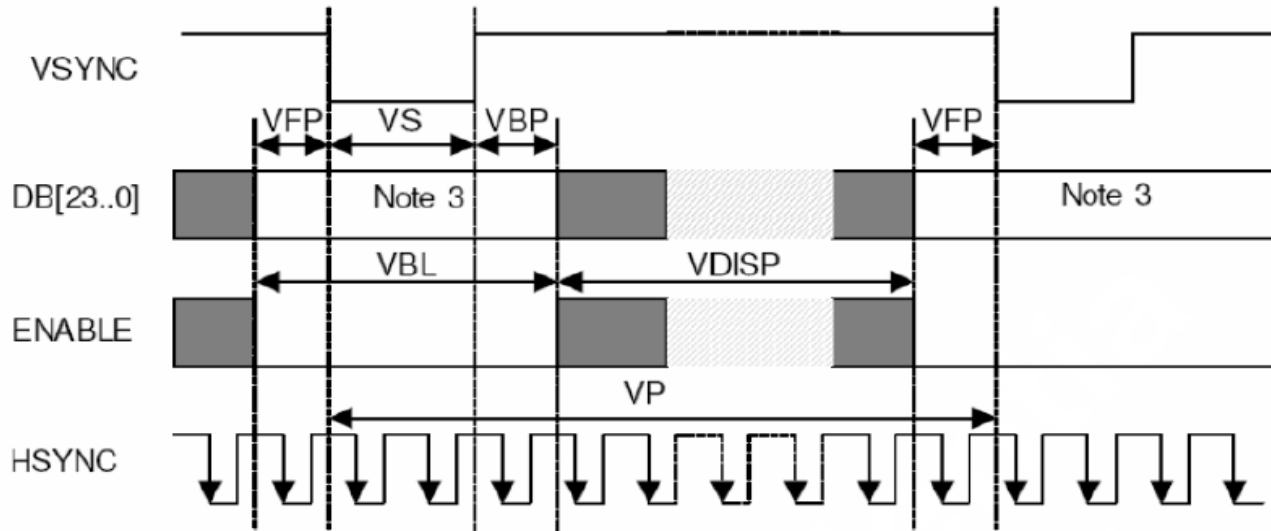
(Resolution=480x854, VSSA=VSSD=0V, VDD1=1.65V to 3.3V, VDD2=2.5 to 3.3V, VDD3=2.5 to 3.3V, T_A = -30 to 70℃)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Vertical cycle	VP	-	860	-	864	Line
Vertical low pulse width	VS	-	2	-	4	Line
Vertical front porch	VFP	-	2	-	4	Line
Vertical back porch	VBP	-	2	-	4	Line
Vertical data start point	-	VS+VBP	4	-	8	Line
Vertical blanking period	VBL	VS+VBP+VFP	6	-	10	Line
Vertical active area	-	VDISP	-	854	-	Line
Vertical Refresh rate	VRR	-	50	-	70	Hz

Note: (1) Signal rise and fall times are equal to or less than 20 ns.
    (2) Input signals are measured by 0.30 x VDD1 for low state and 0.70 x VDD1 for high state.
   (3) Data lines can be set to "High" or "Low" during blanking time – Don't care.
   (4) VRR must keep from 50Hz to 70Hz when adjust other items.

(Resolution=480x800, VSSA=VSSD=0V, VDD1=1.65V to 3.3V, VDD2=2.5 to 3.3V, VDD3=2.5 to 3.3V, T_A = -30 to 70℃)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Vertical cycle	VP	-	806	-	810	Line
Vertical low pulse width	VS	-	2	-	4	Line
Vertical front porch	VFP	-	2	-	4	Line
Vertical back porch	VBP	-	2	-	4	Line
Vertical data start point	-	VS+VBP	4	-	8	Line
Vertical blanking period	VBL	VS+VBP+VFP	6	-	10	Line
Vertical active area	-	VDISP	-	800	-	Line
Vertical Refresh rate	VRR	-	50	-	70	Hz

Note: (1) Signal rise and fall times are equal to or less than 20 ns.
    (2) Input signals are measured by 0.30 x VDD1 for low state and 0.70 x VDD1 for high state.
    (3) Data lines can be set to "High" or "Low" during blanking time – Don't care.
    (4) VRR must keep from 50Hz to 70Hz when adjust other items.

