一众显示科技有限公司

TEAM SOURCE DISPLAY TECH. CO, LTD.

TFT-LCD Module Specification

Module NO.：TST043WQBS-145

Version： V1.0

□ APPROVAL FOR SPECIFICATION   □ APPROVAL FOR SAMPLE

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

TSD		
Presented by	**Reviewed by**	**Approved by**
Hcr	Aron	Aron

Document Revision History

Version	Date	Page	Description	Changed By
V1.0	2023-04-28	all	Provisional specification	Aron

Index

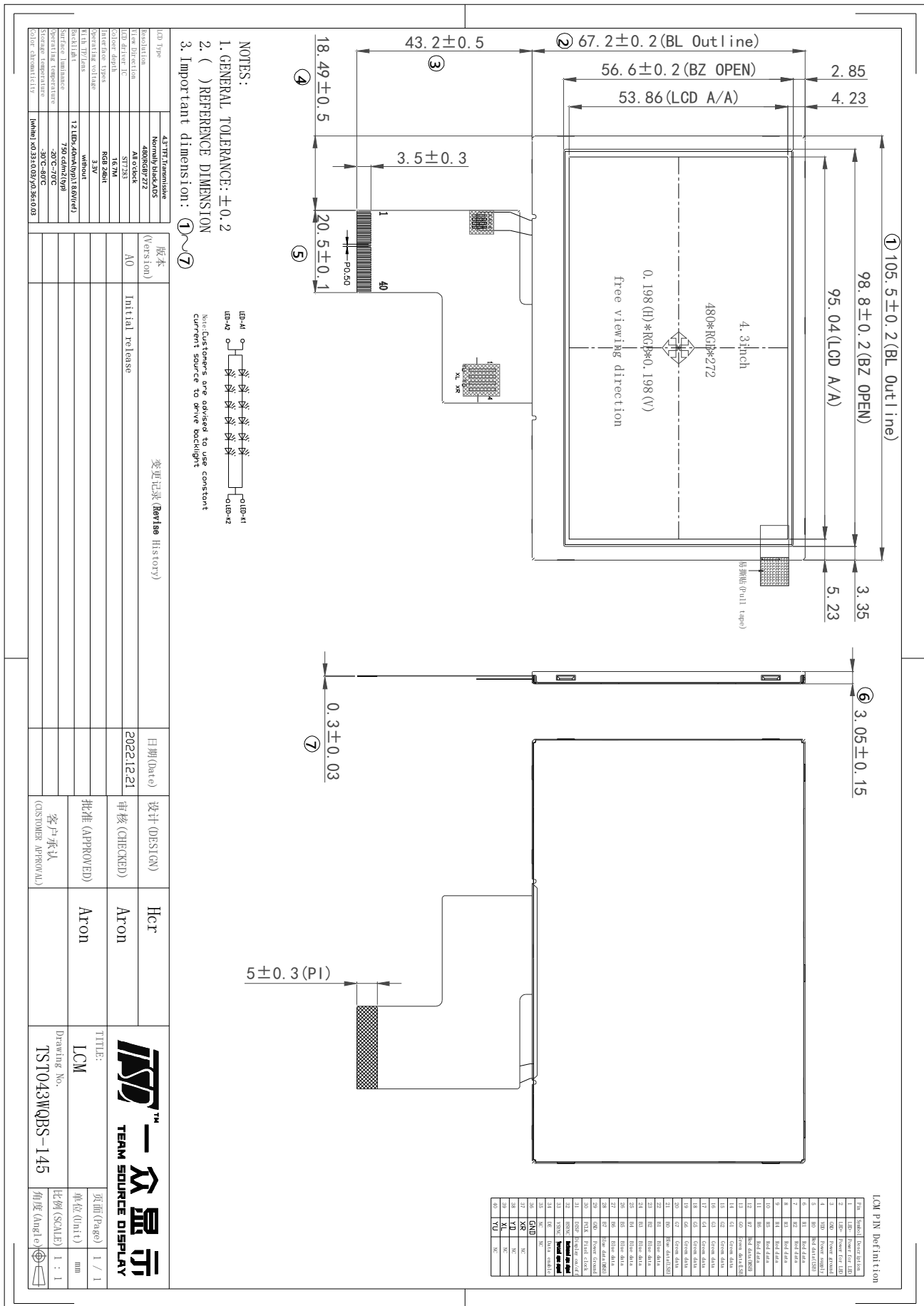| Contents	Page

1. LCM Specification

1.1 Description

TST043WQBS-145(is a transmissive type color active matrix liquid crystal display(LCD) which uses amorphous thin film transistor(TFT) as switching devices. This product is composed of a TFT LCD panel, a drive IC, a FPC, and a LED-backlight unit. The active display area is 4.3inches diagonally measured and the native resolution is 480*RGB*272.Features of this product are listed in the following table.

1.2 Functions & Features

Table 1.1 Module Functions & Features

Parameter	Value	Unit
LCD Mode	TFT/Transmissive	-
Color Depth	16.7M	-
Display Resolution	480*RGB*272	pixels
Module Size	105.5 (H)*67.2(V)*3.05(T)(Exclude FPC)	mm
Active Area (A.A.)	95.04 (L)* 53.86 (W)	mm
Pixel Arrangement	RGB-stripe	-
Viewing Direction	ALL	
Display Mode	Normally Black	
