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	2022-05-25	NEW ISSUE	
B	2022-05-26	MODIFY TEMP	

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	4.3"TFT	--
Dot arrangement	480(RGB)×800	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	60.86(W)×104.5(H)×1.95(T)	mm
Active area	56.16(W)×93.6(H)	mm
Dot pitch	0.117(W)×0.117(H)	mm
Interface	3-wire SPI + RGB interface	--
Operating temperature	-10 ~ +55	°C
Storage temperature	-20 ~ +70	°C
Back Light	8 White LEDS	--

3. External Dimensions

NOTES:
1. DISPLAY TYPE: 4.3" TFT/IPS
2. VIEWING DIRECTION:80/80/80/80
3. LCD DRIVE IC:ST7701S
4. POLARIZER MODE: TRANSMISSIVE/NEGATIVE
5. OPERATING TEMP: -10°C~+55°C
6. STORAGE TEMP: -20°C~+70°C ⚠
7. UNMARKER TOLERANCE: ±0.20
8. REQUIREMENTS ON ENVIRONMENTAL PROTECTION: RoHS

4.3" TFT
480×3(RGB)X800 DOTS

Backlight CIRCUIT DIAGRAM
8 CHIPS LED, VF=25.6V(Type), IF=20mA(Type)

LEDA → LEDK

DETAIL A

PIN	NAME
1	LEDK
2	LEDA
3	NC
4	NC
5	NC
6	NC
7	GND
8	NC
9	VCI
10	IOVCC
11	TE
12	SDO
13	SDI
14	RS
15	/CS
16	/RESET
17	R7
18	R6
19	R5
20	R4
21	R3
22	R2
23	R1
24	R0
25	G7
26	G6
27	G5
28	G4
29	G3
30	G2
31	G1
32	G0
33	B7
34	B6
35	B5
36	B4
37	B3
38	B2
39	B1
40	B0
41	ENABLE
42	DOTCLK
43	HSYNC
44	VSYNC
45	NC
46	SCL
47	IM0
48	IM1
49	IM2
50	IM3
51	GND

SYM.	DESCRIPTION OF REVISION	REASON	REVISED BY	DATE
⚠	first issue	A	XG.SU	2022/05/25
⚠	modify temp	B	XG.SU	2022/05/26

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

TITLE: OUTLINE DIMENSION		
D/N:AM480800-043E		
DRAWN BY:		
CHECKED BY:		
APPROVED BY:		
Rev:B	SCALE: 1:1	SHEET NO: 1 OF 1
		UNIT: mm

4. Interface Description

PIN	PIN NAME	DESCRIPTION
1	LEDK	LED backlight (Cathode).
2	LEDA	LED backlight (Anode).
3	NC	No connection
4	NC	
5	NC	
6	NC	
7	GND	Power ground
8	VCI	A supply voltage to the analog circuit.
9	NC	No connection
10	IOVCC	A supply voltage to the logic circuit.
11	TE	Tearing effect output pin to synchronize MCU to frame writing.
12	SDO	Serial output signal in SPI I/F.
13	SDI	Serial input signal in SPI I/F.
14	RS	Data / Command Selection pin in 4-wire SPI I/F.
15	/CS	Chip select input pin ("Low" enable) in MPU I/F and SPI I/F.
16	/RESET	Reset input pin, Active "L".
17-24	R7-R0	Red Data.
25-32	G7-G0	Green Data.
33-40	B7-B0	Blue Data.
41	ENABLE	Data enable signal in RGB I/F mode
42	DOTCLK	Pixel clock signal in RGB I/F.
43	HSYNC	Horizontal sync signal in RGB I/F.
44	VSYNC	Vertical sync signal in RGB I/F.
45	NC	No connection
46	SCL	A synchronous clock signal in SPI I/F.
47	IM0	
48	IM1	
49	IM2	
50	IM3	
51	GND	Power ground

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)
0/1	1	0	1	MIPI
0	1	1	0	MIPI+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)
1	1	1	0	MIPI+16b SPI(fall)

5. Absolute Maximum Ratings

Item	Symbol	Min.	Max.	Unit
Logic Supply Voltage	IOVCC	-0.3	4.6	V
Analog Supply Voltage	VCI	-0.3	4.6	V
Input Voltage	Vin	-0.3	IOVCC+0.3	V
Operating Temperature	T_{OP}	-10	55	°C
Storage Temperature	T_{ST}	-20	70	°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	3.3	V	-
Analog Supply Voltage	VCI	2.5	2.8	3.6	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 Leakage Current	I_{LI}	-1	-	1	uA	-