Horizontal Timings for RGB I/F

(Resolution=480x854, VSSA=VSSD=0V, VDD1=1.65V to 3.3V, VDD2=2.5 to 3.3V, VDD3=2.5 to 3.3V, T_A = -30 to 70℃)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
HS cycle	HP	Note[3]	504	-	568	DCK
HS low pulse width	HS	-	5	-	78	DCK
Horizontal back porch	HBP	-	5	-	78	DCK
Horizontal front porch	HFP	-	5	-	78	DCK
Horizontal data start point	-	HS+HBP	19	-	83	DCK
Horizontal blanking period	HBLK	HS+HBP+HFP	24	-	88	DCK
Horizontal active area	HDISP	-	-	480	-	DCK
Pixel clock frequency When RGB I/F is running	DCK	VRR = Min. 50Hz - Max. 70Hz	21.6	-	34.3	MHz
			29.1	-	46.2	ns

Note: (1) Signal rise and fall times are equal to or less than 20 ns.
    (2) Input signals are measured by 0.30 x VDD1 for low state and 0.70 x VDD1 for high state.
    (3) HP is multiples of eight DCK.
    (4) Data lines can be set to "High" or "Low" during blanking time – Don't care.
    (5) VRR must keep from 50Hz to 70Hz when adjust other items.

(Resolution=480x800, VSSA=VSSD=0V, VDD1=1.65V to 3.3V, VDD2=2.5 to 3.3V, VDD3=2.5 to 3.3V, T_A = -30 to 70℃)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
HS cycle	HP	Note[3]	504	-	568	DCK
HS low pulse width	HS	-	5	-	78	DCK
Horizontal back porch	HBP	-	5	-	78	DCK
Horizontal front porch	HFP	-	5	-	78	DCK
Horizontal data start point	-	HS+HBP	19	-	83	DCK
Horizontal blanking period	HBLK	HS+HBP+HFP	24	-	88	DCK
Horizontal active area	HDISP	-	-	480	-	DCK
Pixel clock frequency When RGB I/F is running	DCK	VRR = Min. 50Hz - Max. 70Hz	20.3	-	32.2	MHz
			31	-	49.2	ns

Note: (1) Signal rise and fall times are equal to or less than 20 ns.
    (2) Input signals are measured by 0.30 x VDD1 for low state and 0.70 x VDD1 for high state.
    (3) HP is multiples of eight DCK.
    (4) Data lines can be set to 'High" or "Low" during blanking time – Don't care.
    (5) VRR must keep from 50Hz to 70Hz when adjust other items.

