TSD

一众显示科技有限公司

TEAM SOURCE DISPLAY TECH. CO, TD.

TFT-LCD Module Specification

Module NO.：TST088HDHH-03

Version：V1.1

☐ **APPROVAL FOR SPECIFICATION**　　☐ **APPROVAL FOR SAMPLE**

For Customer＇s Acceptance：	
Approved by	**Comment**

Team Source Display：		
Presented by	**Reviewed by**	**Approved by**

Version No.	Date	Content	Remark
V1.0	2023-05-15	Initial Release	
V1.1	2023-06-14	Modify Surface Luminance& IC	

CONTENTS

1   General Characteristics

ITEM	Specification	Unit
LCD Type	a-Si TFT,Transmissive,Normally black,IPS	-
LCD Size	8.8	inch
Resolution (W x H)	1280(RGB) ×480	pixel
LCM size	223.99(H) x95.6(V) x 5.6(T)	mm
Active Area	209.28 (H) x 78.48(V)	mm
Pixel Pitch	0.1635(H)x0.1635(V)	mm
Viewing Direction	ALL o'clock	-
Color Depth	16.7M	-
Pixel Arrangement	RGB-stripe	-
Backlight Type	42 LED，420mA	-
Surface Luminance	1600	cd/m2
Surface Treatment	-	-
Interface Type	Lvds	-
Input Voltage	VDD=3.3	V
With/Without TP	Without	-
Weight	TBD	g

Note 1: RoHS compliant

Note 2: LCM weight tolerance: ± 5%.

2 Product drawingsy

NOTES:
1. GENERAL TOLERANCE: ±0.2
2. ( ) REFERENCE DIMENSION
3. Important dimension: ①~⑤

LCD Type	8.8"TFT,transmissive
Resolution	Normally Black,IPS
	1280(RGB)*480
View Direction	All o'clock
LCD driver IC	RM53G2D/HX8210ZA/FL5895
Colour depth	16.7M
Interface types	LVDS
Operating voltage	3.3V
With TP/Lens	without
Back light	42 LEDs,420mA(typ)21V(ref)
Surface luminance	1600 cd/m2(typ)
Operating temperature	-30℃~80℃
Storage temperature	-30℃~80℃
Color chromaticity	(white) x;y;

Aluminium T=0.6mm

SUS T=0.2mm
Connector GND

5±0.3(PI)

"A"
3:1

Component area
H=2.6mm max

8.8"TFT
1280*RGB*480
All o'clock

BHSR-02VS-01

Revise History:

版本(Version)	日期(Date)	变更记录(Revise History)
A0	2023.05.15	Initial release
A1	2023.05.30	Modify surface luminance & IC
A2	2023.06.14	Modify FPC for LCM&BL

设计(DESIGN)	Bill
审核(CHECKED)	Aron
批准(APPROVED)	Aron
客户承认 (CUSTOMER APPROVAL)	

TITLE: LCM
Drawing No. TST088HDHH-03

页面(Page) 1/1
单位(Unit) mm
比例(SCALE) 1:1
角度(Angle)

Pin table: NC, VDD, NC/CS, NC/SDA1, NC/SCL, GND, RXIN0-, RXIN0+, GND, RXIN1-, RXIN1+, GND, RXIN2-, RXIN2+, GND, RXCLKIN-, RXCLKIN+, GND, RXIN3-, RXIN3+, GND, NC, GND, NC/SDIO, NC/VDD_OTP, SELB/NC, NC, NC, NC, U/D, L/R, RESET, STRYB, NC, NC

3 Interface description

3.1 LCM interface description

PIN NO.	Symbol	description
1	NC	No connect
2-3	VDD	Power voltage for digital circuit
4-6	NC	Must open this pins
7	GND	Power ground
8	RXIN0-	Negative LVDS differential data input
9	RXIN0+	Positive LVDS differential data input
10	GND	Power ground
11	RXIN1-	Negative LVDS differential data input
12	RXIN1+	Positive LVDS differential data input
13	GND	Power ground
14	RXIN2-	Negative LVDS differential data input
15	RXIN2+	Positive LVDS differential data input
16	GND	Power ground
17	RXCLKIN-	Negative LVDS differential clock input
18	RXCLKIN+	Positive LVDS differential clock input
19	GND	Power ground
20	RXIN3-	Negative LVDS differential data input
21	RXIN3+	Positive LVDS differential data input
22	GND	Power ground

