



# Specification for Approval

Customer: \_\_\_\_\_

Model Name: \_\_\_\_\_

Supplier Approval			Customer approval
R&D Designed	R&D Approved	QC Approved	
<i>Peter</i>	<i>Peng Jun</i>		



## Table of Contents

List	Description	Page No.
	Cover	1
	Revision Record	2
	Table of Contents	3
1	Scope	4
2	General Information	4
3	External Dimensions	5
4	Interface Description	6
5	Absolute Maximum Ratings	8
6	DC Characteristics	8
7	Timing Characteristics	9
8	Backlight Characteristics	14
9	Optical Characteristics	15
10	Reliability Test Conditions and Methods	17
11	Inspection Standard	18
12	Handling Precautions	24
13	Precaution for Use	25
14	Packing Method	25

## 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

ITEM	STANDARD VALUES	UNITS
LCD type	4.3" TFT	--
Dot arrangement	480(RGB) × 272	dots
Color filter array	RGB vertical stripe	--
Display mode	TN / Transmission / Normally White	-
Gray Scale Inversion Direction	6 O'clock	--
Eyes Viewing Direction	12 O'clock	
Driver IC	ST7282	--
Module size	113.20(W) × 73.20(H) × 21.83(T)	mm
Active area	95.04(W) × 53.86(H)	mm
Interface	DPI / GPIO Interface	--
Operating temperature	-20 ~ +70	°C
Storage temperature	-30 ~ +80	°C
Back Light	10 White LED	--
Weight	TBD	g

### CTP

ITEM	STANDARD VALUES	UNITS
CTP type	Cover Lens+sensor+FPC	--
CTP Driver IC	ICN8826	--
Surface Treatment	6H	--
Transmittance	≥85%	--
The cover hardness	6H	--
CTP size	109.35(W) × 73.2(H) × 1.45(T)	mm
CTP Active area	97.1(W) × 55.9(H)	mm
CTP Interface	I2C	
response time	10	ms



## 4. Interface Description

### J1: DPI Interface

PIN	PIN NAME	DESCRIPTION
1	VCC	Supply Voltage 3.3V
2	VDD	BL VIN Voltage 5.0V
3	VS	Vertical sync input. Negative polarity.
4	VDD	BL VIN Voltage 5.0V
5	HS	Horizontal sync input. Negative polarity.
6	GND	Power ground.
7	B2	Blue Data Input
8	G0/G6	Green Data Input.
9	GND	Power ground.
10	G1/G7	Green Data Input
11,12	R3,R4	Red Data Input
13	GPIO_A/PWM	RPI GPIO 27/Backlight PWM
14	GND	Power ground.
15	GPIO_B/CTP_INT	RPI GPIO22/PCTP INTERRUPT
16	GPIO_B/CTP_SCL	RPI GPIO23/I2C Serial CLOCK Line
17	VCC	Supply Voltage 3.3V
18	GPIO_B/CTP_SDA	RPI GPIO24/I2C Serial Data Line
19	G2	Green Data Input
20	GND	Power ground.
21	B1/B7	Blue Data Input
22	GPIO_E	RPI GPIO25
23	G3	Green Data Input
24	B0/B6	Blue Data Input
25	GND	Power ground.
26	B5	Blue Data Input
27	DCLK	Clock input.

28	DE	Data Enable signal.
29	B3	Blue Data Input
30	GND	Power ground.
31	B4	Blue Data Input
32,33	G4,G5	Green Data Input.
34	GND	Power ground.
35	R5	Red Data Input
36	R2	Red Data Input
37	GPIO_F	RPI GPIO26
38	R0/R6	Red Data Input
39	GND	Power ground.
40	R1/R7	Red Data Input.

## J2: GPIO Interface

PIN	PIN NAME	DESCRIPTION
1	VDD	BL VIN Voltage 5.0V
2	GPIO_A/PWM	RPI GPIO 27/Backlight PWM
3	VDD	BL VIN Voltage 5.0V
4	GPIO_B/CTP_INT	RPI GPIO22/PCTP INTERRUPT
5	VCC	Supply Voltage 3.3V
6	GPIO_B/CTP_SCL	RPI GPIO23/I2C Serial CLOCK Line
7	VCC	Supply Voltage 3.3V
8	GPIO_B/CTP_SDA	RPI GPIO24/I2C Serial Data Line
9	GND	Power ground.
10	GPIO_E	RPI GPIO25
11	GND	Power ground.
12	GPIO_F	RPI GPIO26

## 5. Absolute Maximum Ratings

Item	Symbol	Min.	Max.	Unit
Power Supply Voltage	VCC	-0.3	3.96	V
	VDD	-0.3	20	V
Logic Voltage	BL_PWM	-0.3	20	V
Operating Temperature	T <sub>OP</sub>	-20	70	°C
Storage Temperature	T <sub>ST</sub>	-30	80	°C
Storage Humidity	HD	-	90	%RH