LCD Controller/Driver	ST7283	-
IC Package Type	COG	-
Interface	RGB24-bit	-
Power Supply Voltage	3.3	V
Backlight	White LED*12	pcs
Brightness	750(Typ)	cd/m^2

2. Mechanical Specification

NOTES:
1. GENERAL TOLERANCE:±0.2
2. ( )REFERENCE DIMENSION
3. Important dimension:①~⑦

Note:Customers are advised to use constant current source to drive backlight

LCD Type	4.3"TFT Transmissive Normally black/ADS
Resolution	480(RGB)*272
View Direction	All o'clock
LCD driver IC	ST7283
Colour depth	16.7M
Interface types	RGB 24bit
Operating voltage	3.3V
FPC th./W/Lens	without
Backlight	12 LEDs,40mA(typ),18.6V(ref)
Surface luminance	750 cd/m2(typ)
Operating temperature	-20°C~70°C
Storage temperature	-30°C~80°C
Color chromaticity	(white) x:0.33±0.03/y:0.36±0.03

105.5±0.2(BL Outline)
98.8±0.2(BZ OPEN)
95.04(LCD A/A)
67.2±0.2(BL Outline)
56.6±0.2(BZ OPEN)
53.86(LCD A/A)
43.2±0.5
18.49±0.5
20.5±0.1
3.5±0.3
2.85
4.23
3.35
5.23
0.3±0.03
5±0.3(PI)
3.05±0.15
4.3 inch
480*RGB*272
0.198(H)*RGB*0.198(V)
free viewing direction

变更记录(Revise History)

版本(Version)		变更记录
A0	Initial release	

		日期(Date)	2022.12.21
设计(DESIGN)	Hcr	审核(CHECKED)	Aron
批准(APPROVED)	Aron	客户承认(CUSTOMER APPROVAL)	

TITLE: LCM
Drawing No. TST043WQBS-145
页面(Page) 1/1
单位(Unit) mm
比例(SCALE) 1:1
角度(Angle) 1:1