7.2 CTP Timing characteristics
7.2.1 Serial Interface
I^{2}C
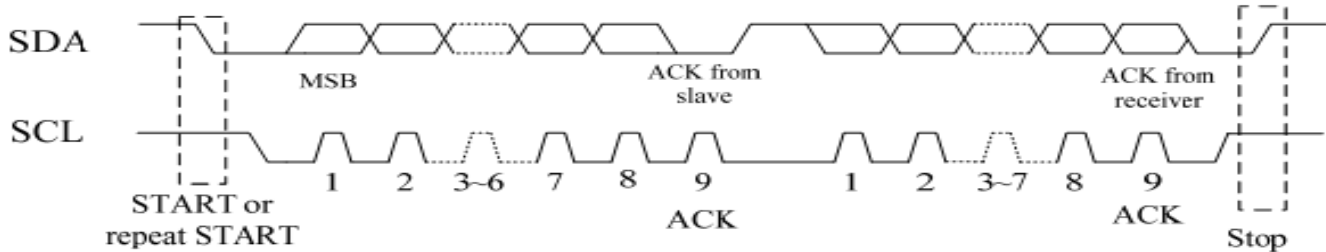
I^{2}C Serial Data Transfer Format
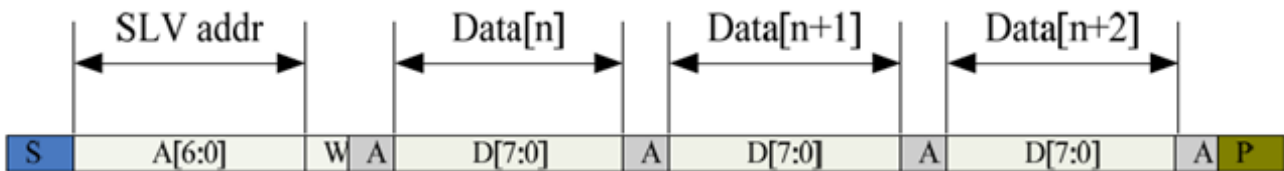
I^{2}C master write, slave read
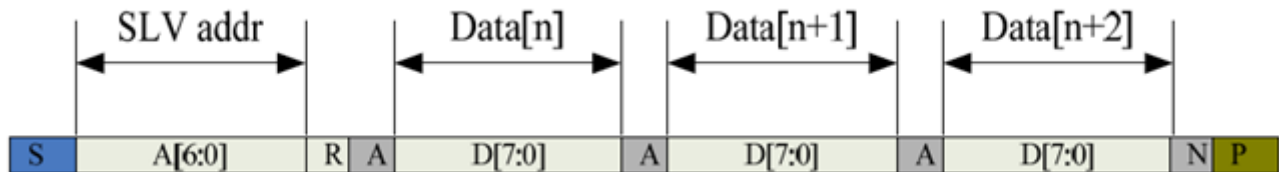
I^{2}C master read, slave write

Mnemonics Description

Mnemonics	Description
S	I2C Start or I2C Restart
A[6:0]	Slave address A[6:0]: address bits are identical to those of I2CADDR [7:1] register.
R/ W	'1' for read, '0'for write
A(N)	ACK(NACK)
P	STOP: the indication of the end of a packet (if this bit is missing, S will indicate the end of the current packet and the beginning of the next packet)

Timing Characteristics

Mnemonics	Description
S	I2C Start or I2C Restart
A[6:0]	Slave address
R/ W	READ/WRITE bit, '1' for read, '0'for write
A(N)	ACK(NACK) bit
P	STOP: the indication of the end of a packet (if this bit is missing, S will indicate the end of the current packet and the beginning of the next packet)

7.2.2 POWER NO /Reset/Wake Sequence

Reset should be pulled down to be low before powering on and powering down. I2C shouldn't be used by other devices during Reset time after VDD powering on (T_{rtp}). INT signal will be sent to the host after initializing all parameters and then start to report points to the host. If Power is down, the voltage of supply must be below 0.3V and Trst is more than 1ms.

Power on time

Power Cycle requirement
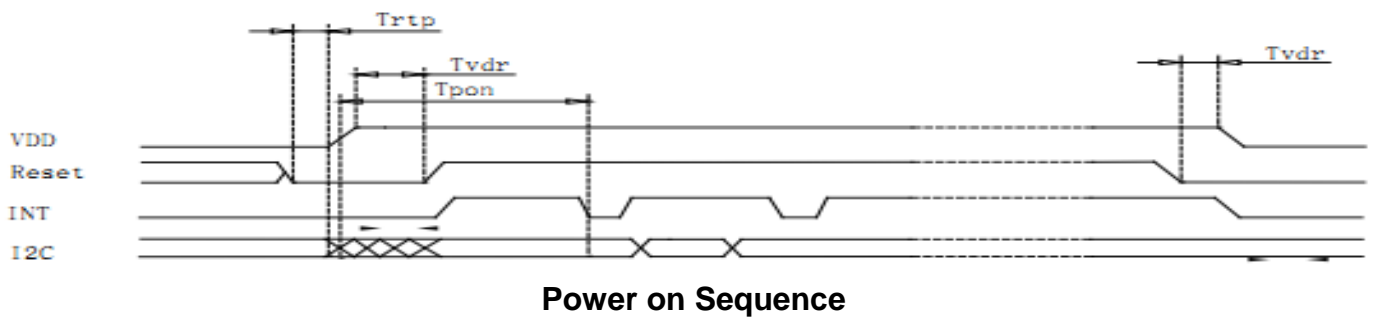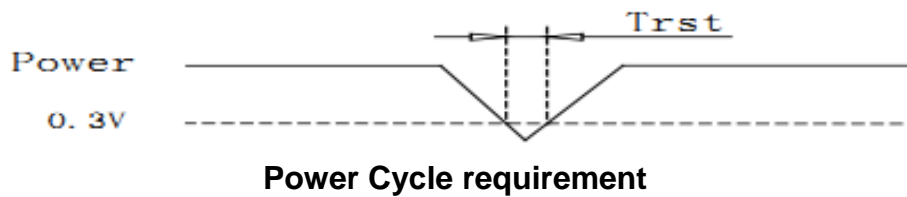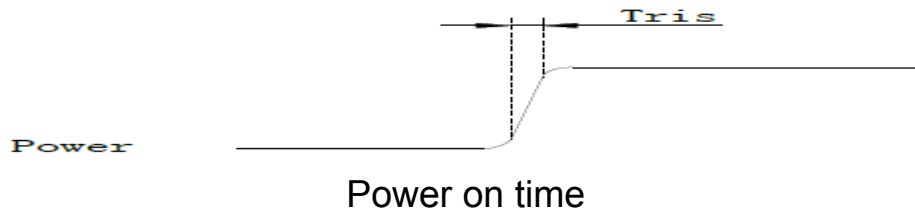
Power on Sequence