## 6. DC Characteristics

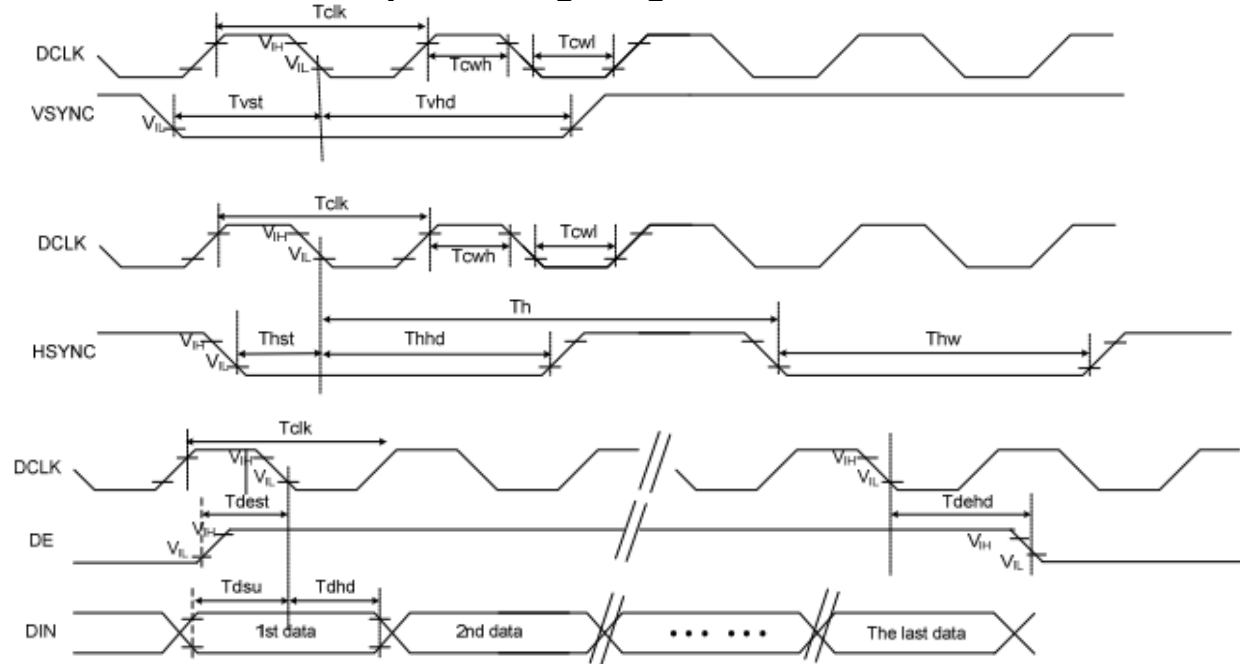
Item	Symbol	Min.	Typ.	Max.	Unit	Remark
Analog Supply Voltage	VCC	3.0	3.3	3.6	V	-
	VDD	4.5	5.0	5.5	V	-
Input High Voltage	V <sub>IH</sub>	0.7VDD	-	VDD	V	-
Input Low Voltage	V <sub>IL</sub>	GND	-	0.3 VDD	V	-
Output High Voltage	V <sub>OH</sub>	0.8 VDD	-	VDD	V	-
Output Low Voltage	V <sub>OL</sub>	GND	-	0.2 VDD	V	-
Logic Voltage	BL_PWM		3.3		V	-
PWM Frequency	F <sub>pwm</sub>	5		100	KHz	-

Note: Maximum current from RGB full-display

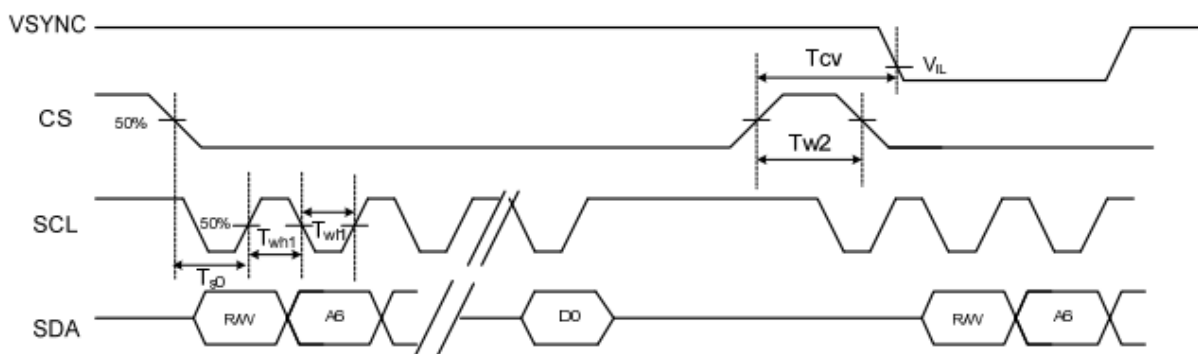


## 7. Timing Characteristics

### 7.1 Clock and Data Input Timing Diagram



### 7.2 3-Wire Communication Timing Diagram



## 7.3 AC Characteristic

VDD=VDDI= 3.3V, AGND= 0V

Item	Symbol	Min.	Typ.	Max.	Unit	Conditions
System operation timing						
VDD power source slew time	TPOR	-	-	20	ms	From 0V to 99% VDD
GRB pulse width	tRSTW	10	50	-	us	R=10Kohm, C=1uF
Input/ Output timing						
CLK pulse duty	Tcw	40	50	60	%	
Hsync width	Thw	1	-	-	DCLK	
Hsync period	Th	55	60	65	us	
Vsync setup time	Tvst	12	-	-	ns	
Vsync hold time	Tvhd	12	-	-	ns	
Hsync setup time	Thst	12	-	-	ns	
Hsync hold time	Thhd	12	-	-	ns	
Data setup time	Tdsu	12	-	-	ns	
Data hold time	Tdhd	12	-	-	ns	
DE setup time	Tdest	10	-	-	ns	
DE setup time	Tdehd	10	-	-	ns	
SD output stable time	Tst	-	-	12	us	Output settled within +20mV Loading = 6.8k+28.2pF.
GD output rise and fall time	Tgst	-	-	6	us	Output settled (5%~95%), Loading = 4.7k+29.8pF
3-wire serial communication						
Delay between CSB and VSYNC	Tcv	1			us	
CS input setup time	Ts0	50			ns	
Serial data input setup time	Ts1	50			ns	
CS input hold time	Th0	50			ns	
Serial data input hold time	Th1	50			ns	
SCL pulse high width	Twh1	50			ns	
SCL pulse low width	Twl1	50			ns	
CS pulse high width	Tw2	400			ns	