LCM PIN Definition

Pin	Symbol	Description
1	LED-	Power (-) for LED
2	LED+	Power (+) for LED
3	GND	Power ground
4	VDD	Power supply
5	B7	Blue data(MSB)
6	B6	Blue data
7	B5	Blue data
8	B4	Blue data
9	B3	Blue data
10	B2	Blue data
11	B1	Blue data
12	B0	Blue data(LSB)
13	G7	Green data(MSB)
14	G6	Green data
15	G5	Green data
16	G4	Green data
17	G3	Green data
18	G2	Green data
19	G1	Green data
20	G0	Green data(LSB)
21	R7	Red data(MSB)
22	R6	Red data
23	R5	Red data
24	R4	Red data
25	R3	Red data
26	R2	Red data
27	R1	Red data
28	R0	Red data(LSB)
29	GND	Power ground
30	CLK	Pixel Clock
31	DISP	Display on/off
32	HSYNC	
33	VSYNC	
34	DE	Data enable
35	NC	
36	NC	
37	XR	
38	YD	
39	XL	
40	YU	

LED-A1 LED-A2 LED-K1 LED-K2

XL XR

Pin Descriptions（参见 P5 页模组图）

Pin No.	Symbol	Description
1	LED-	Cathode of LED backlight
2	LED+	Anode of LED backlight
3	GND	Power ground
4	VDD	Power voltage
5	R0	Red data (LSB)
6	R1	Red data
7	R2	Red data
8	R3	Red data
9	R4	Red data
10	R5	Red data
11	R6	Red data
12	R7	Red data (MSB)
13	G0	Green data (LSB)
14	G1	Green data
15	G2	Green data
16	G3	Green data
17	G4	Green data
18	G5	Green data
19	G6	Green data
20	G7	Green data(MSB)
21	B0	Blue data(LSB)
22	B1	Blue data
23	B2	Blue data
24	B3	Blue data
25	B4	Blue data
26	B5	Blue data
27	B6	Blue data
28	B7	Blue data(MSB)
29	GND	Power ground
30	DCLK	Pixel clock
31	DISP	Display on/off
32	HSYN	Horizontal sync signal
33	VSYNC	Vertical sync signal
34	DE	Data enable
35	NC	NO connect
36	GND	Power ground
37	NC	NO connect
38	NC	NO connect
39	NC	NO connect
40	NC	NO connect

4. Electrical Units

4.1 Absolute Maximum Ratings

The absolute maximum ratings are list on Table 4.1. When used out of the absolute maximum ratings, the LCM may be permanently damaged. Using the LCM within the following electrical characteristics limit is strongly recommended for normal operation. If these electrical characteristic conditions are exceeded during normal operation, the LCM will malfunction and cause poor reliability.

Table 4.1   Module Absolute Maximum Ratings

Item	Symbol	Unit	Value	Note
Power Supply Voltage (1)	VCC	V	-0.3 to + 3.6	
Power Supply Voltage (2)	VGH ~ VSS	V	10.0 to +20.0	
Power Supply Voltage (3)	VSS ~ VGL	V	5.0 to +15.0	
Operating Temperature	Top	°C	-20 to +70	
Storage Temperature	Tst	°C	-30 to +80	
Operating Humidity	Hop	%(RH)	10~90	

(VSS=0V)

4.2 Electrical characteristics (Ta=25°C)

Table 4.2:DC Characteristic

Item		Symbol	Condition	Min.	Typ.	Max.	Unit
Supply Voltage	Logic	VCC	---	2.8	-	3.3	V
Input Voltage	H level	V_{IH}	---	$0.8V_{dd}$	---	V_{dd}	V
	L level	V_{IL}		0	---	$0.2V_{CC}$	
Current Consumption		I_{DD}	With internal voltage generation; VDD=3.3V;Tamb=25℃;	---	---	TBD	mA

4.3 Backlight Specification

Table 4.3 Back-light Characteristics

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Supply Voltage	VF		-	18.6	-	V
Supply Current	IF	Backlight Current IF=40mA		40		mA
Life times	Lt		20000	30000	-	hours
Uniformity	B		80	–	–	%
Color		White				

Note: With 12 pcs white LED parallel connection.