7. Timing Characteristics
7.1 Reset Timing Characteristics
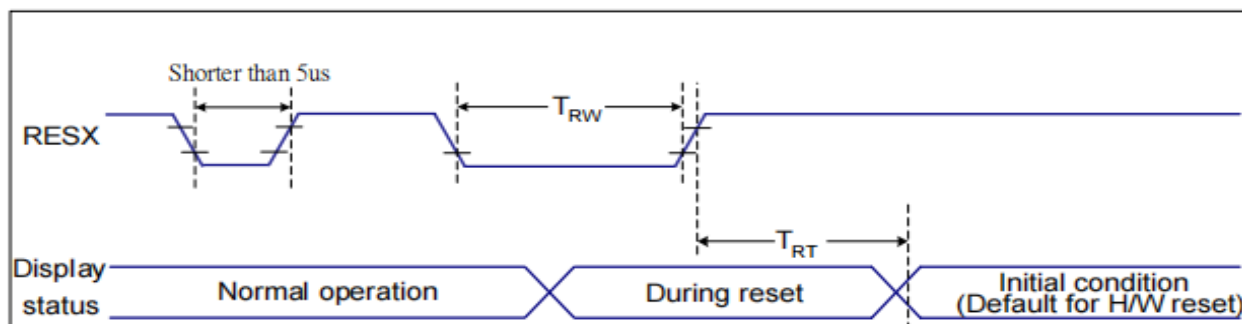
Figure 9 Reset Timing

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

Table 9 Reset Timing

Notes:

1. The reset cancel includes also required time for loading ID bytes, VCOM setting and other settings from NVM (or similar device) to registers. This loading is done every time when there is HW reset cancel time (tRT) within 5 ms after a rising edge of RESX.

2. Spike due to an electrostatic discharge on RESX line does not cause irregular system reset according to the table below:

RESX Pulse	Action
Shorter than 5us	Reset Rejected
Longer than 9us	Reset
Between 5us and 9us	Reset starts

3. During the Resetting period, the display will be blanked (The display is entering blanking sequence, which maximum time is 120 ms, when Reset Starts in Sleep Out –mode. The display remains the blank state in Sleep In –mode.) and then return to Default condition for Hardware Reset.

4. Spike Rejection also applies during a valid reset pulse as shown below:

10μs

Reset is accepted

10μs

20ns   Less than 20ns width positive spike will be rejected.
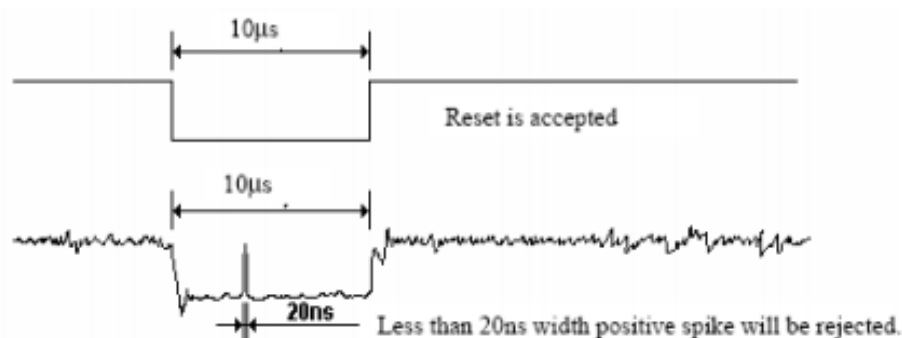
5. When Reset applied during Sleep In Mode.

6. When Reset applied during Sleep Out Mode.

7. It is necessary to wait 5msec after releasing RESX before sending commands. Also Sleep Out command cannot be sent for 120msec.

7.2 AC Characteristics
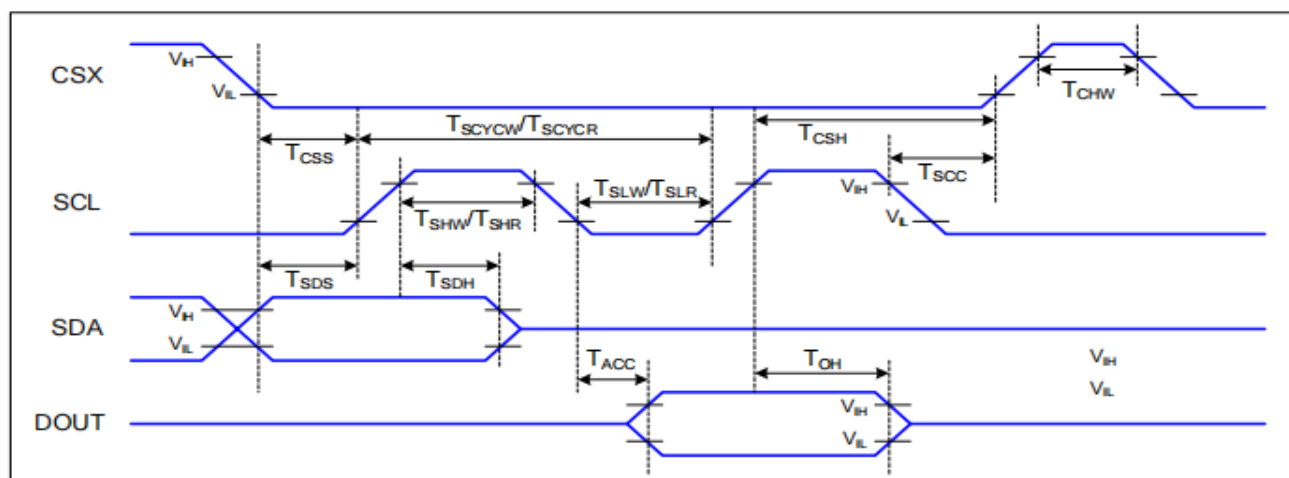
7.2.1 Serial Interface Characteristics(3-line serial):

Figure 1 3-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)	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	T$_{SDS}$	Data setup time	10		ns	
(DIN)	T$_{SDH}$	Data hold time	10		ns	

