



# 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>		



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## 1. Scope

This specification defines general provisions as well as inspection standards for TFT module supplied by AMSON electronics.

If the event of unforeseen problem or unspecified items may occur, naturally shall negotiate and agree to solution.

## 2. General Information

ITEM	STANDARD VALUES	UNITS
LCD type	10.1" TFT	--
Dot arrangement	1280×3(RGB)×800	dots
Color filter array	RGB vertical stripe	--
Display mode	Normally Black	-
Viewing Direction	85/85/85/85	--
Module size	229.8(W)×149(H)×5.9(T)	mm
Active area	216.96(W)×135.60(H)	mm
Dot pitch	0.1695(W)×0.1695(H)	mm
Interface	MIPI 4LANS	--
Operating temperature	-30 ~ +80	°C
Storage temperature	-30 ~ +85	°C



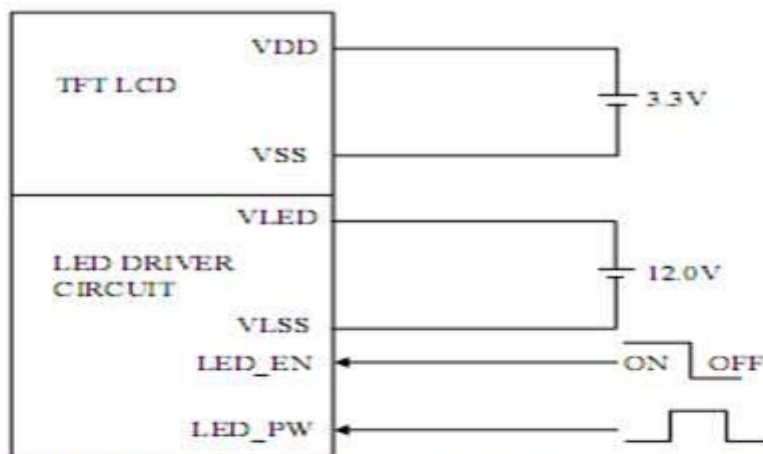
## 4. Interface Description

PIN	PIN NAME	DESCRIPTION
1	NC	No connection
2	VDD	Power Supply
3	VDD	
4	NC	No connection
5	NC	
6	NC	
7	NC	No connection
8	MIPI_D3N	MIPI-DSI Data differential signal input pins. (Data lane 3)
9	MIPI_D3P	MIPI-DSI Data differential signal input pins. (Data lane 3)
10	GND	Ground
11	MIPI_D0N	MIPI-DSI Data differential signal input pins. (Data lane 0)
12	MIPI_D0P	MIPI-DSI Data differential signal input pins. (Data lane 0)
13	GND	Ground
14	MIPI_CLKN	MIPI-DSI CLOCK differential signal input pins.
15	MIPI_CLKP	MIPI-DSI CLOCK differential signal input pins.
16	GND	Ground
17	MIPI_D1N	MIPI-DSI Data differential signal input pins. (Data lane 1)
18	MIPI_D1P	MIPI-DSI Data differential signal input pins. (Data lane 1)
19	GND	Ground
20	MIPI_D2N	MIPI-DSI Data differential signal input pins. (Data lane 2)
21	MIPI_D2P	MIPI-DSI Data differential signal input pins. (Data lane 2)
22	GND	Ground
23	VLSS	Ground
24	VLSS	
25	VLSS	
26	NC	No connection
27	LED_PWM	CABC controller signal output for backlight
28	LED_EN	CABC Enable Input
29	NC	No connection
30	NC	No connection
31	VLED	VIN Voltage(12V TYP)
32	VLED	
33	VLED	
34	NC	No connection
35	BIST	No connection
36	NC	No connection
37	NC	No connection
38	NC	No connection
39	NC	No connection
40	NC	No connection