Reset time must be enough to guarantee reliable reset, the time of starting to report point after resetting approach to the time of starting to report point after powering on.
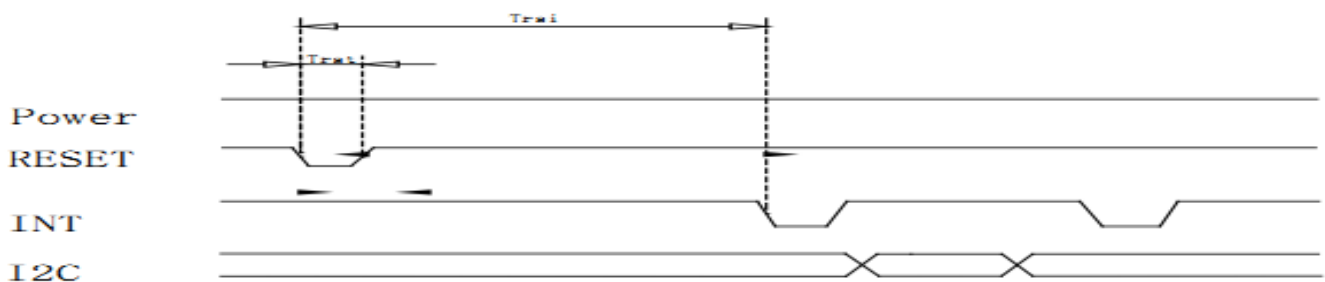
Reset Sequence

Power on/Reset Sequence Parameters

Parameter	Description	Min	Max	Units
Tris	Rise time from 0.1VDD to 0.9VDD	--	5	ms
Trtp	Time of resetting to be low before powering on	100	--	μs
Tpon	Time of starting to report point after powering on	200	--	ms
Tvdr	Reset time after VDD powering on	1	--	ms
Trsi	Time of starting to report point after resetting	200	--	ms
Trst	Reset time	1	--	ms

8. Backlight Characteristic

Item	Symbol	MIN	TYP	MAX	Unit	Remark
Forward Current	I_F	-	20		mA	
Forward Voltage	V_F	24	25.6		V	
Backlight Power consumption	W_{BL}	-	TBD	-	W	

Note 1: Each LED : IF =20 mA, VF =3.2V.
Note 2: Optical performance should be evaluated at Ta=25℃ only.
Note 3: If LED is driven by high current, high ambient temperature & humidity condition. The life time of LED will be reduced.Operating life means brightness goes down to 50% initial brightness. Typical operating life time is estimated data.