Table 4 3-line serial Interface Characteristics

Note : The rising time and falling time (Tr, Tf) of input signal are specified at 15 ns or less. Logic high and low levels are specified as 30% and 70% of VDDI for Input signals.

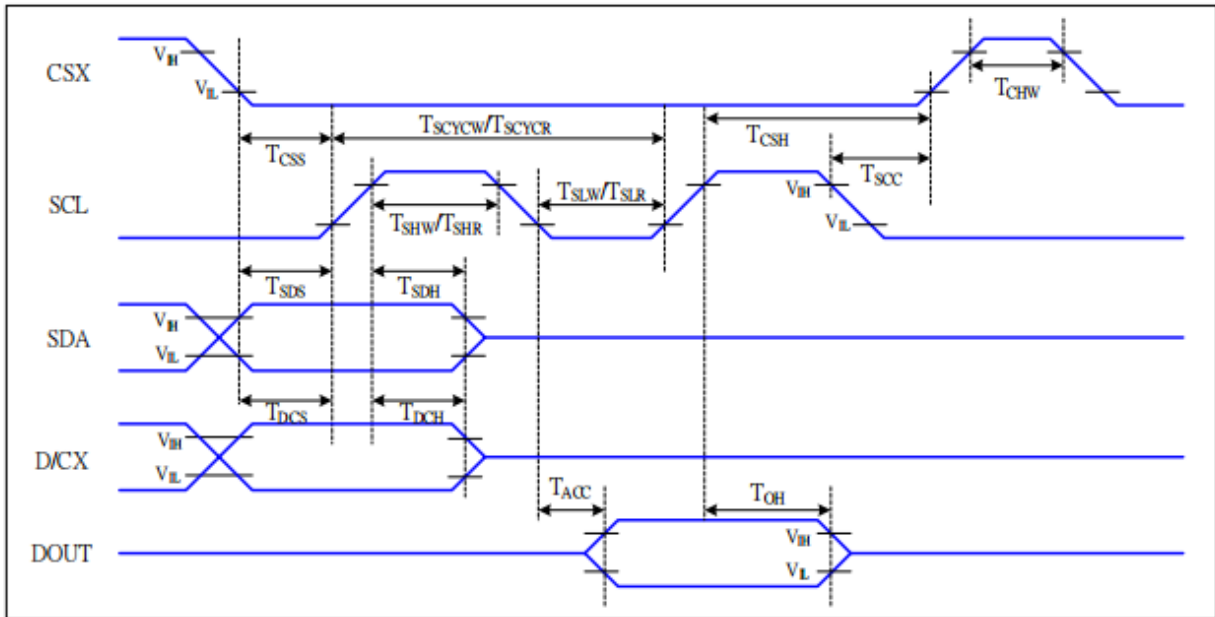## 7.2.2 Serial Interface Characteristics(4-line serial):

