一众显示科技有限公司

TEAM SOURCE DISPLAY TECH. CO, LTD.

TFT-LCD Module Specification

Module NO.: TST070WSIH-187

Version: V1.0

☐ APPROVAL FOR SPECIFICATION ☐ APPROVAL FOR SAMPLE

For Customer's Acceptance:	
Approved by	Comment

Team Source Display:		
Presented by	Reviewed by	Organized by
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Revision history

Version No.	Date	Page	Content	Remark
V1.0	2024-11-11	All	The initial release	

CONTENTS

1 General Characteristics

1.1 Introduction

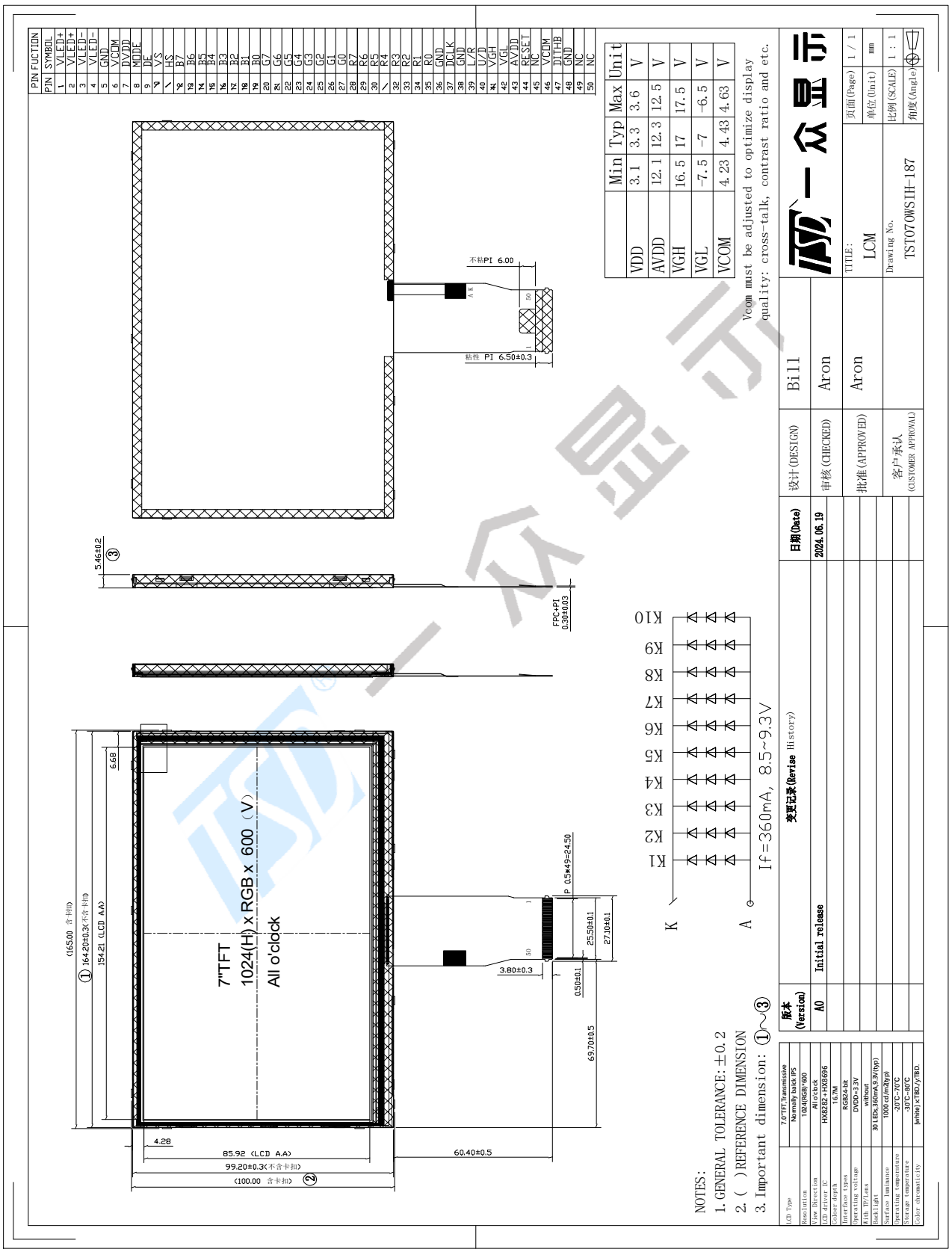
TST070WSIH-187 is a color active matrix thin film transistor (TFT) liquid crystal display (LCD) that uses amorphous silicon TFT as a switching device. This model is composed of a TFT LCD panel, a Backlight .This TFT LCD has a 7.0 inch diagonally measured active display area with 1024 horizontal by 600 vertical pixel resolution.