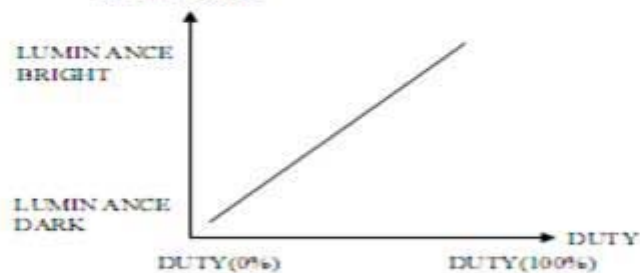
## 5. Absolute Maximum Ratings

Item	Symbol	Min.	Max.	Unit	Remark
Digital Supply Voltage	VDD	-0.3	4.0	V	
VIN Voltage	VLED	-0.3	50	V	
Operating Temperature	Top	-30	80	°C	
Storage Temperature	TST	-30	85	°C	

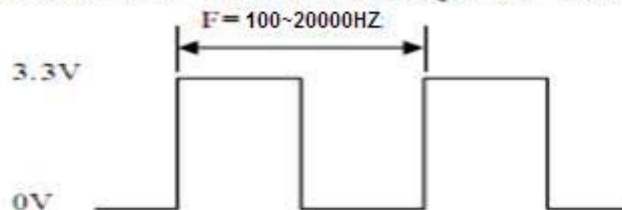
### 5.1 POWER SUPPLY FOR LCM



NOTE ( 1 ) : ADJUST THE PWM SIGNAL IN ORDER TO CONTROL LED BACKLIGHTS BRIGHTNESS. THE HIGHER THE DUTY CYCLE, THE HIGHER THE BRIGHTNESS LUMINANCE



NOTE ( 2 ) : PWM SIGNAL=0~3.3V · OPERATION FREQUENCY : 100~20000HZ



## 6. DC Characteristics

Item	Symbol	Min.	Typ.	Max.	Unit	Remark
Digital Supply Voltage	VDD	2.75	3.3	3.6	V	
Digital Supply Current	IDD	-	400	480	mA	VDD=3.3V
VIN Voltage	VLED	4.5	-	40		
Input logic high voltage	V <sub>IH</sub>	0.7*VDD	-	VDD	V	
Input logic low voltage	V <sub>IL</sub>	GND	-	0.3*VDD	V	



## 7. Timing Characteristics

### 7.1 MIPI DC/AC Characteristics

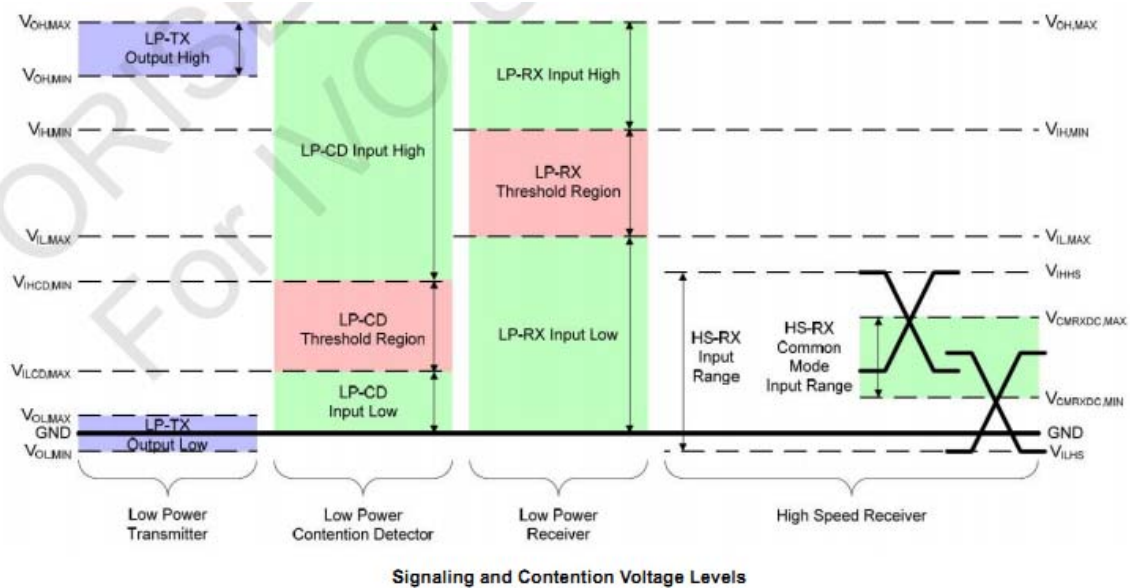
HS Receiver DC Specifications						
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
VDDA	MIPI RX Power		2.25		3.6	V
V <sub>NOZ</sub>	Supply Noise Voltage		-50	-	50	mV
V <sub>CMRX(DC)</sub>	Differential common-mode range		70	-	330	mV
V <sub>IDTH</sub>	Differential input high threshold		-	-	70	mV
V <sub>IDTL</sub>	Differential Input Low Threshold		-70	-	-	mV
V <sub>IHHS</sub>	Single-ended input high voltage		-	-	460	mV
V <sub>ILHS</sub>	Single-ended input low voltage		-40	-	-	mV
V <sub>TERM-EN</sub>	Single-ended threshold for HS termination enable		-	-	450	mV
Z <sub>ID</sub>	Differential input impedance		80	100	125	Ω