9. Optical Characteristics

Item	Conditions		Min.	Typ.	Max.	Unit	Note
Viewing Angle (CR>10)	Horizontal	θL	-	80	-	degree	(1),(2),(6)
		θR	-	80	-		
	Vertical	θT	-	80	-		
		θB	-	80	-		
Center Luminance of White	Lc		80	100	-	cd/m^2	
Contrast Ratio	Center		-	300	-	-	(1),(3),(6)
Response Time	Rising		-	25	35	ms	(1),(4),(6)
	Falling						
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.
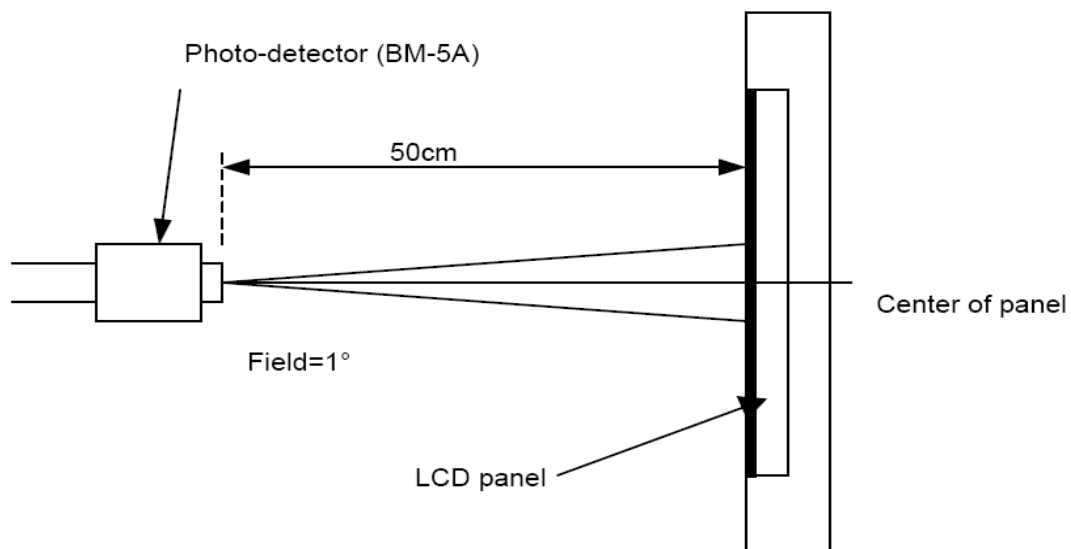
Note (2) Definition of Viewing Angle
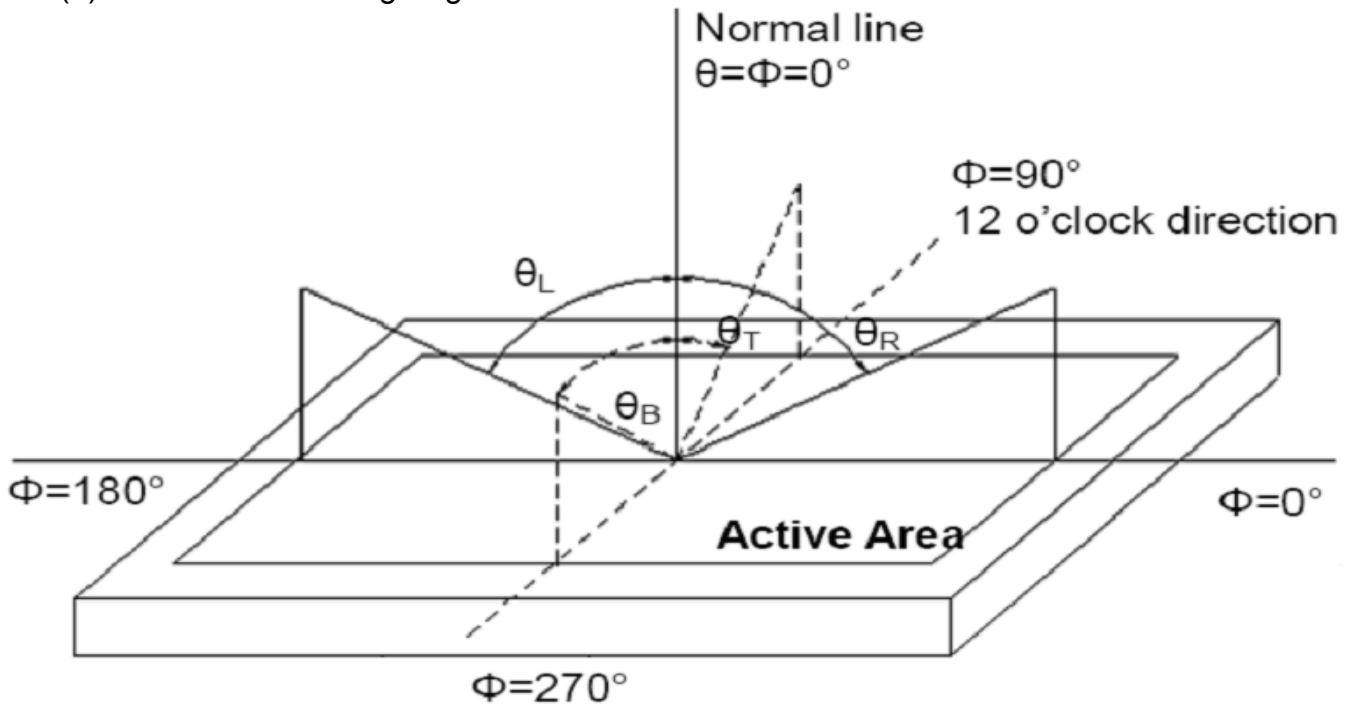
Note (3) Definition of Contrast Ratio (CR)
    The contrast ratio can be calculated by the following expression
    Contrast Ratio (CR) = L63 / L0
    L63: Luminance of gray level 63, L0: Luminance of gray level 0