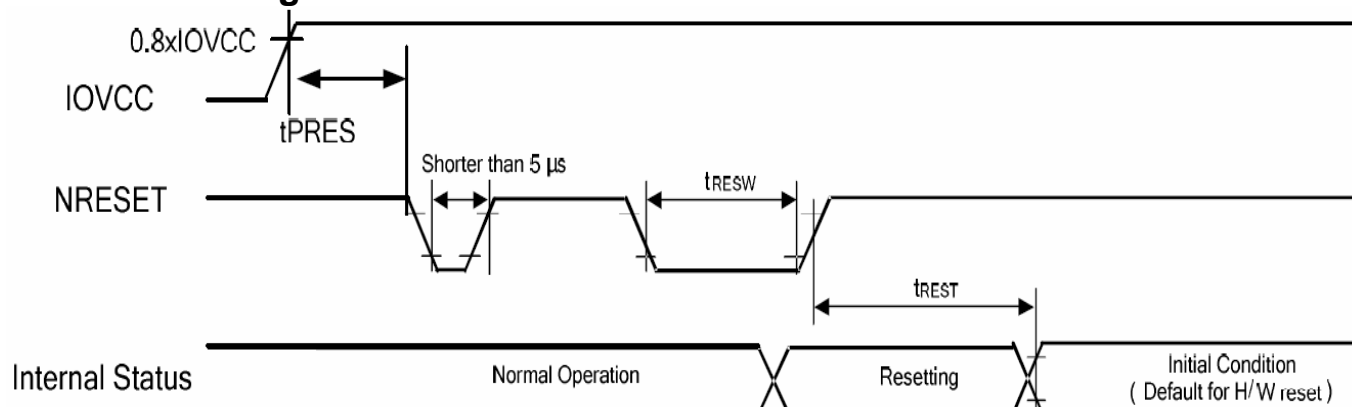
## 7.4 RGB Input Timing Table

### Parallel 24-bit RGB Timing Table

Item	Symbol	Min.	Typ.	Max.	Unit	Remark
DCLK Frequency	Fclk	8	9	12	MHz	
DCLK Period	Tclk	83	111	125	Ns	
HSYNC	Period Time	Th	485	531	DCLK	
	Display Period	Thdisp	480		DCLK	
	Back Porch	Thbp	3	43	DCLK	By H_Blanking setting
	Front Porch	Thfp	2	8	DCLK	
	Pulse Width	Thw	2	4	DCLK	
VSYNC	Period Time	Tv	276	292	H	
	Display Period	Tvdisp	272		H	
	Back Porch	Tvbp	2	12	H	By V_Blanking setting
	Front Porch	Tvfp	2	8	H	
	Pulse Width	Tvw	2	4	H	

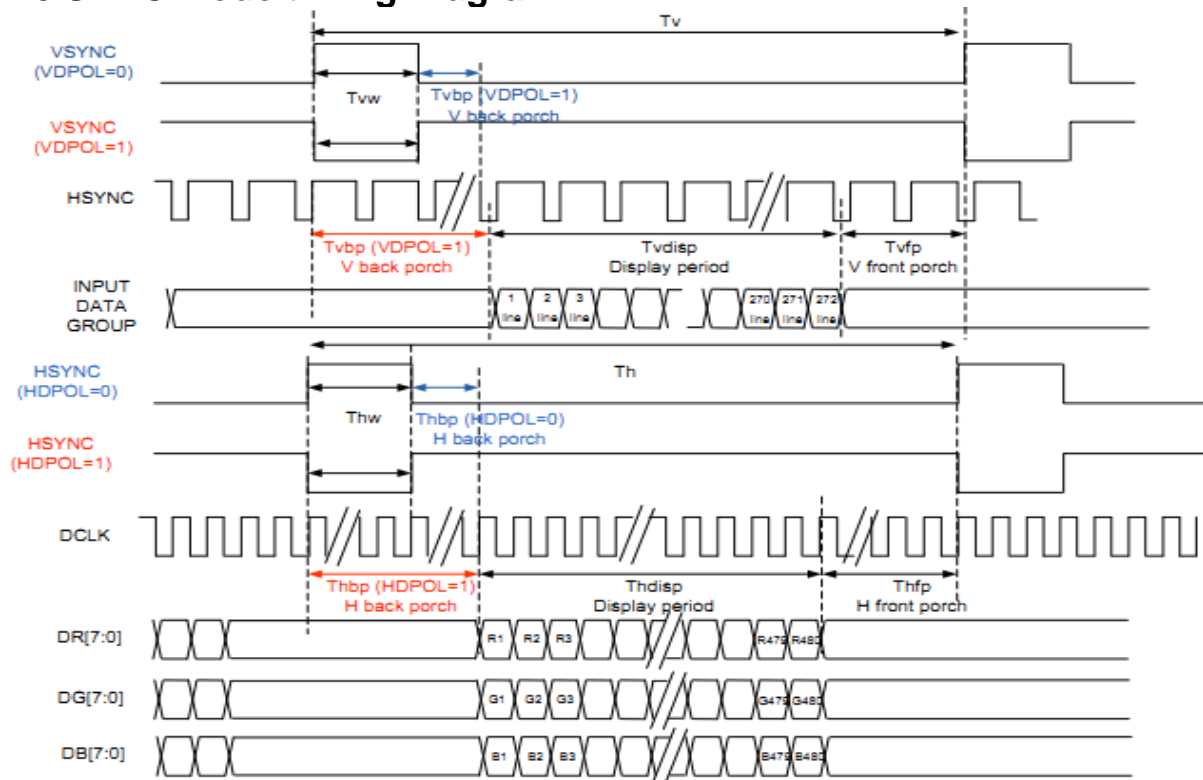
Note: It is necessary to keep Tvbp =12 and Thbp =43 in sync mode. DE mode is unnecessary to keep it.