Figure 2 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	

Table 5 4-line serial Interface Characteristics

Note : The rising time and falling time (Tr, Tf) of input signal are specified at 15 ns or less. Logic high and low levels are specified as 30% and 70% of VDDI for Input signals.
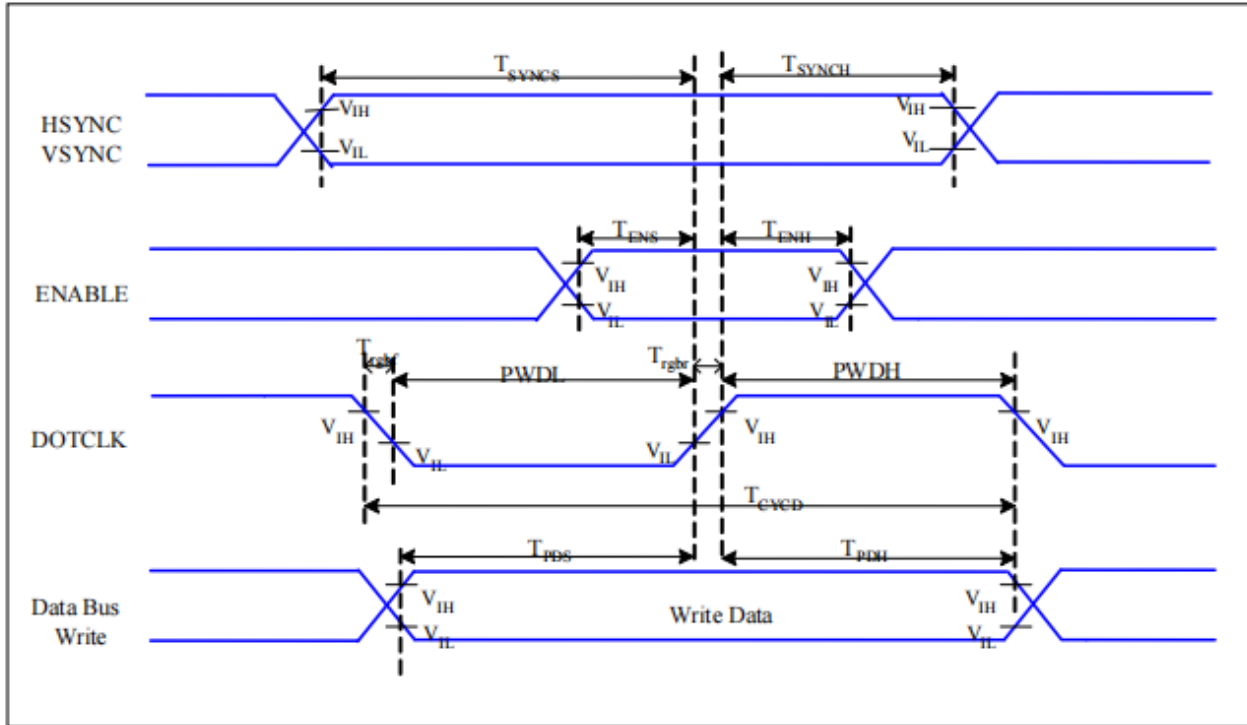
7.2.3 RGB Interface Characteristics:



Figure 3 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

7.3 RGB Interface Timing Characteristics

7.3.1 Vertical Timings for RGB I/F

RGB I/F Vertical Timings
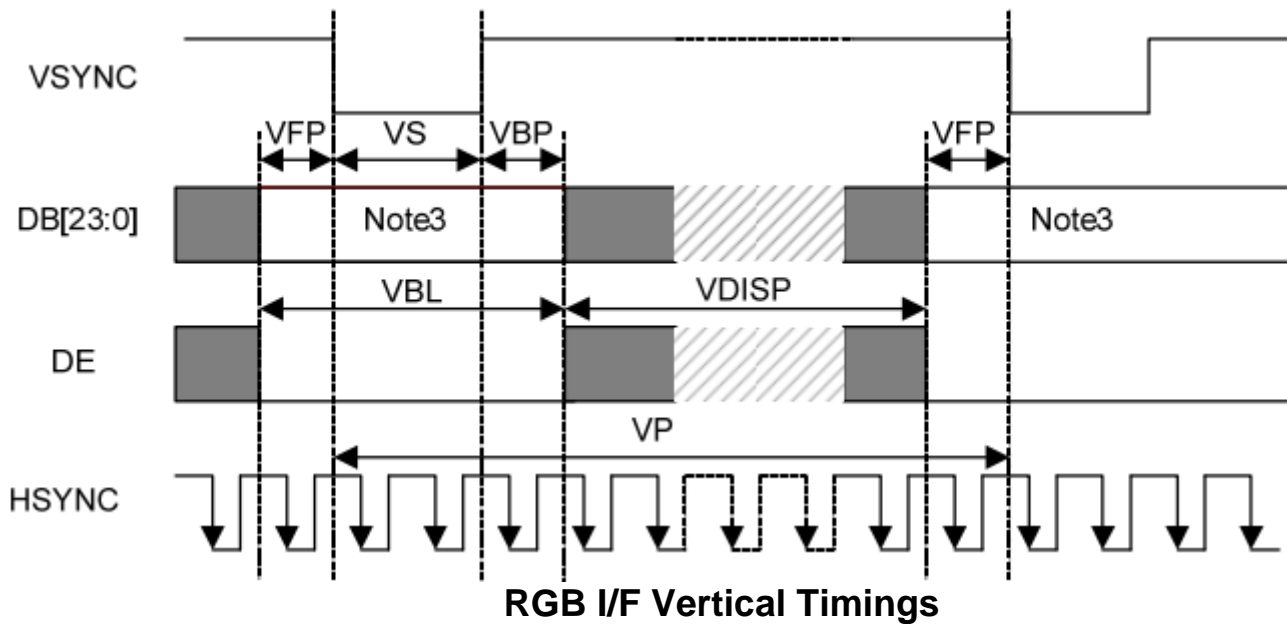
Resolution=480x800(T_A=25°C, IOVCC=1.8V, VCIP=2.8V, VCI=2.8V)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Vertical cycle	VP	-	806	-	-	Line
Vertical low pulse width	VS	-	2	-	Note(4)	Line
Vertical front porch	VFP	-	2	-	-	Line
Vertical back porch	VBP	-	2	-	Note(4)	Line
Vertical data start point	-	VS+VBP	4	-	Note(4)	Line
Vertical blanking period	VBL	VS+VBP+VFP	6	-	-	Line
Vertical active area	-	VDISP	-	800	-	Line
Vertical Refresh rate	VRR	-	-	60	-	Hz

**Note:** (1) Signal rise and fall times are equal to or less than 10 ns.
(2) Measuring of input signals are using 0.30 x IOVCC for low state and 0.70 x IOVCC for high state.
(3) Data lines can be set to "High" or "Low" during blanking time – Don't care.
(4) The VS and VBP pulse width are related to GSP and GCK timing. The GSP and GCK must be set at corresponding position for LCD normal display.