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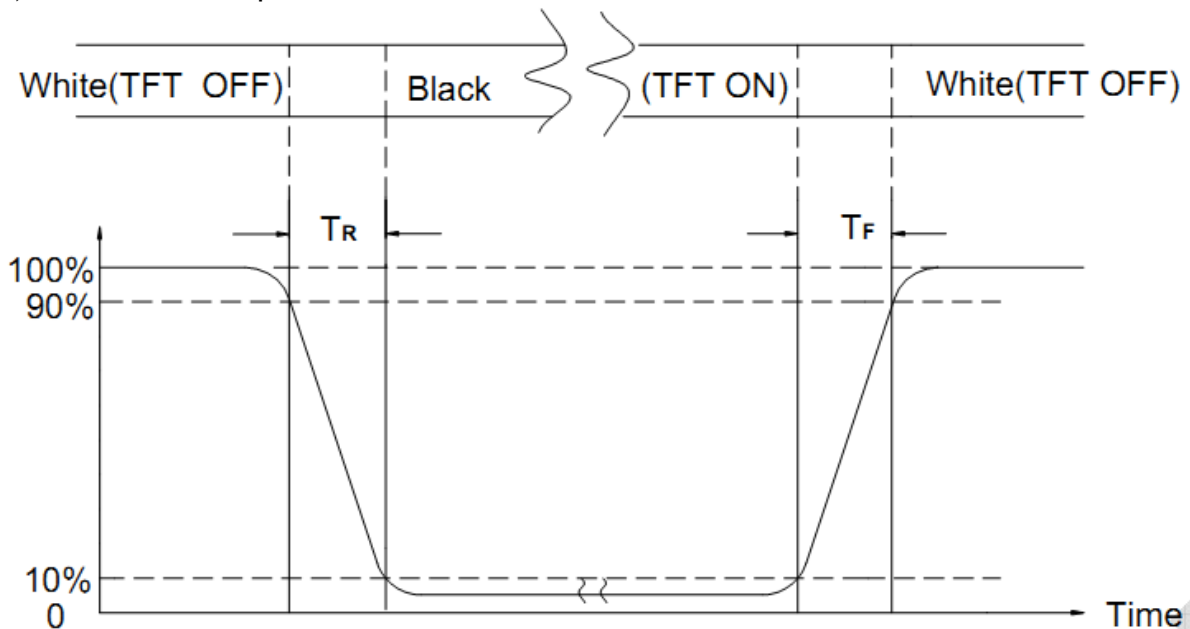
Note (5) Definition of Transmittance (Module is without signal input)
    Transmittance = Center Luminance of LCD / Center Luminance of Back Light x 100%