## 7.5 Reset Timing Characteristics

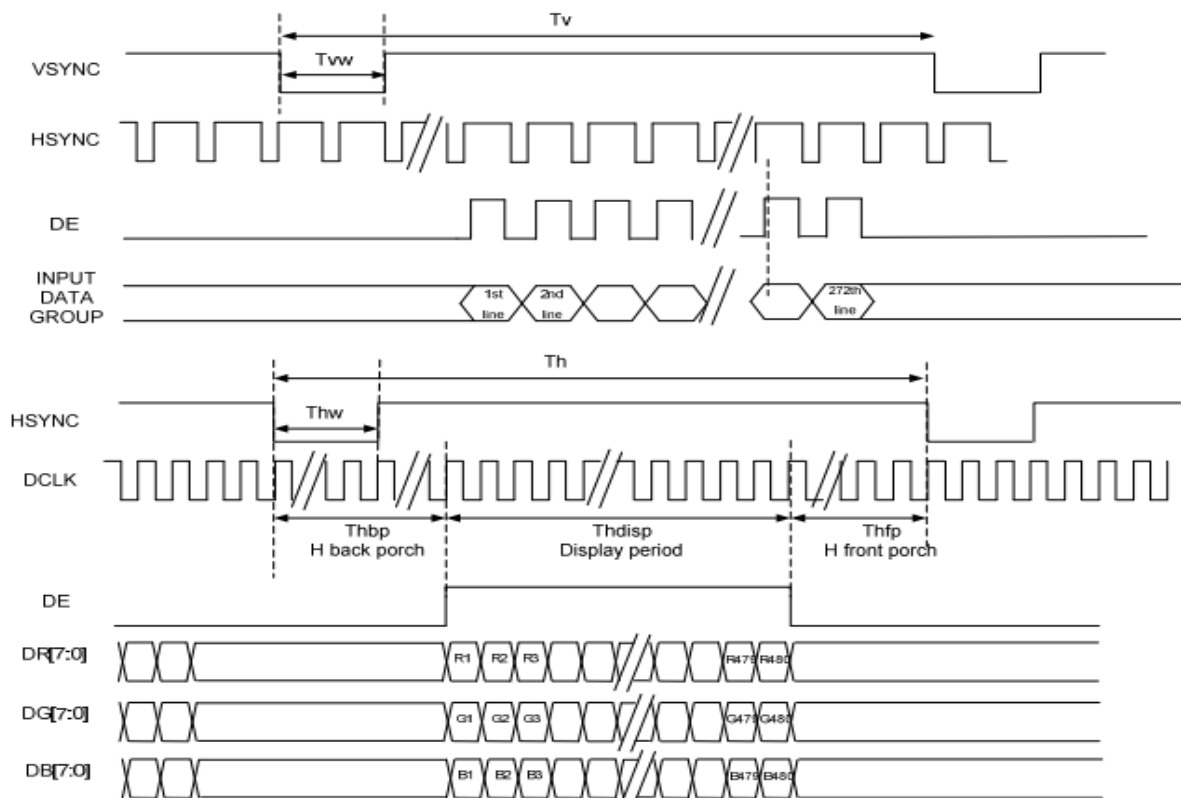


Symbol	Parameter	Related Pins	Spec.			Note	Unit
			Min.	Typ.	Max.		
tRESW	Reset low pulse width <sup>(1)</sup>	NRESET	10	-	-	-	μs
tREST	Reset complete time <sup>(2)</sup>	-	5	-	-	When reset applied during STB OUT mode	ms
		-	120	-	-	When reset applied during STB mode	ms
tPRES	Reset goes high level after Power on time	NRESET & IOVCC	1	-	-	Reset goes high level after Power on	ms