LP Receiver DC Specifications						
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V <sub>IH</sub>	Logic 1 input voltage		880	-	-	mV
V <sub>IL</sub>	Logic 0 input voltage		-	-	550	mV
V <sub>HYST</sub>	Input hysteresis		25	-	-	mV

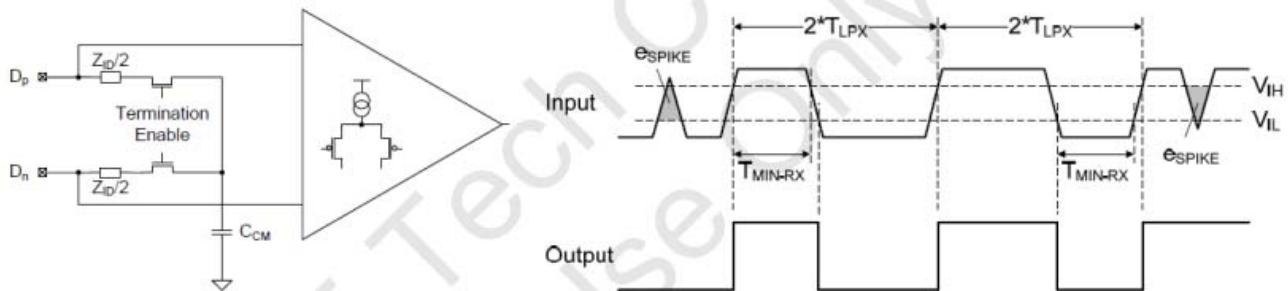
Contention Detector (LP-CD) DC Specifications						
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V <sub>IHCD</sub>	Logic 1 contention threshold		450	-	-	mV
V <sub>ILCD</sub>	Logic 0 contention threshold		-	-	200	mV



HS Receiver AC Specifications						
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$\Delta V_{CMRX(HF)}$	Common-mode interference beyond 450MHz		-	-	100	mV
$\Delta V_{CMRX(HF)}$	Common-mode interference 50MHz ~ 450MHz		-50	-	50	mV
$C_{CM}$	Common-mode termination		-	-	60	mV
$U_{INST}$	UI instantaneous	HF=0	2		12.5	ns
		HF=1	1		2	ns

HS Receiver AC Specifications						
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$\theta_{SPIKE}$	Input pulse rejection		-	-	300	V*ps
$T_{MIN-RX}$	Minimum pulse width response		20	-	-	ns
$V_{INT}$	Peak interference amplitude		-	-	200	mV
$f_{INT}$	Interference frequency		450	-	-	MHz