1.2 General Information

ITEM	Specification	Unit
LCD Type	a-Si TFT,Transmissive,Normally black,IPS	-
LCD Size	7.0	inch
Resolution (W x H)	1024x (RGB) ×600	pixel
Outline size	164.2(H) x 99.2(V) x5.46(D)	mm
Active Area	154.21 (H) x 85.92 (V)	mm
Pixel Pitch	0.1506(H)x 0.1432(V)	mm
Driver IC	HX8282&HX8696	
Viewing Direction	All o'clock	-
Color Depth	16.7M	-
Pixel Arrangement	RGB-stripe	-
Surface Luminance	1000	cd/m²
LCD Interface Type	RGB24-Bit	-
Weight	TBD	g

Note 1: RoHS compliant
Note 2: LCM weight tolerance: ± 5%.

2 Product drawings



3 Interface description

3.1 LCM interface description

Pin No.	Symbol	I/O	Function	Remark
1	V_{LED+}	P	Power for LED backlight (Anode)	
2	V_{LED+}	P	Power for LED backlight (Anode)	
3	V_{LED-}	P	Power for LED backlight (Cathode)	
4	V_{LED-}	P	Power for LED backlight (Cathode)	
5	GND	P	Power ground	
6	V_{COM}	I	Common voltage	
7	DVDD	P	Power for Digital Circuit	
8	MODE	I	DE/SYNC mode select	Note 1
9	DE	I	Data Input Enable	
10	VS	I	Vertical Sync Input	
11	HS	I	Horizontal Sync Input	
12	B7	I	Blue data(MSB)	
13	B6	I	Blue data	
14	B5	I	Blue data	
15	B4	I	Blue data	
16	B3	I	Blue data	
17	B2	I	Blue data	
18	B1	I	Blue data	Note 2
19	B0	I	Blue data(LSB)	Note 2
20	G7	I	Green data(MSB)	
21	G6	I	Green data	
22	G5	I	Green data	
23	G4	I	Green data	
24	G3	I	Green data	
25	G2	I	Green data	
26	G1	I	Green data	Note 2
27	G0	I	Green data(LSB)	Note 2
28	R7	I	Red data(MSB)	

29	R6	I	Red data	
30	R5	I	Red data	
31	R4	I	Red data	
32	R3	I	Red data	
33	R2	I	Red data	
34	R1	I	Red data	Note 2
35	R0	I	Red data(LSB)	Note 2
36	GND	P	Power Ground	
37	DCLK	I	Sample clock	Note 3
38	GND	P	Power Ground	
39	L/R	I	Left / right selection	Note 4,5
40	U/D	I	Up/down selection	Note 4,5
41	V_{GH}	P	Gate ON Voltage	
42	V_{GL}	P	Gate OFF Voltage	
43	AVDD	P	Power for Analog Circuit	
44	RESET	I	Global reset pin.	Note 6
45	NC	-	No connection	
46	V_{COM}	I	Common Voltage	
47	DITHB	I	Dithering function	Note 7
48	GND	P	Power Ground	
49	NC	-	No connection	
50	NC	-	No connection	

I: input, O: output, P: Power

Note 1: DE/SYNC mode select. Normally pull high.

When select DE mode, MODE="1", VS and HS must pull high.

When select SYNC mode, MODE= "0", DE must be grounded.

Note 2: When input 18 bits RGB data, the two low bits of R,G and B data must be grounded.

Note 3: Data shall be latched at the falling edge of DCLK.