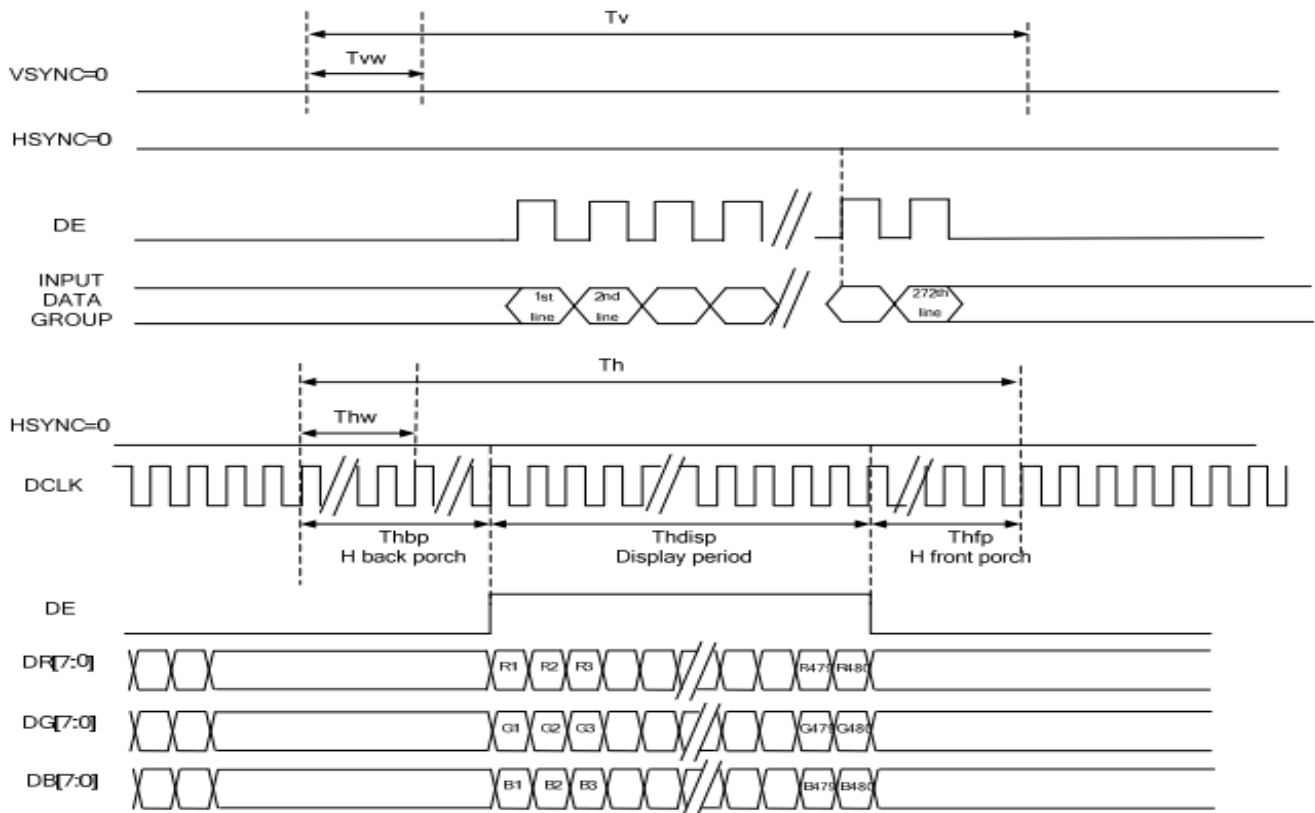
## 7.6 SYNC Mode timing Diagram



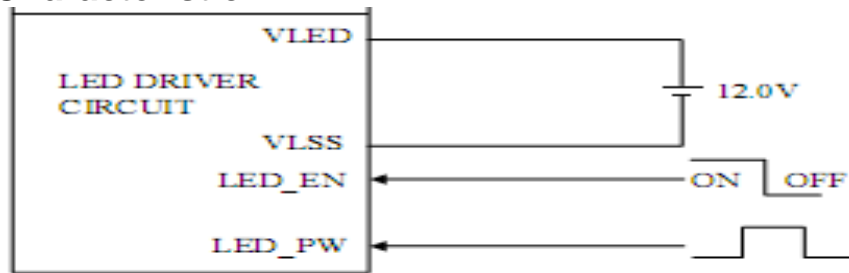
## 7.7 SYNC\_DE Mode timing Diagram



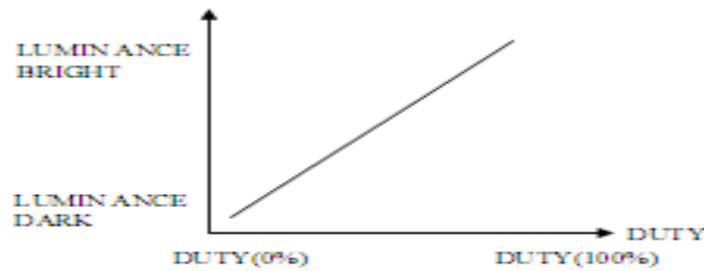
## 7.8 DE Mode timing Diagram



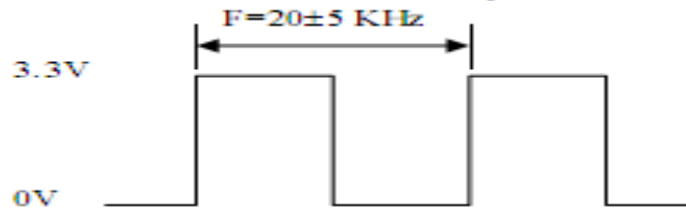
## 8. Backlight Characteristic



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 : 20±5KHz

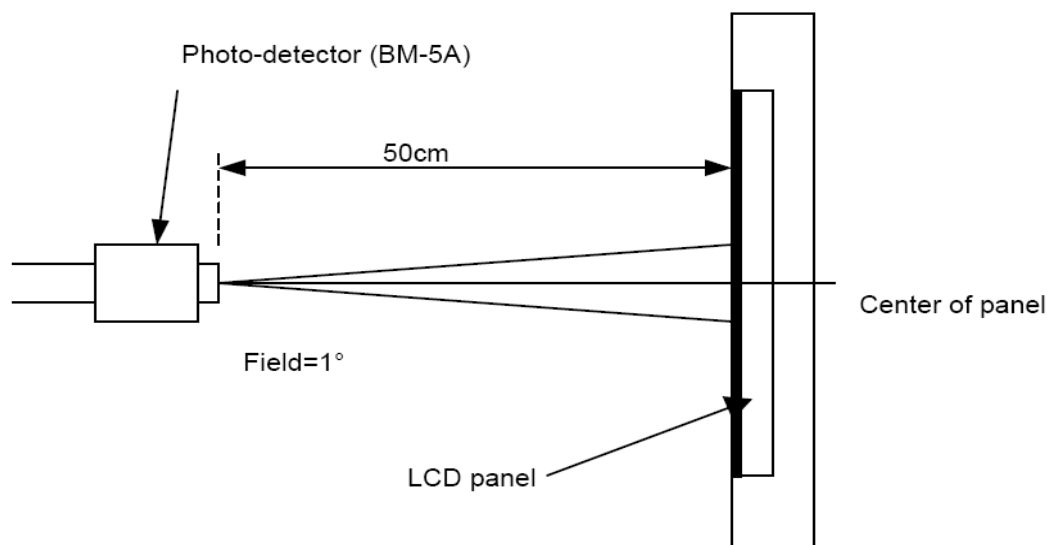


Item		Symbol	MIN	TYP	MAX	UNIT	NOTE
Backlight Power		LED_VCC	5	12	18	V	Ta = 25°C
Backlight Power		ILED_VCC	-	(0.15)	(0.2)	A	LED_VCC=5V
			-	(0.05)	(0.075)	A	LED_VCC=12V
EN Signal Voltage	VIH	1.2 GND				V	
	VIL			0.4	0.4	V	
PWM Frequency		LED_PWM	100		20000	Hz	
Lifetime			50000	-	-	Hr	
Color		White					
Average Brightness		-	480	500	-	Cd/cm <sup>2</sup>	
Luminance uniformity		-	--	80	-	%	