23-24	NC	No connect
25	GND	Power ground
26	NC	Must open this pin
27	NC	Must open this pin
28	SELB/NC	No connect. Default 8bit
29	NC	No connect
30	GND	Power ground
31-32	NC	No connect
33	U/D	UP/down selection
34	L/R	Left/right selection
35	NC	No connect
36	Reset	Global reset pin. Active low
37	Stbyb	Standby mode setting pin,active low
38	NC	No connect
39-40	NC	No connect

4 Timing Characteristics

4.1 Data input format
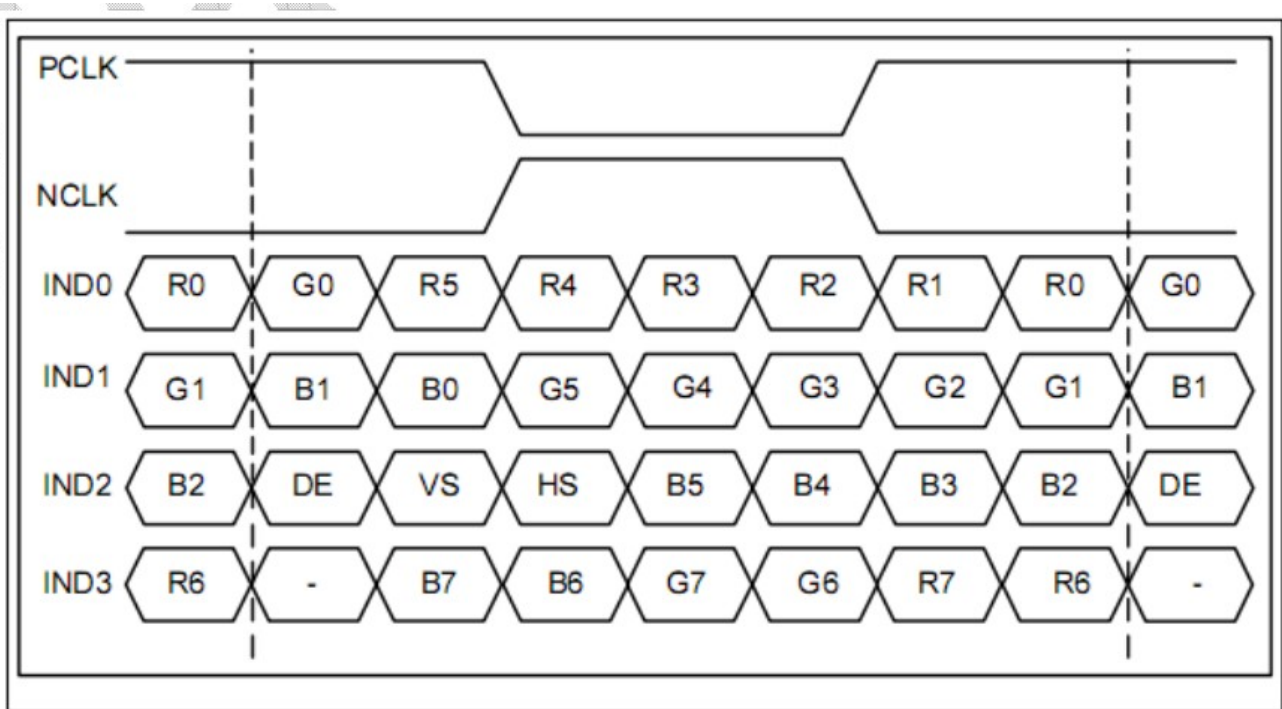
4.2 Lvds timing specification
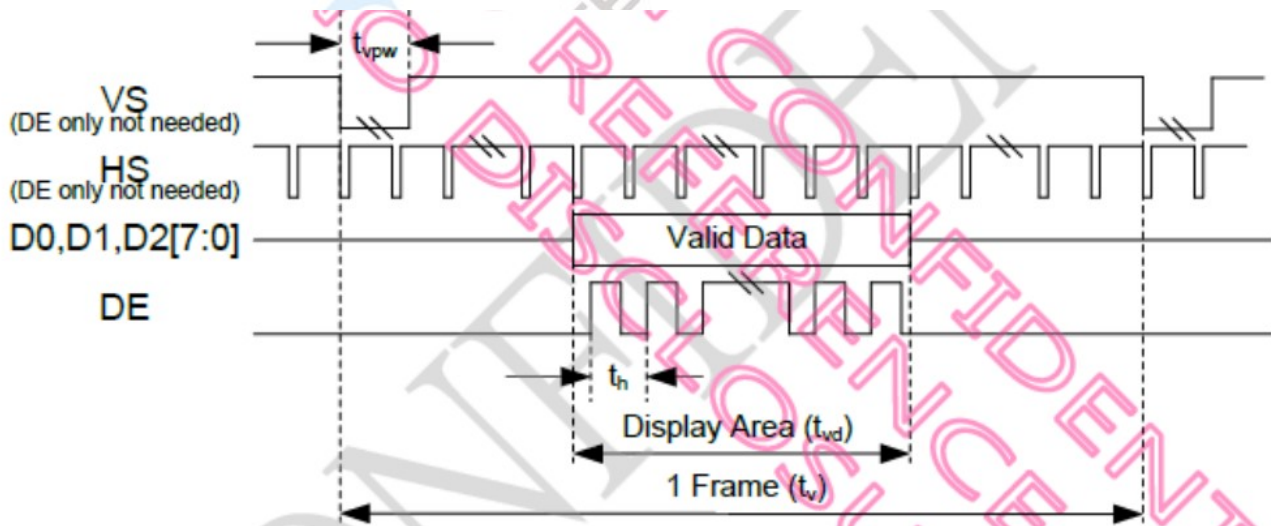
Vertical input timing
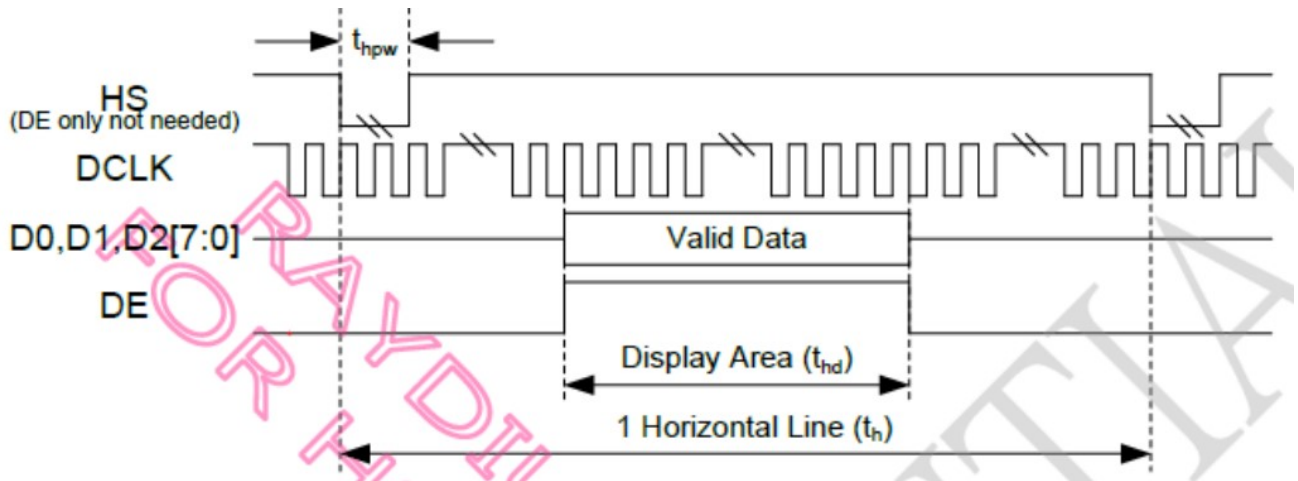
Horizontal input timing