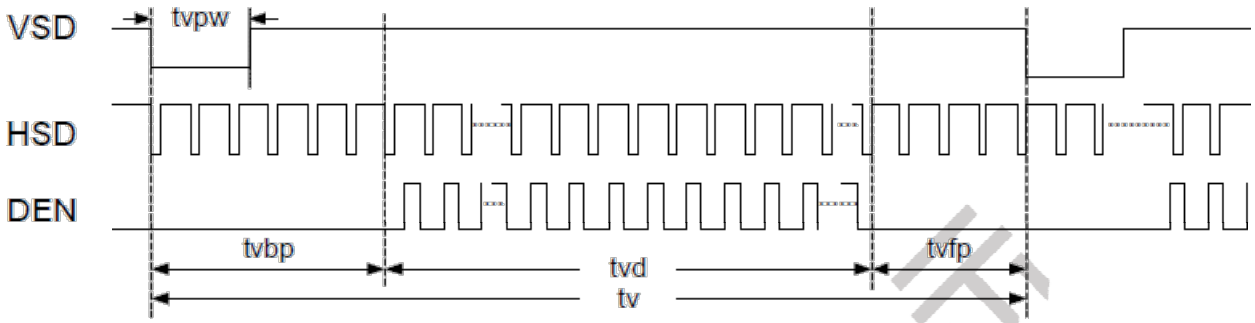
Note 4: Selection of scanning mode

Setting of scan control input		Scanning direction
UD	LR	
GND	VDD	Up to down, left to right
VDD	GND	Down to up, right to left
GND	GND	Up to down, right to left
VDD	VDD	Down to up, left to right

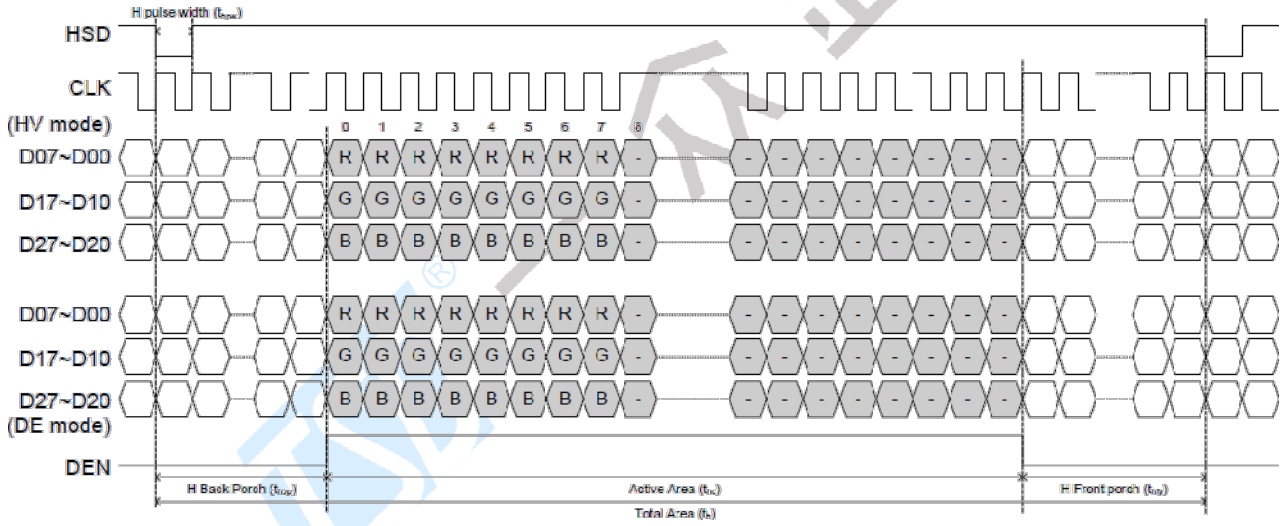
4 Timing Characteristics

4.1 Timing Diagram of Interface Signal

Vertical timing



Horizontal timing



4.2 Parallel 24bit RGB Interface Timing Characteristics

Horizontal Timing

Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
DCLK Frequency	fclk	44.9	51.2	63	MHz
Horizontal Display Area	thd		1024		DCLK
HS Period	th	1200	1344	1400	DCLK
HS Pulse Width	thpw	1	-	140	DCLK
HS Back Porch	thbp		160		DCLK
HS Front Porch	thfp	16	160	216	DCLK

Table 10.5: HV Mode Horizontal Timing (1024x600)

Vertical Timing

Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
Vertical Display Area	tvd		600		T_H
VS Period	tv	624	635	750	T_H
VS Pulse Width	tvpw	1	-	20	T_H
VS Back Porch	tvbp		23		T_H
VS Front Porch	tvfp	1	12	127	T_H

Table 10.6: HV Mode Vertical Timing (1024x600)