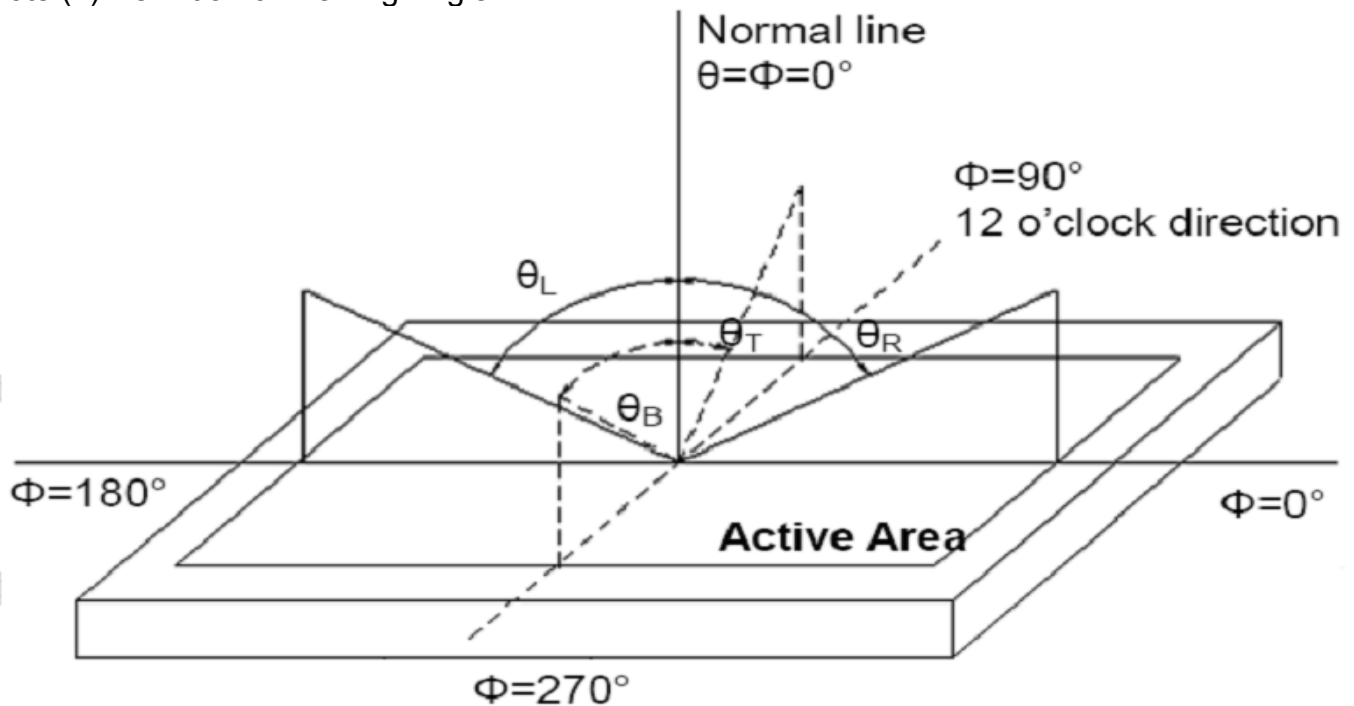
## 9. Optical Characteristics

Item	Conditions		Min.	Typ.	Max.	Unit	Note
Viewing Angle (CR>10)	Horizontal	θL		70	-	degree	(1),(2),(6)
		θR		70	-		
	Vertical	θT		50	-		
		θB		70	-		
Contrast Ratio	Center		TBD	500	-	-	(1),(3),(6)
Response Time	Rising		-	25	-	ms	(1),(4),(6)
	Falling		-	25	-	ms	
CF Color Chromaticity (CIE1931)	Red x		Typ. -0.05	0.618	Typ. +0.05	-	(1), (6)
	Red y			0.343		-	
	Green x			0.306		-	
	Green y			0.527		-	
	Blue x			0.139		-	
	Blue y			0.098		-	
	White x			0.313		-	
	White y			0.323		-	
NTSC	CIE1931		-	52	-	%	(1),(6)

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



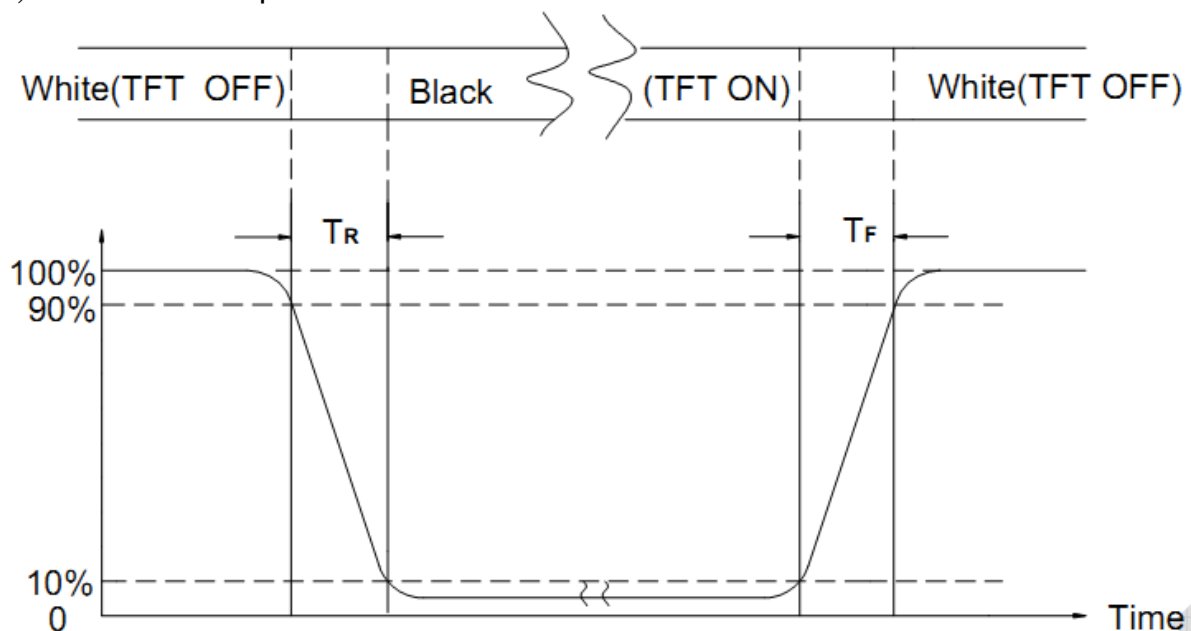
Note (3) Definition of Contrast Ratio (CR)

The contrast ratio can be calculated by the following expression

$$\text{Contrast Ratio (CR)} = L_{63} / L_0$$

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)

$$\text{Transmittance} = \text{Center Luminance of LCD} / \text{Center Luminance of Back Light} \times 100\%$$

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
<input type="checkbox"/>	High Temperature Storage	80°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.
<input type="checkbox"/>	Low Temperature Storage	-30°C±2°C×96Hours	
<input type="checkbox"/>	High Temperature Operating	70°C±2°C×96Hours	
<input type="checkbox"/>	Low Temperature Operating	-20°C±2°C×96Hours	
<input type="checkbox"/>	Temperature Cycle(Storage)	-20°C ↔ 25°C ↔ 70°C (30min) (5min) (30min) 1cycle Total 10cycle	
<input type="checkbox"/>	Damp Proof Test (Storage)	50°C±5°C×90%RH×96Hours	
<input type="checkbox"/>	Vibration Test	Frequency:10Hz~55Hz~10Hz Amplitude:1.5MM X,Y,Z direction for total 3hours (packing condition test will be tested by a carton)	
<input type="checkbox"/>	Drooping Test	Drop to the ground from 1M height one time every side of carton. (packing condition test will be tested by a carton)	
<input type="checkbox"/>	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. INSPECTION TOOLS 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.