RGB I/F Vertical Timings

7.3.2 Horizontal Timings for RGB I/F
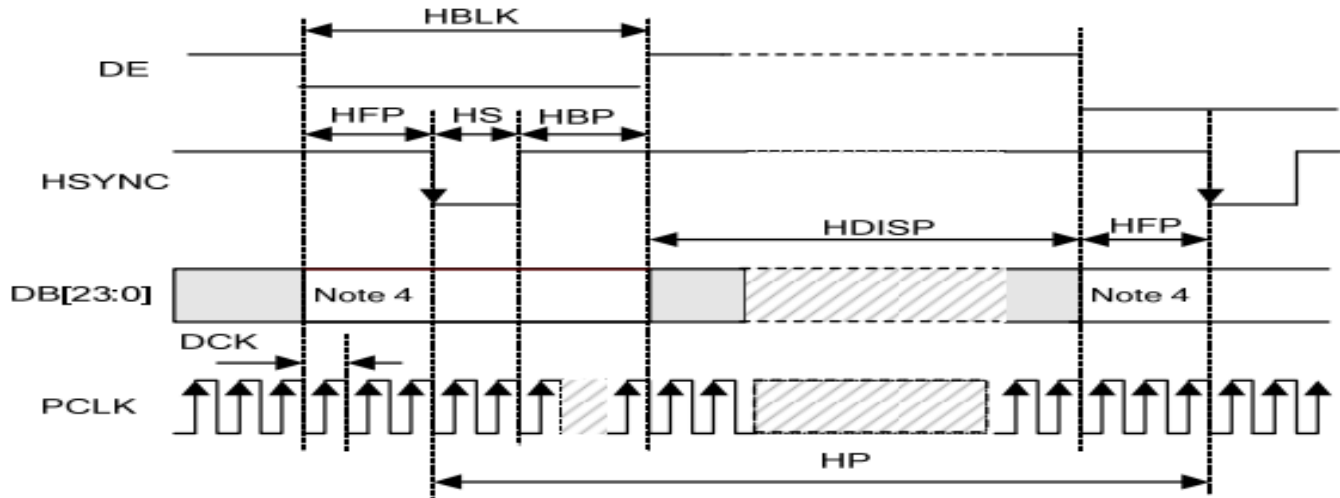
RGB I/F Horizontal Timings

Resolution=480x800 (T_A=25°C, IOVCC=1.8V, VCIP=2.8V, VCI=2.8V)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
HS cycle	HP	Note(3)	496	-	568	DCK
HS low pulse width	HS	-	6	-	78	DCK
Horizontal back porch	HBP	-	5	-	78	DCK
Horizontal front porch	HFP	-	5	-	78	DCK
Horizontal data start point	-	HS+HBP	11	-	83	DCK
Horizontal blanking period	HBLK	HS+HBP+HFP	16	-	88	DCK
Horizontal active area	HDISP	-	-	480	-	DCK
Pixel clock frequency When RGB I/F is running	DCK	VRR = 50 ~ 70 Hz	19.9	-	32.0	MHz

Note: (1) Signal rise and fall times are equal to or less than 10 ns.
(2) Measuring of input signals are using 0.30 x IOVCC for low state and 0.70 x IOVCC 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.

RGB I/F Horizontal Timings

8. Backlight Characteristic

LED CIRCUIT:

LEDA ——————▷|—▷|—▷|—▷|—▷|—▷|—▷|—————— LEDK

Item	Symbol	MIN	TYP	MAX	UNIT	Test Condition
Supply Voltage	Vf	24	25.6	28	V	If=20mA
Supply Current	If	-	20	-	mA	-
Luminous Intensity for LCM	-	250	300	-	cd/m^2	If=20mA
Uniformity for LCM	-	80	-	-	℅	If=20mA
Life Time	-	-	50000	-	Hr	If=20mA
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.
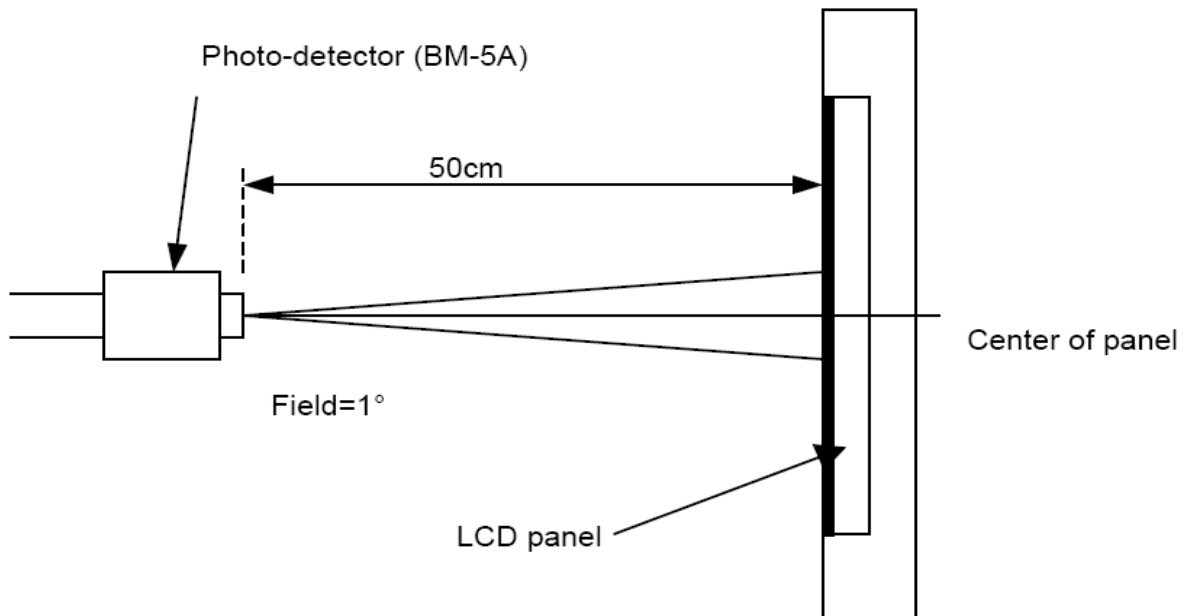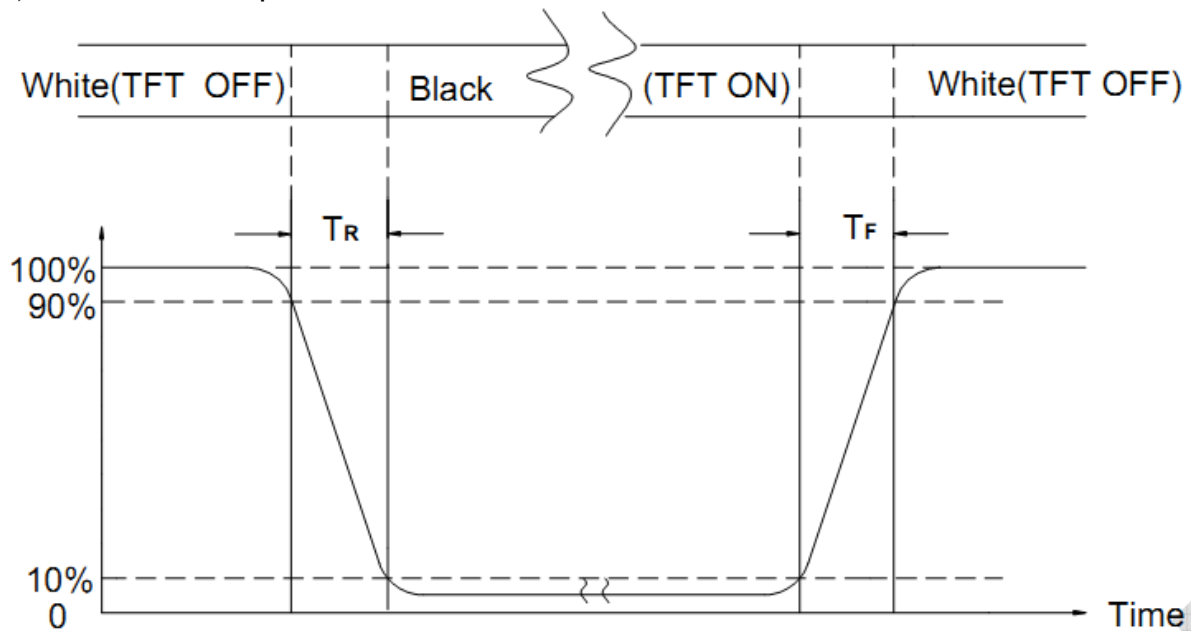
Note (2) Definition of Viewing Angle
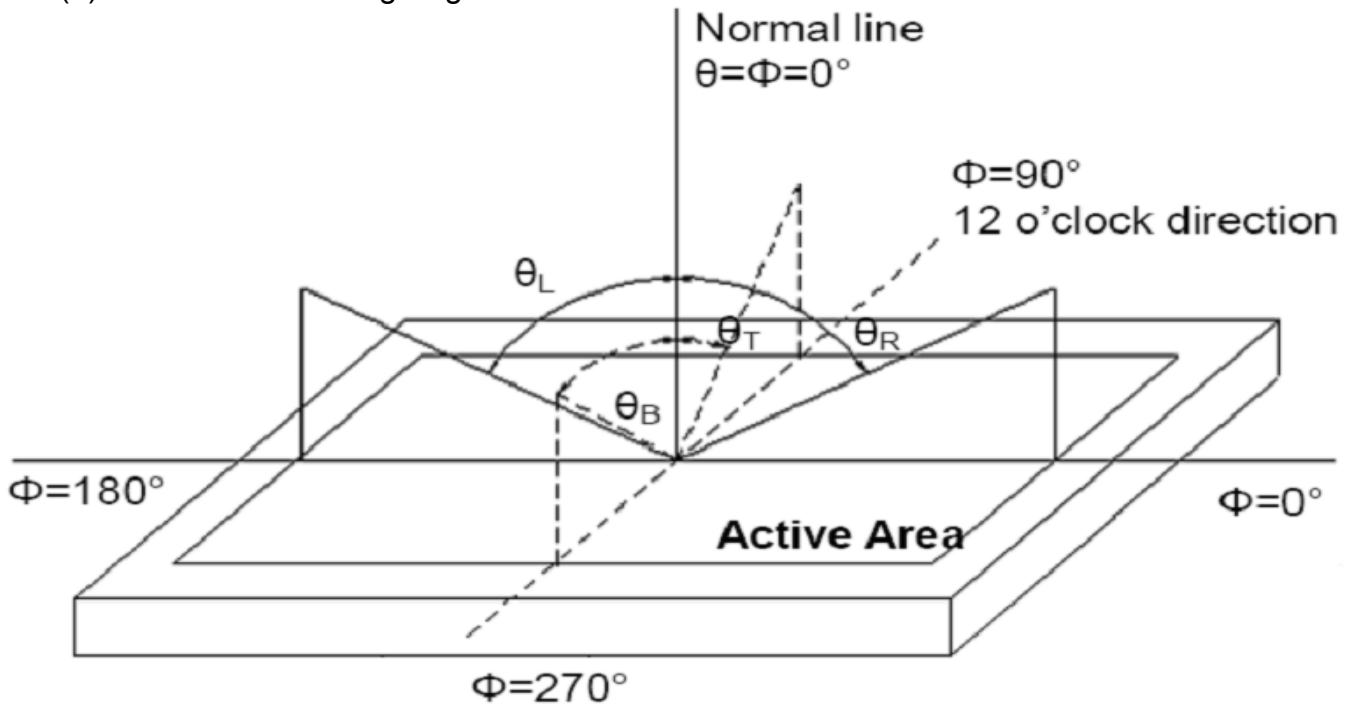
Note (3) Definition of Contrast Ratio (CR)
    The contrast ratio can be calculated by the following expression
    Contrast Ratio (CR) = L63 / L0
    L63: Luminance of gray level 63, L0: Luminance of gray level 0