5 Absolute Maximum Ratings

PARAMETER	SYMBOL	MIN	MAX	UNIT
Supply Voltage	DVDD	-0.5	5.0	V
Analog Supply Voltage	AVDD	-0.5	15	
Gate On Voltage	VGH	-0.3	40	
Gate Off Voltage	VGL	-20	0.3	
Operating Temperature	TOP	-20	70	° C
Storage Temperature	TST	-30	80	° C
Humidity	RH	-	90%(Max 60° C)	RH

6 Electrical Characteristics

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT
Digital Supply Voltage	DVDD	3.0	3.3	3.6	V
LCD Input Current	I_{VDD}		TBD		mA
Analog Supply Voltage	AVDD	12.1	12.3	12.5	V
Gate On Voltage	VGH	16.5	17	17.5	V
Gate Off Voltage	VGL	-7.5	-7.0	-6.5	
Common Supply Voltage	VCOM	4.23	4.43	4.63	
Input Voltage ' H ' level	VIH	0.7VDD	-	VDD	
Input Voltage ' L ' level	VIL	0	-	0.3VDD	
Output Voltage ' H ' level	VOH	VDD-0.4	-	VDD	
Output Voltage ' L ' level	VOL	GND	-	GND+0.4	

7 Backlight Characteristics

ITEM	SYMBOL	MIN	TYP	MAX	UNIT
Voltage for LED backlight	V_f	-	9.3	-	V
Current for LED backlight	I_f	-	360	-	mA
Power consumption	Wbl	-	3348	-	mW
LED Life Time	-	-	50000	-	Hrs

Note (1) LED current is measured by utilizing a high frequency current meter as shown below:

Note (2) The lifetime of LED is defined as the time when it continues to operate under the conditions at Ta = 25 ±2 ℃ and Typical operating current of LED until the brightness becomes ≦ 50% of its original value.

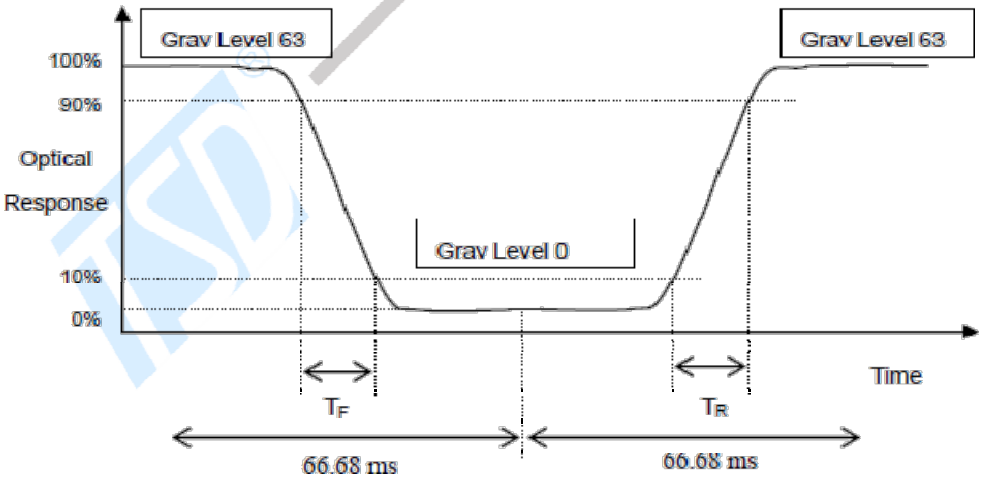
Note (3) Please note that LED life will be shorter than the average life described in the specification if operate in higher ambient temperature.

8 LCD Optical specifications

Item	Symbol	Condition	Specification			Unit	Remark
			Min	Typ	Max		
Response time (By Quick)	Tr+Tf	-	-	25	35	ms	Note 3
Contrast ratio	CR	-	800	1000	-	-	Note 4
Surface luminance	Lv	θ= 0°	-	1000	-	cd/m^2	Note 2,6
Luminance uniformity	-	θ= 0°	-	80	-	%	Note 7
Viewing angle	Top	CR≧10	80	-	-	Deg.	Note 5
	Bottom	CR≧10	80	-	-		
	Left	CR≧10	80	-	-		
	Right	CR≧10	80	-	-		
Color chromaticity （CIE1931）	Wx	θ= 0°	Typ -0.04	0.300	Typ +0.04		
	Wy			0.330			
	Rx			0.590			
	Ry			0.365			
	Gx			0.330			
	Gy			0.575			
	Bx			0.150			
	By			0.105			

Note 2: To be measured with a viewing cone of 2°by Topcon luminance meter BM-7.