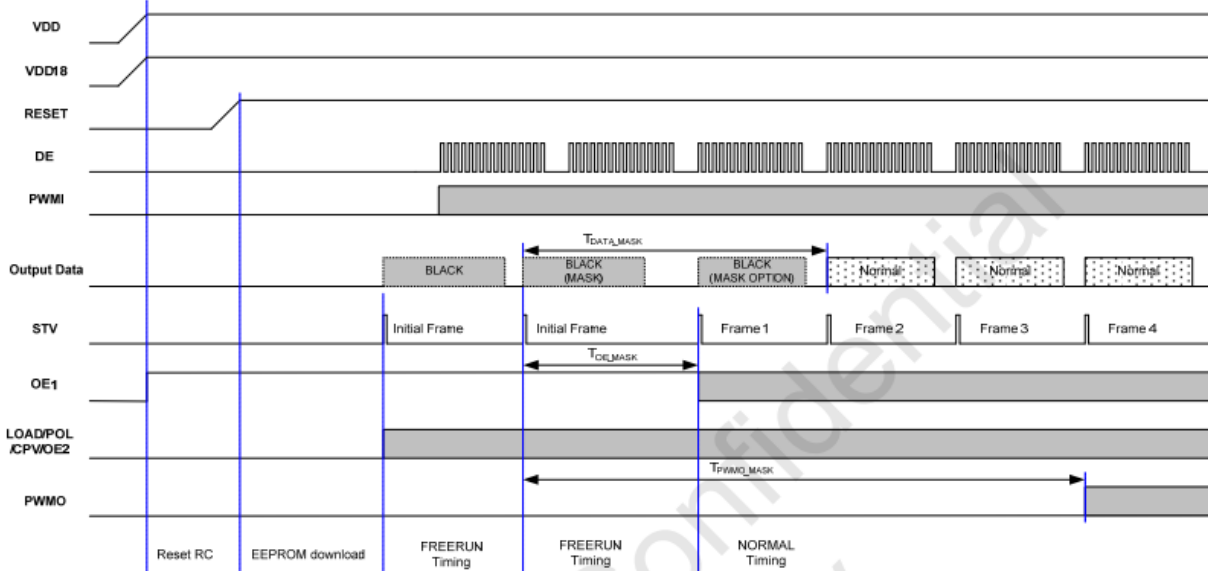
Pin Characteristic Specifications							
Symbol	Parameter	Conditions	Min	Typ	Max	Unit	Note
$V_{PIN}$	Pin signal voltage range		-50	-	1350	mV	
$I_{LEAK}$	Pin leakage current		-10	-	10	uA	1
$V_{GND SH}$	Ground shift		-50	-	50	mV	
$V_{PIN(ABS MAX)}$	Transient pin voltage level		-0.15	-	1.45	V	3
$T_{V_{PIN(ABS MAX)}}$	Maximum transient time above $V_{PIN(max)}$ or below $V_{PIN(min)}$		-	-	20	ns	2

## 7.2 Power ON and Reset Timing

Symbol	Description	Min.	Typ.	Max.	Unit
$T_{OE\_MASK}$	OE1 keep high frame setting	0	1	7	$T_{FRAME}$
$T_{DATA\_MASK}$	Output data keep "0" frame setting	1	2	7	$T_{FRAME}$
$T_{PWM\_MASK}$	PWMO keep low frame setting	2	4	7	$T_{FRAME}$

Note: It is suggestion that PWMO start to output after normal display.

When Power (VDD) turns on and RESET=High, the timing sequence is listed below,



### 7.2.3 Interface Timings

Parameter	Symbol	Unit	Min.	Typ.	Max.
Frame Rate	--	Hz	-	60	-
Frame Period	$t_V$	line	(815)	(823)	(1023)
Vertical Display Time	$t_{VD}$	line	800		
Vertical Blanking Time	$t_{VW}+t_{VBP}+t_{VFP}$	line	(15)	(23)	(33)
1 Line Scanning Time	$t_H$	clock	(1410)	(1440)	(1470)
Horizontal Display Time	$t_{HD}$	clock	1280		
Horizontal Blanking Time	$t_{HW}+t_{HBP}+t_{HFP}$	clock	(60)	(160)	(190)
Clock Rate	$1/T_C$	MHz	(68.9)	(71.1)	(73.4)