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：

$\longrightarrow$

END SEAL

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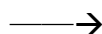
11.2.5. Inspection should be carried out with rope electrostatic ring and static finger cover (both hands except small fingers must be worn)
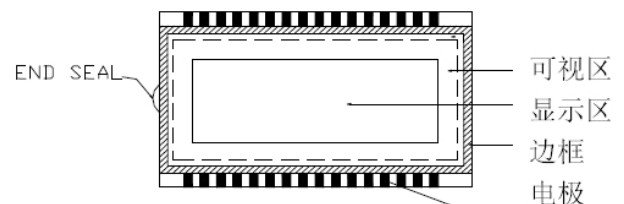
11.2.6.   The inspector may make a visual inspection or a comparative examination with a film ruler and a magnifying eyepiece. Individual defects shall be determined according to the limited samples.

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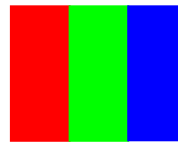
Dot:
Any of the sub-pixels (Red or Green or Blue).
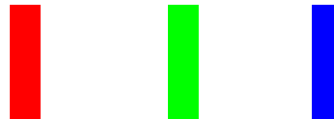
Bright and dark dots:
   A point pixel (sub-pixel: R, G, B pixels) is lit or turned off during the display function test.
Highlights:
   Usually considered to be shown on a black screen.
Dark spots:
   They are generally considered to be shown on R, G, B solid colors or white images.
Neighborhood:
 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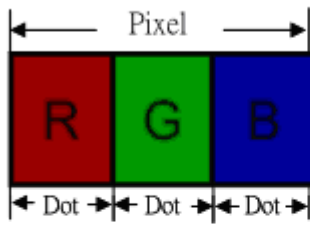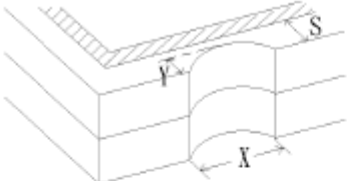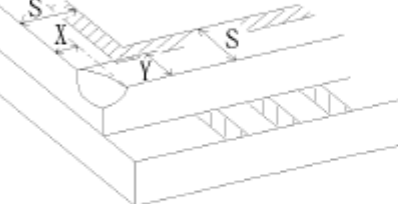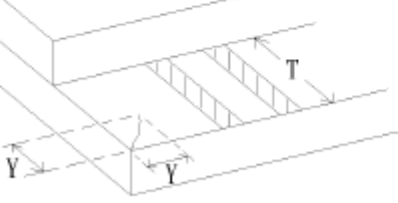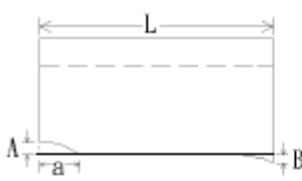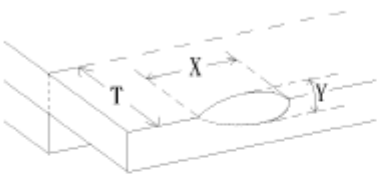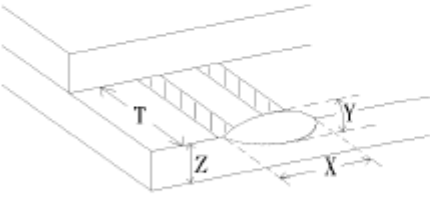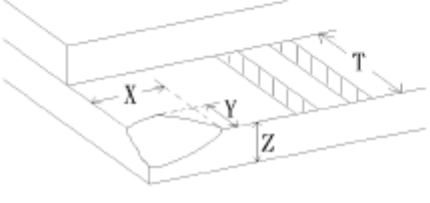
11.3. INSPECTION PLAN :

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

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.			

(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 MINOR — BUBBLE IN POLARIZER / DENT ON POLARIZER

     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 MINOR — Dot Defect

Items	ACC. Q'TY
Bright dot	$N \leqq 2$ (Distance≥15mm)
Dark dot	$N \leqq 3$ (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 $N \leqq 5$

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.

11.4.4 MINOR — Mura

Not visible thriugh 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 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