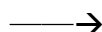
11.2.2.CHECKER SHALL SEE OVER 300±25 mm. WITH BARE EYES FAR FROM SAMPLE

11.2.3.Ambient Illumination:

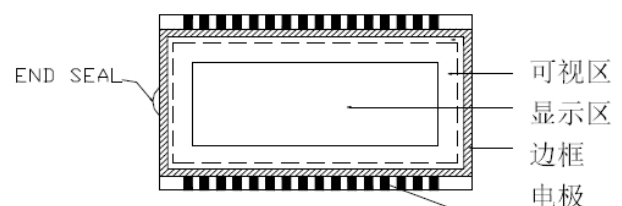
0 ~30 Lux for functional inspection

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

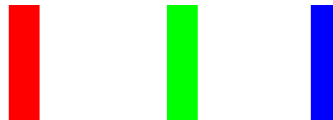
Pixel:

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:

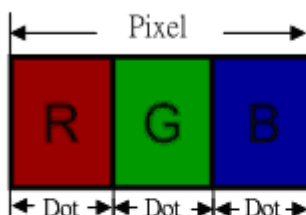
They are generally considered to be shown on R, G, B solid colors or white images.

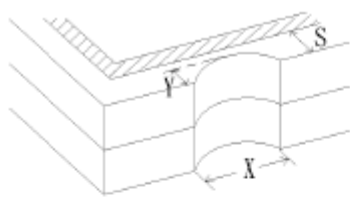
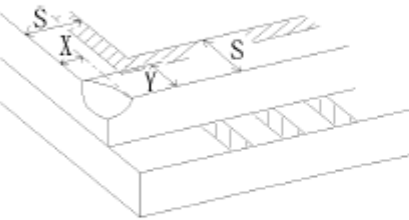
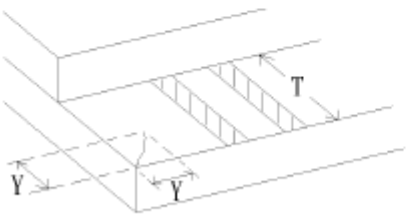
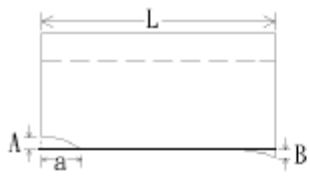
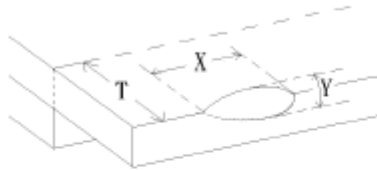
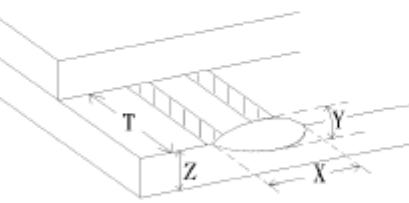
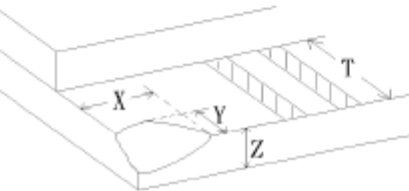
### Neighborhood:

Two or three adjacent point pixels (dot: sub-pixel) connected together (R, G or G, B or B, R or RGB).


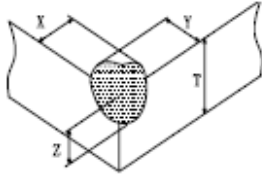
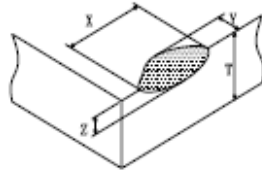
## 11.3. INSPECTION PLAN :