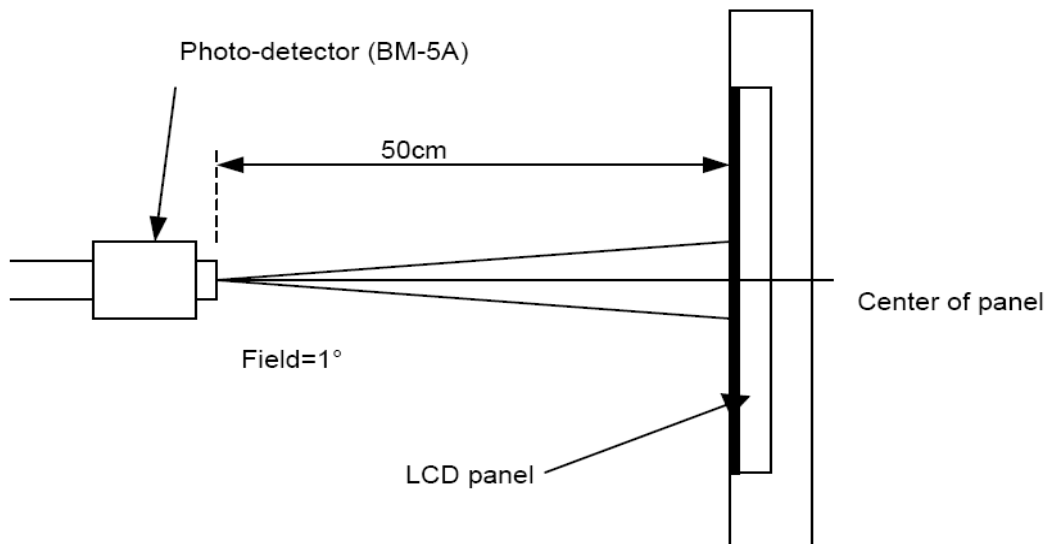
## 8. Backlight Characteristic

Item		Symbol	MIN	TYP	MAX	UNIT	NOTE
Backlight Power		VLED	8	12	15	V	Ta = 25°C
Backlight Power		IVLED	-	0.5	0.8	A	VLED=12V
EN Signal Voltage	VIH	LED_EN	1.65		5.25	V	
	VIL		GND		0.4	V	
Luminous Intensity for LCM	VIH	LED_PWM	0.8Ven		5.25	V	
	VIL		GND		0.2Ven	V	
PWM Frequency		LED_PWM	100		20000	Hz	
Lifetime			50000	-	-	Hr	
Color		White					
Average Brightness		-	850	1000	-	Cd/cm2	
Luminance uniformity		-	80	-	-	%	