Note 3: Definition of Response Time (TR, TF) and measurement method:

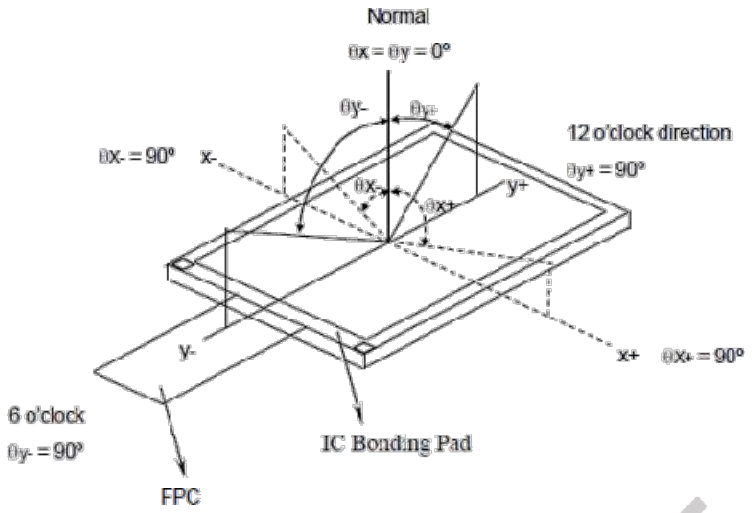


Note 4: Definition of contrast ratio:

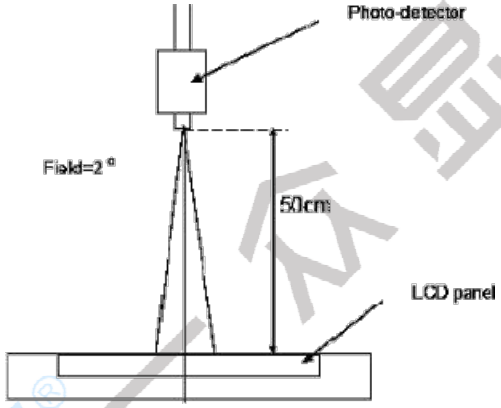
Contrast ratio is calculated by the following formula.

$$\text{Contrast ratio (CR)} = \frac{\text{Brightness on the "white" state}}{\text{Brightness on the "black" state}}$$

Note 5: Definition of viewing angle



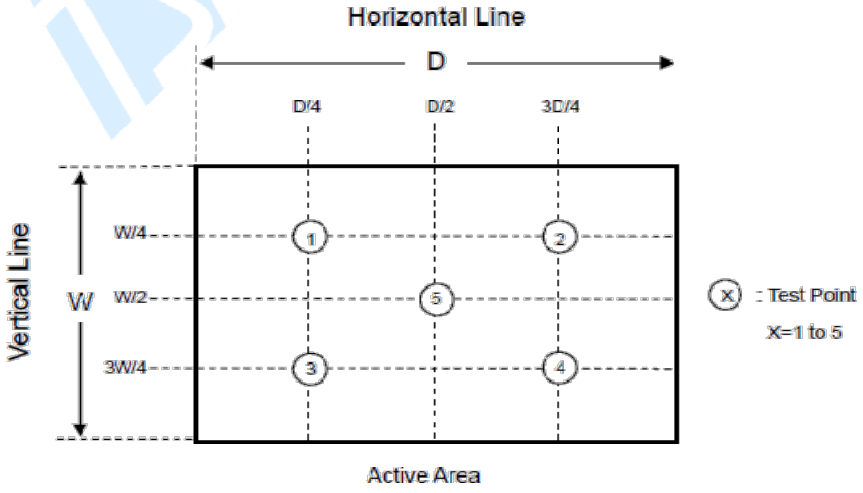
Note 6: Optical characteristic measurement setup.