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	INSPECTION AFTER TEST
	High Temperature Storage	70°C±2°C×96Hours	Inspection after 2~4hours storage at room temperature, the samples should be free from defects: 1, Air bubble in the LCD. 2, Seal leak. 3, Non-display. 4, Missing segments. 5, Glass crack. 6, Current IDD is twice higher than initial value. 7, The surface shall be free from damage. 8, The electric characteristic requirements shall be satisfied.
	Low Temperature Storage	-20°C±2°C×96Hours	
	High Temperature Operating	55°C±2°C×96Hours	
	Low Temperature Operating	-10°C±2°C×96Hours	
	Temperature Cycle(Storage)	-20°C ⟺ 25°C ⟺ 70°C (30min) (5min) (30min) 1cycle Total 10cycle	
	Damp Proof Test (Storage)	50°C±5°C×90%RH×96Hours	
	Vibration Test	Frequency:10Hz~55Hz~10Hz Amplitude:1.5M X,Y,Z direction for total 3hours (packing condition test will be tested by a carton)	
	Drooping Test	Drop to the ground from 1M height one time every side of carton. (packing condition test will be tested by a carton)	
	ESD Test	Voltage:±8KV,R:330Ω,C:150PF, Air Mode,10times	

REMARK:
1, The Test samples should be applied to only one test item.
2, Sample side for each test item is 5~10pcs.
3,For Damp Proof Test, Pure water(Resistance＞10MΩ)should be used.
4,In case of malfunction defect caused by ESD damage, if it would be recovered to normal state after resetting, it would be judge as a good part.
5, EL evaluation should be accepted from reliability test with humidity and temperature: Some defects such as black spot/blemish can happen by natural chemical reaction with humidity and Fluorescence EL has.
6, Failure Judgment Criterion: Basic Specification Electrical Characteristic, Mechanical Characteristic, Optical Characteristic.