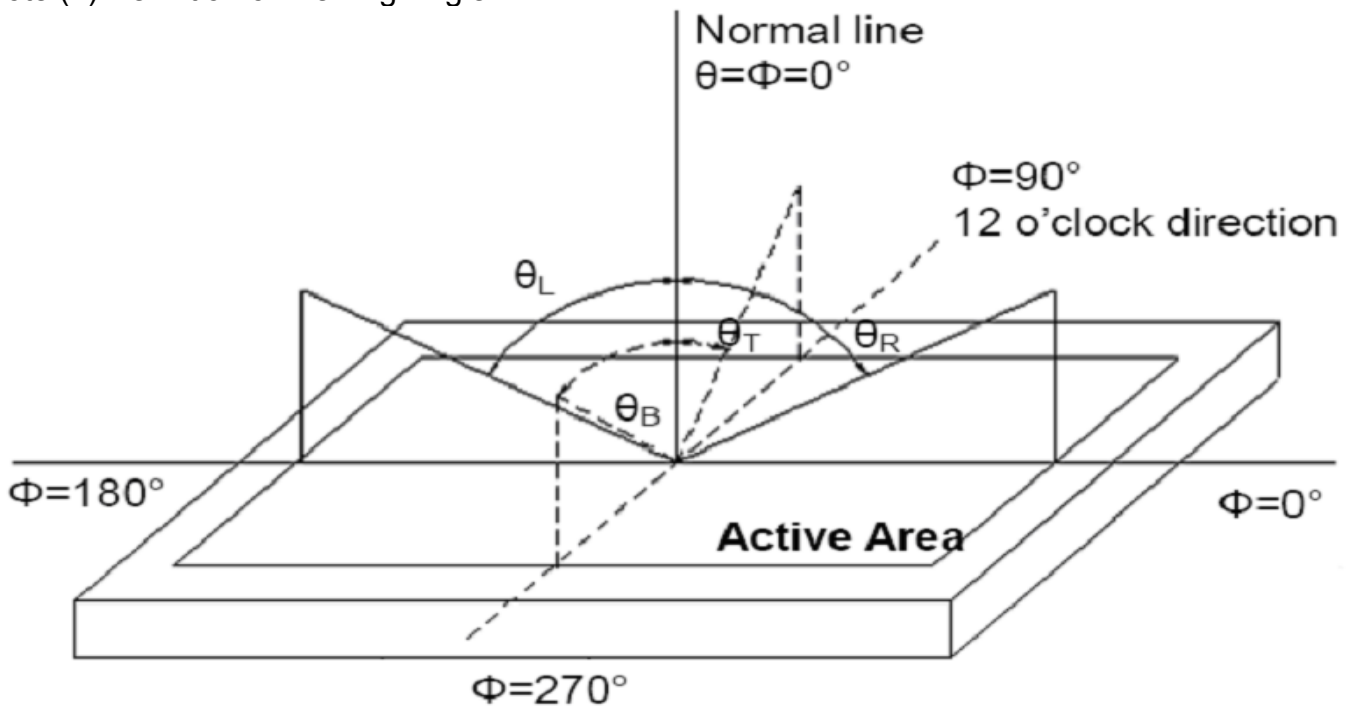
## 9. Optical Characteristics

Item	Conditions		Min.	Typ.	Max.	Unit	Note
Viewing Angle (CR>10)	Horizontal	θL	-	85	-	degree	(1),(2),(6)
		θR	-	85	-		
	Vertical	θT	-	85	-		
		θB	-	85	-		
Contrast Ratio	Center		600	800	-	-	(1),(3),(6)
Response Time	Rising		-	25	35	ms	(1),(4),(6)
	Falling						
CF Color Chromaticity (CIE1931)	Red x		Typ. -0.05	0.610	Typ. +0.05	-	(1), (6)
	Red y			0.335		-	
	Green x			0.340		-	
	Green y			0.595		-	
	Blue x			0.155		-	
	Blue y			0.205		-	
	White x			0.340		-	
	White y			0.370		-	