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

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. <table><tr><th>DIAMETER (mm.)</th><th>ACCEPTABLE Q'TY</th></tr><tr><td><math>\Phi \leq 0.15</math></td><td>Distance<math>\geq</math>1mm</td></tr><tr><td><math>0.15 &lt; \Phi \leq 0.4</math></td><td>3 (Distance<math>&gt;</math>15mm)</td></tr><tr><td><math>0.4 &lt; \Phi</math></td><td>0</td></tr></table> NOTE: $\Phi=(\text{LENGTH}+\text{WIDTH})/2$ (B) LINEAR TYPE: unit : mm. <table><tr><th>LENGTH</th><th>WIDTH</th><th>ACCEPTABLE Q'TY</th></tr><tr><td>-----</td><td><math>W \leq 0.03</math></td><td>Distance<math>\geq</math>1mm</td></tr><tr><td><math>L \leq 4.0</math></td><td><math>0.03 &lt; W \leq 0.05</math></td><td>3 (Distance<math>&gt;</math>15mm)</td></tr><tr><td>-----</td><td><math>0.05 &lt; W</math></td><td>FOLLOW ROUND TYPE</td></tr></table>	DIAMETER (mm.)	ACCEPTABLE Q'TY	$\Phi \leq 0.15$	Distance $\geq$ 1mm	$0.15 < \Phi \leq 0.4$	3 (Distance $>$ 15mm)	$0.4 < \Phi$	0	LENGTH	WIDTH	ACCEPTABLE Q'TY	-----	$W \leq 0.03$	Distance $\geq$ 1mm	$L \leq 4.0$	$0.03 < W \leq 0.05$	3 (Distance $>$ 15mm)	-----	$0.05 < W$	FOLLOW ROUND TYPE
DIAMETER (mm.)	ACCEPTABLE Q'TY																						
$\Phi \leq 0.15$	Distance $\geq$ 1mm																						
$0.15 < \Phi \leq 0.4$	3 (Distance $>$ 15mm)																						
$0.4 < \Phi$	0																						
LENGTH	WIDTH	ACCEPTABLE Q'TY																					
-----	$W \leq 0.03$	Distance $\geq$ 1mm																					
$L \leq 4.0$	$0.03 < W \leq 0.05$	3 (Distance $>$ 15mm)																					
-----	$0.05 < W$	FOLLOW ROUND TYPE																					
11.4.2	MINOR	BUBBLE IN POLARIZER DENT ON POLARIZER	unit : mm. <table><tr><th>DIAMETER</th><th>ACCEPTABLE Q'TY</th></tr><tr><td><math>\Phi \leq 0.2</math></td><td>Distance<math>\geq</math>1mm</td></tr><tr><td><math>0.2 &lt; \Phi \leq 0.3</math></td><td>3 (Distance<math>&gt;</math>15mm)</td></tr><tr><td><math>0.3 &lt; \Phi</math></td><td>0</td></tr></table>	DIAMETER	ACCEPTABLE Q'TY	$\Phi \leq 0.2$	Distance $\geq$ 1mm	$0.2 < \Phi \leq 0.3$	3 (Distance $>$ 15mm)	$0.3 < \Phi$	0												
DIAMETER	ACCEPTABLE Q'TY																						
$\Phi \leq 0.2$	Distance $\geq$ 1mm																						
$0.2 < \Phi \leq 0.3$	3 (Distance $>$ 15mm)																						
$0.3 < \Phi$	0																						
11.4.3	MINOR	Dot Defect	<table><tr><th>Items</th><th>ACC. Q'TY</th></tr><tr><td>Bright dot</td><td><math>N \leq 2</math> (Distance<math>\geq</math>15mm)</td></tr><tr><td>Dark dot</td><td><math>N \leq 3</math> (Distance<math>&gt;</math>15mm)</td></tr></table> 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. Definitition: $<1/2\text{dot}$ and visible by 5% ND filter $N \leq 5$ 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.	Items	ACC. Q'TY	Bright dot	$N \leq 2$ (Distance $\geq$ 15mm)	Dark dot	$N \leq 3$ (Distance $>$ 15mm)														
Items	ACC. Q'TY																						
Bright dot	$N \leq 2$ (Distance $\geq$ 15mm)																						
Dark dot	$N \leq 3$ (Distance $>$ 15mm)																						
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	 $X \text{ or } Y > S$ Reject
11.4.6	MAJOR	LCD GLASS GLASS CRACK	 $Y > (1/2) T$ Reject
11.4.7	MAJOR	LCD GLASS SCRIBE DEFECT	 <ol style="list-style-type: none"> <li><math>a &gt; L/3</math>, <math>A &gt; 1.5\text{mm}</math>. Reject</li> <li>B : ACCORDING TO DIMENSION</li> </ol>
11.4.8	MINOR	LCD GLASS CHIPPING ( ON THE TERMINAL AREA )	 $\Phi = (x+y)/2 > 2.5 \text{ mm}$ 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

## 11.5 INSPECTION STANDARD OF TOUCH PANEL

NO.	CLASS	ITEMS		JUDGEMENT	
11.5.1	MAJOR	Touch Panel Crack			Reject
11.5.2	MINOR	Touch Panel Chipping	Corner	 $X \leq 2\text{mm}, Y \leq 2\text{mm}, Z < 1/2T$	Accept
			Edge	 $X \leq 3\text{mm}, Y \leq 3\text{mm}, Z < 1/2T$	Accept
11.5.3	MINOR	Scratch Dust and Foreign materiel (Linear Type)	$W \leq 0.05, L \leq 20\text{mm}$		Accept
			$0.05\text{mm} < W \leq 0.07\text{mm}; L \leq 10.0\text{mm}$ Distance between scratch $> 5.0\text{mm}$		Accept 3 ea Max.
			$W > 0.07\text{mm}$		Reject
11.5.4	MINOR	Scratch Dust and Foreign materiel (Round Type: $\Phi = (\text{Length} + \text{Width})/2$ )	$\Phi \leq 0.25\text{mm}$		Accept
			$0.25\text{mm} < \Phi \leq 0.35\text{mm}$ Distance between spots $> 5.0\text{mm}$		Accept 5 ea Max.
			$\Phi > 0.35\text{mm}$		Reject
11.5.5	MINOR	Touch Panel Dent / Fish Eyes	$\Phi \leq 0.35\text{mm}$		Accept
			$0.35\text{mm} < \Phi \leq 1.0\text{mm}$ Distance $> 5.0\text{mm}$		Accept 3 ea Max.
			$\Phi > 1.0\text{mm}$		Reject
11.5.6	MINOR	Touch Panel Air Bubble	$\Phi \leq 0.2\text{mm}$		Accept
			$0.2\text{mm} < \Phi \leq 0.5\text{mm}$ Distance between bubbles $> 5.0\text{mm}$		Accept 3 ea Max.
			$\Phi > 0.5\text{mm}$		Reject
11.5.7	MINOR	Touch Panel Printing area Scratch	$W \leq 0.05\text{mm}, L \leq 5\text{mm}$ Distance between scratch $> 5.0\text{mm}$		Accept 3 ea Max.
			$W > 0.05\text{mm}$ or $L > 5\text{mm}$ ( $W > 0.05$ Follow 11.5.4 Round type )		Reject
11.5.8	MINOR	Touch Panel White Haze Mark / Dust		Can not be removed	Reject



## 12. Handling Precautions

### 12.1 Mounting method

The LCD panel of AMSON TFT module consists of two thin glass plates with polarizers which easily be damaged. And since the module is 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 happens 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 uses C-MOS LSI drivers, so we recommend 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 than the limit causes 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 than the operating temperature range and on the other hand at higher temperature LCD's show 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