Item	Symbol	Min.	Typ.	Max.	Unit
Frame Rate	--	--	60	--	Hz
Vertical Total Time	T_V	490	496	504	H
Vertical Display Time	T_{VD}		480		H
Horizontal Total Time	T_H	1335	1346	1664	DCLK
Horizontal Display Time	T_{HD}		1280		DCLK
Clock Rate	$1/ T_{Clock}$	39.25	40.06	50.32	MHz

5   Absolute Maximum Ratings

PARAMETER	SYMBOL	MIN	MAX	UNIT
Supply voltage for analog	VDD	-0.3	4	V
Supply voltage for logic	VDD	-0.5	4	V
Operating Temperature	TOP	-30	80	°C
Storage Temperature	TST	-30	80	°C
Humidity	RH	-	90%(Max 60°C)	RH

6   Electrical   Characteristics

Item	Symbol	Min	Typ.	Max	Unit	Applicable terminal
Supply Voltage for Logic	VDD	3.0	3.3	3.6	V	
Supply Voltage for Analog	AVDD	-	-	-	V	
Power supply	VGH	-	-	-	V	
Power supply	VGL	-	-	-	V	
Power supply	VCOM	-	-	-	V	
Input Voltage	V_{IL}	GND	-	0.3VDD	V	
	V_{IH}	0.7VDD	-	VDD		
Input leakage Current	I_{LKG}	-	-	-	μA	

7   Backlight   Characteristics

ITEM	SYMBOL	MIN	TYP	MAX	UNIT
Voltage for LED backlight	V_f	-	21	-	V
Current for LED backlight	I_f	-	420	-	mA
Power consumption	Wbl	-	8820	-	mW
Uniformity	Avg	75	80	-	%
LED Life Time	-	40000	50000	-	Hrs

Note:

1.The LED life time is defined as the module brightness decrease to 50% original brightness at Ta=25°C, 60%RH ±5 %.