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



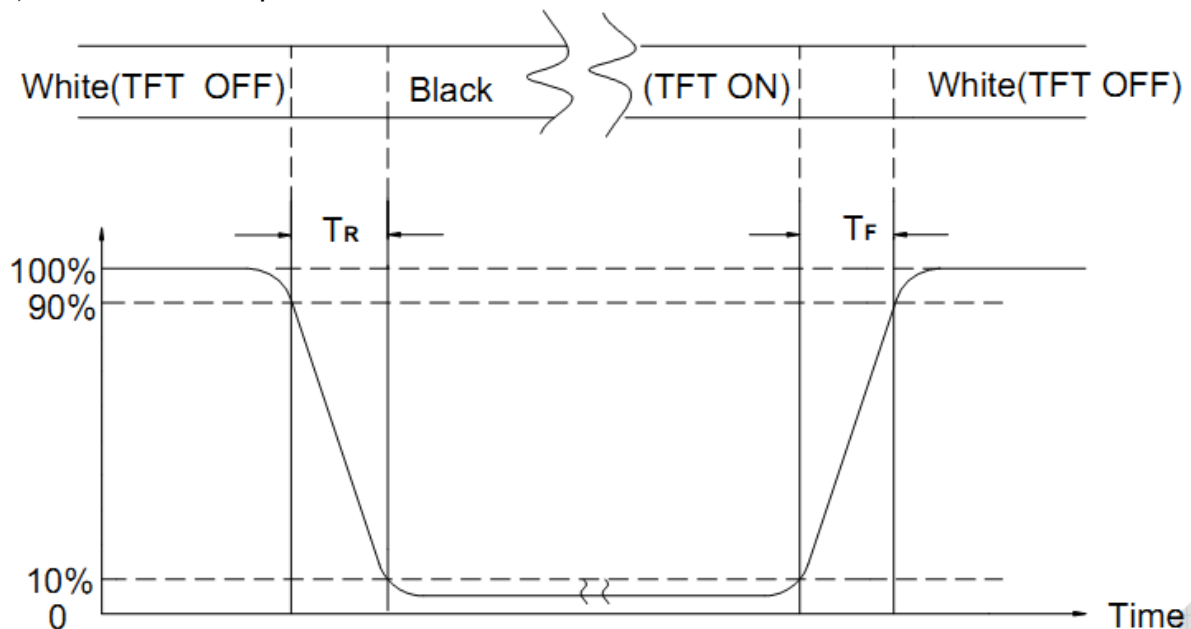
Note (3) Definition of Contrast Ratio (CR)

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											
①	High Temperature Storage	Keep in 85℃ 96 hrs Surrounding temperature, then storage at normal condition 4hrs.											
②	Low Temperature Storage	Keep in -30℃ ±5℃ 96 hrs Surrounding temperature, then storage at normal condition 4hrs.											
③	High Temperature Operating Test	80℃*96Hrs											
④	Low Temperature Operating Test	-30℃*96Hrs											
⑤	High Temperature / High Humidity Operating Test	60 ℃ / 90% R.H , 96 hrs.											
⑥	High Temperature / High Humidity Storage Test	Keep in 60 ℃ / 90% R.H duration for 96 hrs Surrounding temperature, then storage at normal condition 4hrs.											
⑦	Temperature Cycling Storage Test	<div><div><div>-30℃ → +25℃ → 85℃ → +25℃</div><div>(30mins) (5mins) (30mins) (5mins)</div><div>30 Cycle</div></div><div>Surrounding temperature, then storage at normal condition 4hrs.</div></div>											
⑧	ESD Test	Air Discharge: Apply 6 KV with 5 times Discharge for each polarity +/-	Contact Discharge: Apply 250 V with 5 times discharge for each polarity +/-										
		1. Temperature ambience : 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%)											
⑨	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											
⑩	Drop Test (Packaged)	<table><tr><th>Packing Weight (Kg)</th><th>Drop Height (cm)</th></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>		Packing Weight (Kg)	Drop Height (cm)	0 ~ 45.4	122	45.4 ~ 90.8	76	90.8 ~ 454	61	Over 454	46
		Packing Weight (Kg)	Drop Height (cm)										
0 ~ 45.4	122												
45.4 ~ 90.8	76												
90.8 ~ 454	61												
Over 454	46												
		Drop Direction :※ 1 corner / 3 edges / 6 sides each 1time											

PS: ①~ ⑦ test exclude Polaroid;



## 11. Inspection Standard

### 11.1. QUALITY :

THE QUALITY OF GOODS SUPPLIED TO PURCHASER SHALL COME UP TO THE FOLLOWING STANDARD.

#### 11.1.1. 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.

#### 11.1.2. 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.

#### 11.1.3. 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

#### Ambient Illumination:

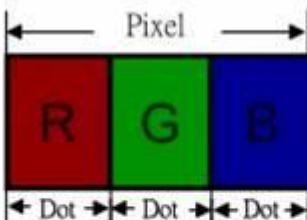
Functional detection in 1000 nits backlight environment