5. AC Characteristics

5.1 Parallel RGB Mode Timing Diagram
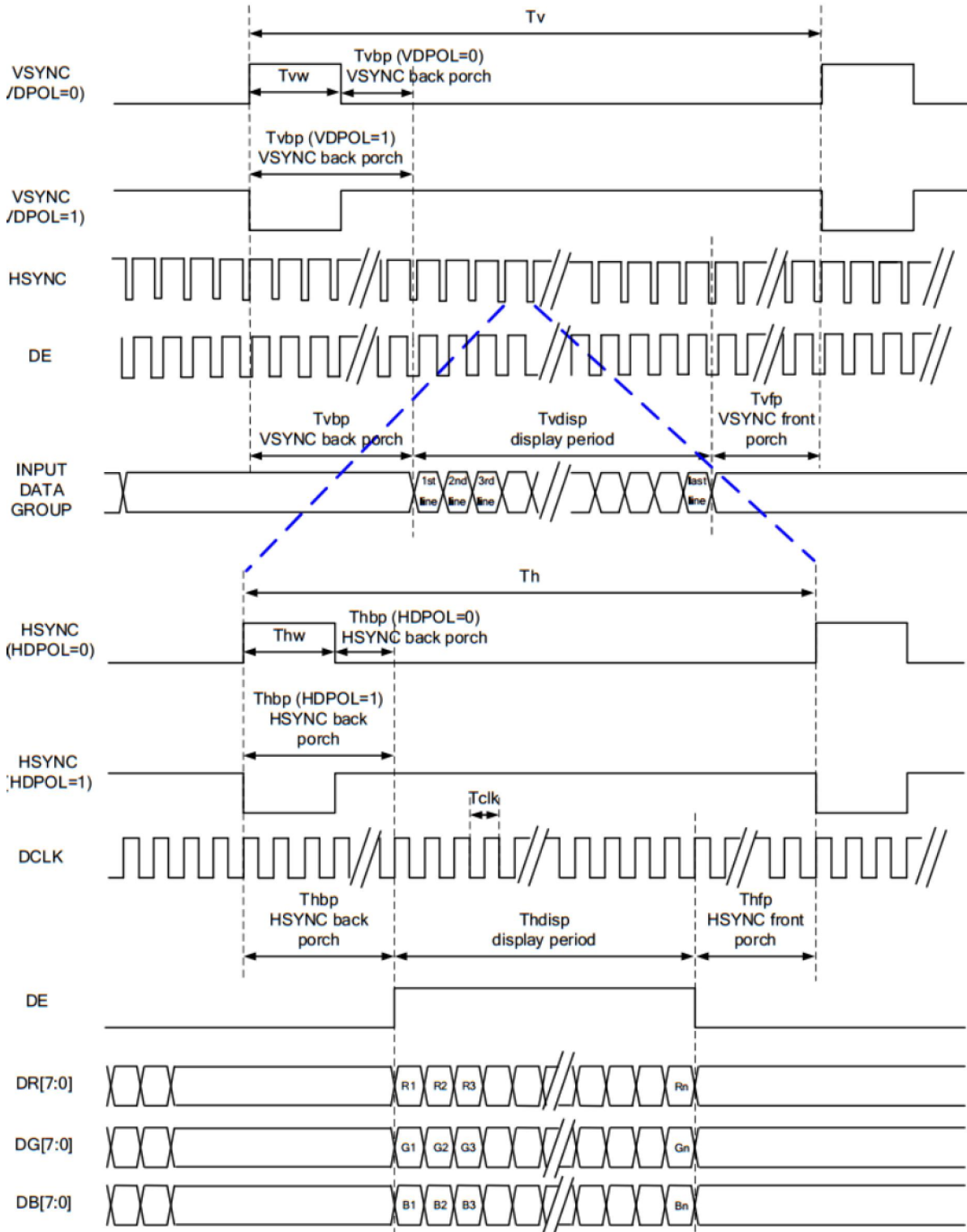
Parallel 24-bit RGB Input Timing (PVDD=VDD=VDDI= 3.3V, AGND= 0V, TA=25°C)