2. The life time of LED will be reduced if LED is driven by high current, high ambient temperature and humidity conditions.

3. Typical operating life time is an estimated data.

4. Permanent damage to the device may occur if maximum values are exceeded or reverse voltage is loaded .Functional operation should be restricted to the conditions described under normal operating conditions.

8 LCD Optical specifications

Item	Symbol	Condition	Specification			Unit	Remark
			Min	Typ	Max		
Response time (By Quick)	Tr+Tf	$\theta = 0°$	-	30	-	ms	Note 5
Contrast ratio	CR	$\theta = 0°$	1100	1300	-		Note 2,6
Viewing angle	Top	CR≧10	80	85	-	Deg.	Note 2,6,7
	Bottom	CR≧10	80	85	-		
	Left	CR≧10	80	85	-		
	Right	CR≧10	80	85	-		
Color Filter Chromacicity with C light	Wx	$\theta = 0°$	Typ -0.04	TBD	Typ +0.04		Note 3
	Wy			TBD			
	Rx			TBD			
	Ry			TBD			
	Gx			TBD			
	Gy			TBD			
	Bx			TBD			
	By			TBD			
NTSC			-	70	%		Note 3
Transmittance	Trans		-	3.5	%		Note 4

Note 1: Ambient temperature = 25°C.

Note 2: To be measured with a viewing cone of 2°by Topcon luminance meter BM-5A.

Note 3: To be measured with Otsuta chromaticity meter LCF-2100M, CF only measure under C light simulation.

Note 4: BOE shipping status is cell without polarizer. Transmittance of Specification is cell with polarizer. The tolerance of Transmittance is ±10%.

Note 5: Definition of response time:

The output signals of TRD-100 are measured when the input signals are changed to "White" (falling time) and from "White" to "Black" (rising time), respectively. The interval is between the 10% and 90% of amplitudes. Refer to figure as below.
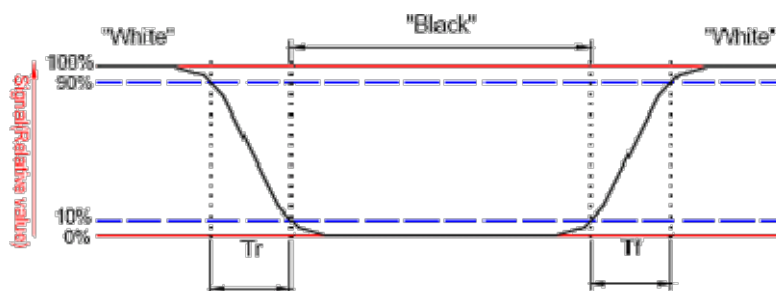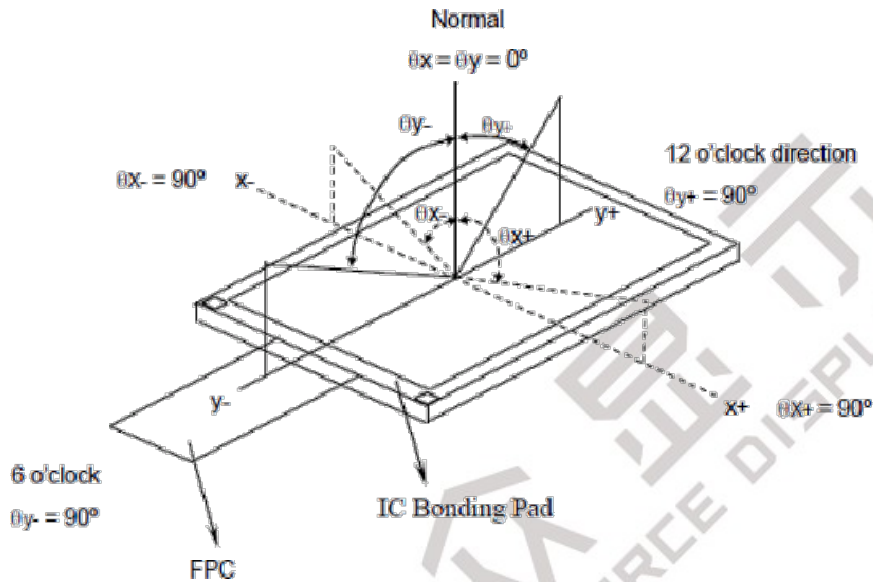
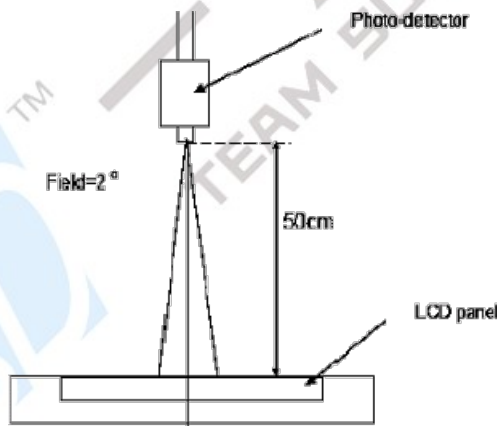Note 6: Definition of contrast ratio:

Contrast ratio is calculated by the following formula.

$$\text{Contrast ratio (CR)} = \frac{\text{Brightness on the "white" state}}{\text{Brightness on the "black" state}}$$
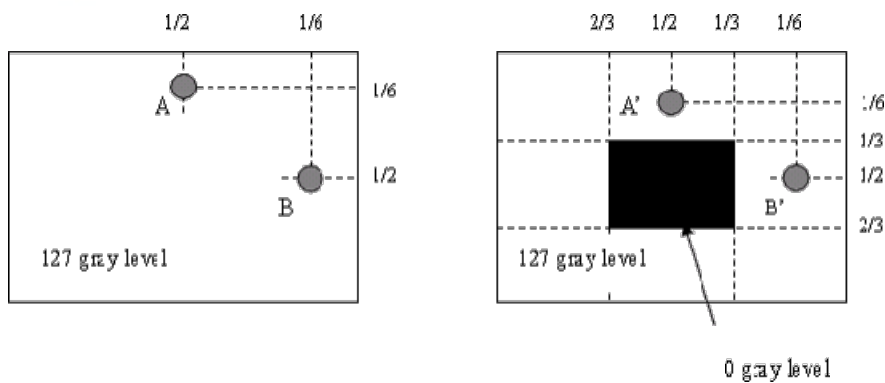
Note 7: Definition of viewing angle

Note 8: Optical characteristic measurement setup.

Note 9:

l LA-LA'1 / LA x 100%= 2% max., LA and LA' are brightness at location A and A'.

l LB-LB'1 / LB x 100%= 2% max., LB and LB' are brightness at location B and B'.

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	80±2°C/240 hours	
4	Low Temperature Operating	-30±2°C/240 hours	
5	Temperature Cycle	-30±2°C(30 min.) , 80± 2°C (30min.) , 100 cycles	
6	Damp Proof Test	60°C ±5°C × 90%RH/240 hours	
7	Vibration Test	Frequency 10Hz~55Hz Stroke: 1.5mm Sweep: 10Hz~150 Hz~10Hz 2 hours For each direction of X, Y, Z	
8	Shock Test	Half-sine, wave, 300m/s	
9	Packing Drop Test	Height: 80 cm 1 corner, concrete floor	
10	Electrostatic Discharge Test	C=150pF, R=330 Ω Air: ±8KV 150pF/330Ω 30 times Contact: ±4KV,20 times	
11	Image Sticking	25℃,60%RH (ref.to Remark(1))/30 minutes	

Remark (1): Switch the image to Grey 127 after displaying the 5*8 chess pattern for 30 minutes,the afterimage disappears within 5 minutes.
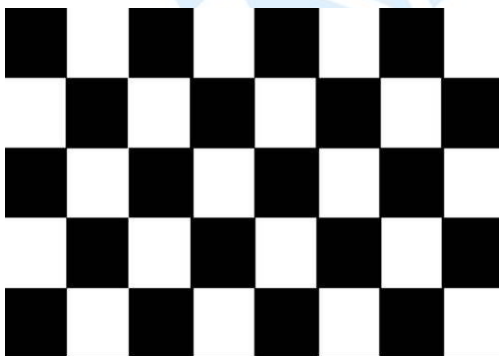
5*8 chess pattern   Gray127

1.1 About Image Sticking

1.1.1 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.

1.1.2 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.

1.1.3 How to Avoid Image Sticking?

- Try not to operate the LCD with a "fixed" image on the screen for more than 1 hours.
- 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.

1.1.4   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.

1.1.5   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.

1.2 Others

1. Issues that are not defined in this document shall be discussed and agreed with both parties. (Customer and supplier)
2. Unless otherwise agreed upon in writing, the criteria shall be applied to both parties. (Customer and supplier)

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.