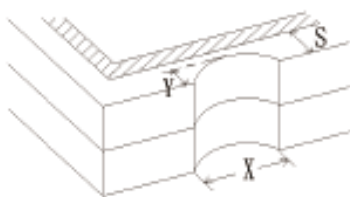
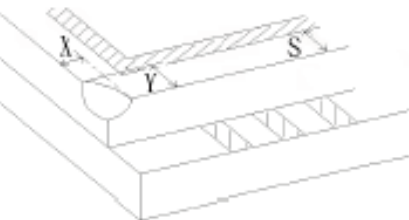
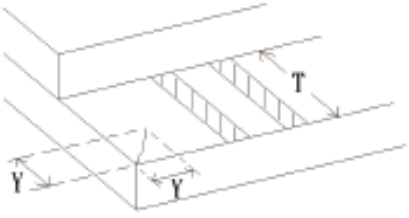
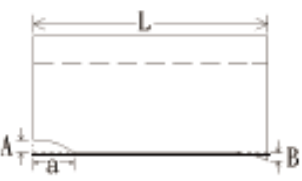
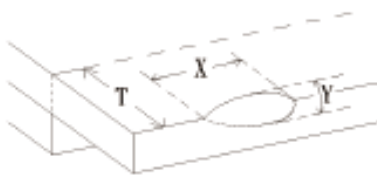
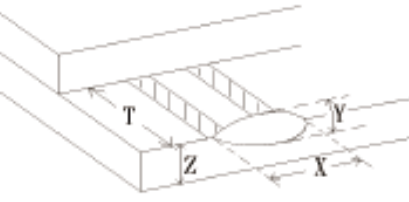
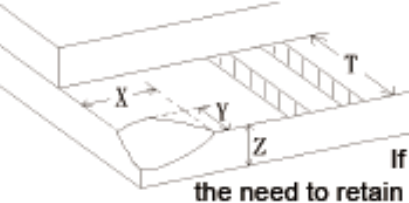
Appearance detection in 800~1000 Lux external environment



## 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>\geq</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>\geq</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 $\geq$ 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 $\geq$ 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 $\geq$ 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 $\geq$ 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 0.5</math></td><td>3 (Distance<math>\geq</math>15mm)</td></tr><tr><td><math>0.5 &lt; \Phi</math></td><td>0</td></tr></table>	DIAMETER	ACCEPTABLE Q'TY	$\Phi \leq 0.2$	Distance $\geq$ 1mm	$0.2 < \Phi \leq 0.5$	3 (Distance $\geq$ 15mm)	$0.5 < \Phi$	0												
DIAMETER	ACCEPTABLE Q'TY																						
$\Phi \leq 0.2$	Distance $\geq$ 1mm																						
$0.2 < \Phi \leq 0.5$	3 (Distance $\geq$ 15mm)																						
$0.5 < \Phi$	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>\geq</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:<1/2dot 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 $\geq$ 15mm)														
Items	ACC. Q'TY																						
Bright dot	$N \leq 2$ (Distance $\geq$ 15mm)																						
Dark dot	$N \leq 3$ (Distance $\geq$ 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
11.4.5	MINOR	LCD GLASS CHIPPING	 $X \geq 3\text{mm}$ $Y > S$ Reject
11.4.6	MINOR	LCD GLASS CHIPPING	 $X \text{ or } Y > S$ Reject
11.4.7	MAJOR	LCD GLASS GLASS CRACK	 Continuous burst NG      Reject
11.4.8	MAJOR	LCD GLASS SCRIBE DEFECT	 ACCORDING TO DIMENSION
11.4.9	MINOR	LCD GLASS CHIPPING ( ON THE TERMINAL AREA )	 $Y < 1/2Z$ $Y \geq 0.5\text{mm}$ Reject $X \geq 3\text{mm}$
11.4.10	MINOR	LCD GLASS CHIPPING ( ON THE TERMINAL SURFACE )	 $Y < 1/2Z$ $Y \geq 0.5\text{mm}$ Reject $X \geq 3\text{mm}$
11.4.11	MINOR	LCD GLASS CHIPPING	 $X \geq 3\text{mm}$ $Y \geq T$ Reject If touch the electrode lines, the need to retain the two-thirds electrode lines

## 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