Note 7:Definition of White Variation (δ W):

Measure the luminance of gray level 63 at 5 points

δ W = Maximum [L (1), L (2), L (3), L (4), L (5)] / Minimum [L (1), L (2), L (3), L (4), L (5)]



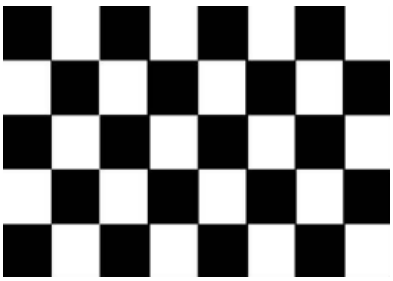
9 RELIABILITY TEST

NO.	TEST ITEM	TEST CONDITION	INSPECTION AFTER TEST
1	High Temperature Storage	80±2°C/240 hours	Inspection after 2~4 hours storage at room temperature and humidity. The condensation is not accepted. The sample shall be free from defects: 1. Air bubble in the LCD 2. Seal leak 3. Non-display 4. Missing segments 5. Glass crack
2	Low Temperature Storage	-30±2°C/240 hours	
3	High Temperature Operating	70±2°C/240 hours	
4	Low Temperature Operating	-20±2°C/240 hours	
5	Temperature Cycle	-30±2°C ~ 25~ 80± 2°C × 10 cycles (30 min.) (5min.) (30min.)	
6	Damp Proof Test	60°C ±5°C × 90%RH/240hours	
7	Vibration Test	Frequency 10Hz~55Hz Stroke: 1.5mm Sweep: 10Hz~150 Hz~10Hz 2 hours For each direction of X, Y, Z	
8	Packing Drop Test	Height: 50 cm 1 corner, concrete floor	
9	Electrostatic Discharge Test	C=150pF, R=330 Ω Air: ±6KV 150pF/330Ω 30 times Contact: ±4KV,20 times	
10	Image Sticking	25℃,60%RH (ref.to Remark(1))/30 minutes	

Note 1： Inspection after 2~4 hours storage at room temperature and humidity. The condensation is not accepted. The sample shall be free from defects:

1. Air bubble in the LCD
2. Seal leak
3. Non-display
4. Missing segments
5. Glass crack
6. No mura: 50% gray(Grey 127) / ND 5%
7. When working at high temperature, the driving current needs to be reduced to 50%.

Note 2： Switch the image to Grey 127 after displaying the 5*8 chess pattern for 30 minutes, the afterimage disappears within 10 minutes.



5*8 chess pattern

Gray127

9.1 About Image Sticking

9.1.1 What is Image Sticking?

If you remain a fixed image on LCD Display for a long period of time, you may experience a phenomenon called Image Sticking. Image Sticking - sometimes also called“image retention”or“ghosting”- is a phenomenon where a faint outline of a previously displayed image remains visible on the screen when the image is changed. It can occur at variable levels of intensity depending on the specific image makeup, as well as the amount of time the core image elements are allowed to remain unchanged on the screen. In POS applications, for example, a button menu which remains fixed, or in which the “frame” elements (core image) remain fixed and the buttons may change, may be susceptible to image sticking. It is important to note that if the screen is used exclusively for this application, the user may never notice this phenomenon since the screen never displays other content. `It is only when an image other than the“retained”image is shown on the screen that this issue becomes evident. Image sticking is different that the “burn-in” effect commonly associated with phosphor based devices.

9.1.2 What causes Image Sticking?

Image sticking is an intrinsic behavior of LCD displays due to the susceptibility to polarization of the interior materials (liquid crystals) when used under static, charged conditions (continuously displaying the same image). The individual liquid crystals in an LCD panel have unique electrical properties. Displaying a fixed pattern - such as the POS menu described above – over prolonged periods can cause a parasitic charge build-up (polarization) within the liquid crystals which affects the crystals’ optical properties and ultimately prevents the liquid crystal from returning to its normal, relaxed state when the pattern is finally changed. This effect takes place at a cellular level within the LCD, and the effect can cause charged crystal alignment at the bottom or top of a crystal cell in the“z”axis, or even crystal migration to the edges of a cell, again based on their polarity. These conditions can cause image sticking over an entire area, or at boundaries of distinct color change respectively. In either case, when the liquid crystals in the pixels and sub-pixels utilized to display the static image are polarized such that they can not return fully to their “relaxed” state upon deactivation, the result is a faint, visible, retained image on the panel upon presentation of a new, different image. The actual rate of image retention depends on variation factors such as the specific image, how long it is displayed unchanged, the temperature within the panel and even the specific panel brand due to manufacturing differences amongst panel manufacturers.