480RGB X 272 Resolution 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	598	DCLK	
	Display Period	Thdisp		480		DCLK	
	Back Porch	Thbp	3	43	43	DCLK	By H_BLANKING setting
	Front Porch	Thfp	2	8	75	DCLK	
	Pulse Width	Thw	2	4	43	DCLK	
VSYNC	Period Time	Tv	276	292	321	HSYNC	
	Display Period	Tvdisp		272		HSYNC	
	Back Porch	Tvbp	2	12	12	HSYNC	By V_BLANKING setting
	Front Porch	Tvfp	2	8	37	HSYNC	
	Pulse Width	Tvw	2	4	12	HSYNC	

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

6. Optical Specifications

Optical characteristics are determined after the unit has been 'ON' and stable for approximately 30 minutes in a dark environment at 25℃. The values specified are at an approximate distance 50cm from the TFT-LCD surface at a viewing angle of Φ and θ equal to 0°.

Measurement condition: Refer to next pages (C-light source, Halogen Lamp)

*1): with Polarizer   *2): without Polarizer   *3): Only Color Filter glass

Items		Symbol	Condition	Specifications			Unit
				Min.	Typ.	Max.	
Contrast Ratio		CR		800	1000	-	-
Response Time		T_R		-	30	-	ms
		T_F			30		ms
Chromaticity	Red	X_R	Θ=0	-0.03	0.61	+0.03	-
		Y_R			0.33		-
	Green	X_G			0.36		-
		Y_G			0.59		-
	Blue	X_B			0.15		-
		Y_B			0.11		-
	White	X_W			0.32		-
		Y_W			0.35		-
Viewing angle	Hor.	L(3 o'clock)	Center CR≥10	-	80	-	deg.
		R(9 o'clock)		-	80	-	
	Ver.	U(12 o'clock)		-	80	-	
		D(6 o'clock)		-	80	-	
Color Gamut(NTSC)		-	Θ=0	45	50	-	%
Brightness(With LCD)		IV	White	700	750	800	cd/m²

7. Reliability Test Items

Test condition

No.	Test Items	Test Condition	Remarks
1	High Temperature Storage	T = 80℃ for 96h	Module (Without Contamination)
2	Low Temperature Storage	T = -30℃ for 96h	
3	High Temperature Operating	T = 70℃ for 96h	
4	Low Temperature Operating	T = -20℃ for 96h (But no condensation of dew)	
5	High Temp. and High Humidity Operating	T = 50℃ /90% for 96h (But no condensation dew)	
6	Thermal Shock	-20±2℃~25~70±2℃×10cycles (30min.) (5min.) (30min.)	
7	ESD test	Voltage:±8KV R: 330Ω, C:150pF,Air discharge, 10time	
8	Packing Shock	1corner, 3edge, 6face / 1.0mDrop	Packing
9	Packing Vibration	Frequency：10Hz~55Hz~10Hz Amplitude：1.5mm, X，Y，Z direction for total 3hours	
10	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 10 seconds.
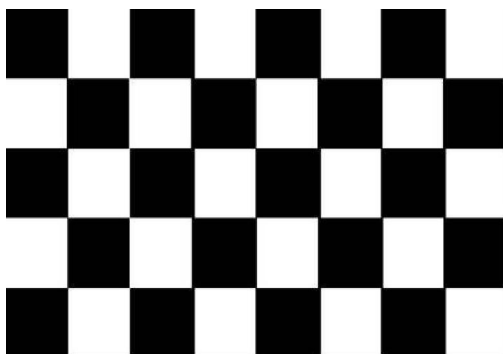
5*8 chess pattern   Gray127

8   About Image Sticking

8.1   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.

8.2   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.

8.3   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.

8.4 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.

8.5 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.

8.6 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)

9 Suggestions for using LCD modules

9.1 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.

9.2   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.

10   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.