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
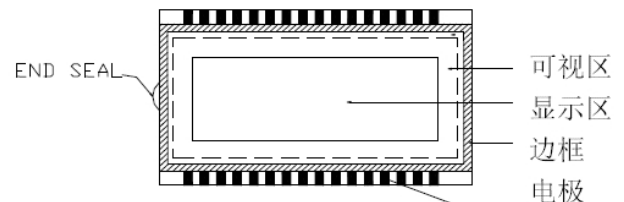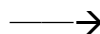**11.2.1.**CHECKING DIRECTION SHALL BE IN THE 45 DEGREE AREA TO FACE THE SAMPLE.

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.

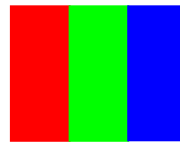**11.2.8.** the ion fan should be used when testing.

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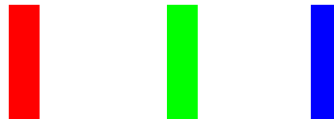
Bright and dark dots:
  A point pixel (sub-pixel: R, G, B pixels) is lit or turned off during the display function test.
Highlights:
  Usually considered to be shown on a black screen.
Dark spots:
  They are generally considered to be shown on R, G, B solid colors or white images.
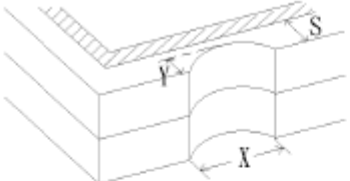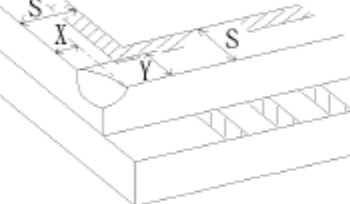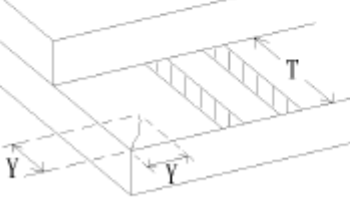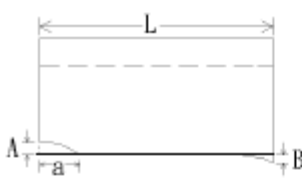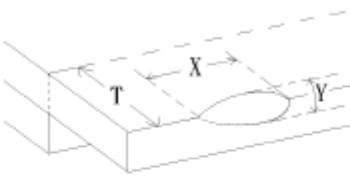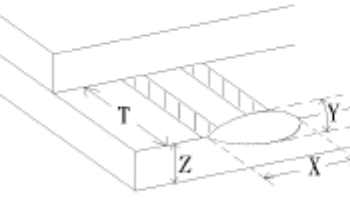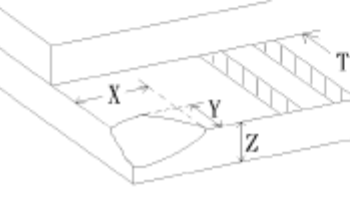**Neighborhood**:
  Two or three adjacent point pixels (dot: sub-pixel) connected together (R, G or G, B or B, R or RGB).

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

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: Φ ≤ 0.1 → DISREGARD 0.1 < Φ ≤ 0.25 → 3 (Distance>5mm) 0.25 < Φ → 0 NOTE: Φ=(LENGTH+WIDTH)/2 (B) LINEAR TYPE: unit : mm. LENGTH / WIDTH / ACCEPTABLE Q'TY: ------ / W ≤0.03 → DISREGARD L ≤ 5.0 / 0.03 < W ≤0.07 → 3 (Distance>5mm) ------ / 0.07 < W → FOLLOW ROUND TYPE
11.4.2	MINOR	BUBBLE IN POLARIZER DENT ON POLARIZER	unit : mm. DIAMETER / ACCEPTABLE Q'TY: Φ ≤ 0.2 → DISREGARD 0.2 < Φ ≤ 0.5 → 2 (Distance>5mm) 0.5 < Φ → 0
11.4.3	MINOR	Dot Defect	Items / ACC. Q'TY: Bright dot → N≤ 4 Dark dot → N≤ 4 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. 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.

(A) ROUND TYPE: (11.4.1)

unit : mm.

DIAMETER (mm.)	ACCEPTABLE Q'TY
Φ ≤ 0.1	DISREGARD
0.1 < Φ ≤ 0.25	3 (Distance>5mm)
0.25 < Φ	0

NOTE: Φ=(LENGTH+WIDTH)/2

(B) LINEAR TYPE:

unit : mm.

LENGTH	WIDTH	ACCEPTABLE Q'TY
------	W ≤0.03	DISREGARD
L ≤ 5.0	0.03 < W ≤0.07	3 (Distance>5mm)
------	0.07 < W	FOLLOW ROUND TYPE

(11.4.2)

unit : mm.

DIAMETER	ACCEPTABLE Q'TY
Φ ≤ 0.2	DISREGARD
0.2 < Φ ≤ 0.5	2 (Distance>5mm)
0.5 < Φ	0

(11.4.3)

Items	ACC. Q'TY
Bright dot	N≤ 4
Dark dot	N≤ 4

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.

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 (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.