9.1.3 How to Avoid Image Sticking?

- Try not to operate the LCD with a “fixed” image on the screen for more than 30mins.
- If you are operating the monitor in an elevated temperature environment and with a displayed image which is contrary to the recommendations in “For Software Developers” below, image stick can occur in as little as 30 minutes. Adjust your screen saver settings accordingly.
- Power down the unit during prolonged periods of inactivity such as the hours a store is closed or a shift during which the piece of equipment isn’t used.
- Use a screensaver with a black or medium gray background that is automatically set to come on if the device is inactive for more than 5-10 minutes.
- Avoid placing the monitor in poorly ventilated areas or in areas that will create excess heat around the monitor for software developers.

- In defining the icons, buttons, or windows in the screen, try to utilize block patterns instead of distinct lines as borders for dividing the display into distinct areas.
- If it is necessary to display a static image, try to use colors that are symmetric to the middle grey level at the boundary of two different colors, and slightly shift the borders line once in a while.
- Try to utilize medium gray hues for those areas that will have prolonged display times or remain static as other menu elements change.

9.1.4 How to Fix the Image Sticking?

Unlike the usually irreversible “burn-in” effects commonly associated with direct view phosphor display devices such as CRTs, an image retained on an LCD display can be reversed – often to a point of total invisibility. However, the severity of the underlying causes (as described above) of the image retained on a specific display, as well as the variation factors (see “For Software Developers” above) under which the retained image was created, will dictate the final level of retention reversal. One way to erase a retained image on a panel is to run the screen (monitor “on”) in an “all black” pattern for 4-6 hours. It is also helpful to do this in an elevated temperature environment of approximately 35° to 50° C. Again, utilizing a dynamic screen saver with an all black background during prolonged idle display periods is a good way to avoid image retention issues.

9.1.5 Is Image Sticking Covered by TSD RMA Warranty?

Image sticking is a phenomenon inherent to LCD Display technology itself, and as such, the occurrence of this “ghosting” effect is considered normal operation by the manufacturers of the LCD display modules which are integrated into today’s monitor solutions. TSD does not warrant any display against the occurrence of image sticking. We strongly advise that you follow the operating recommendations listed above to avoid the occurrence of this phenomenon.

10 Suggestions for using LCD modules

10.1 Handling of LCM

1. The LCD screen is made of glass. Don't give excessive external shock, or drop from a high place.
2. If the LCD screen is damaged and the liquid crystal leaks out, do not lick and swallow. When the liquid is attach to your hand, skin, cloth etc, wash it off by using soap and water thoroughly and immediately.
3. Don't apply excessive force on the surface of the LCM.
4. If the surface is contaminated, clean it with soft cloth. If the LCM is severely contaminated, use Isopropyl alcohol/Ethyl alcohol to clean. Other solvents may damage the polarizer. The following solvents is especially prohibited: water , ketone Aromatic solvents etc.
5. Exercise care to minimize corrosion of the electrode. Corrosion of the electrodes is accelerated by water droplets, moisture condensation or a current flow in a high-humidity environment.
6. Install the LCD Module by using the mounting holes. When mounting the LCD module make sure it is free of twisting, warping and distortion. In particular, do not forcibly pull or bend the I/O cable or the backlight cable.
7. Don’t disassemble the LCM.
8. To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.

- Be sure to ground the body when handling the LCD modules.
- Tools required for assembling, such as soldering irons, must be properly grounded.
- To reduce the amount of static electricity generated, do not conduct assembling and other work under dry conditions.
- The LCD module is coated with a film to protect the display surface. Exercise care when peeling off this protective film since static electricity may be generated.

9. Do not alter, modify or change the the shape of the tab on the metal frame.
10. Do not make extra holes on the printed circuit board, modify its shape or change the positions of components to be attached.
11. Do not damage or modify the pattern writing on the printed circuit board.
12. Absolutely do not modify the zebra rubber strip (conductive rubber) or heat seal connector
13. Except for soldering the interface, do not make any alterations or modifications with a soldering iron.
14. Do not drop, bend or twist LCM.

10.2 Storage

1. Store in an ambient temperature of 5 to 45 C, and in a relative humidity of 40% to 60%. Don't expose to sunlight or fluorescent light.
2. Storage in a clean environment, free from dust, active gas, and solvent.
3. Store in antistatic container.

11 Limited Warranty

1.Our warranty liability is limited to repair and/or replacement. We will not be responsible for any consequential loss.

2.If possible, we suggest customer to use up all LCD modules as soon as possible. If the LCD module storage time over twelve months, we suggest to recheck it before being used.

3.Any product issues must be feedback to TSD within 12 months since delivery, otherwise, we will not be responsible for the subsequent or consequential events.