TFT-LCD Module Specification

Module NO.： TST043WQHS-114P

Version： V1.0

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

For Customer's Acceptance：	
Approved by	**Comment**
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Document Revision History

Version	Date	Page	Description	Changed By
V1.0	2024-02-27	all	new	San

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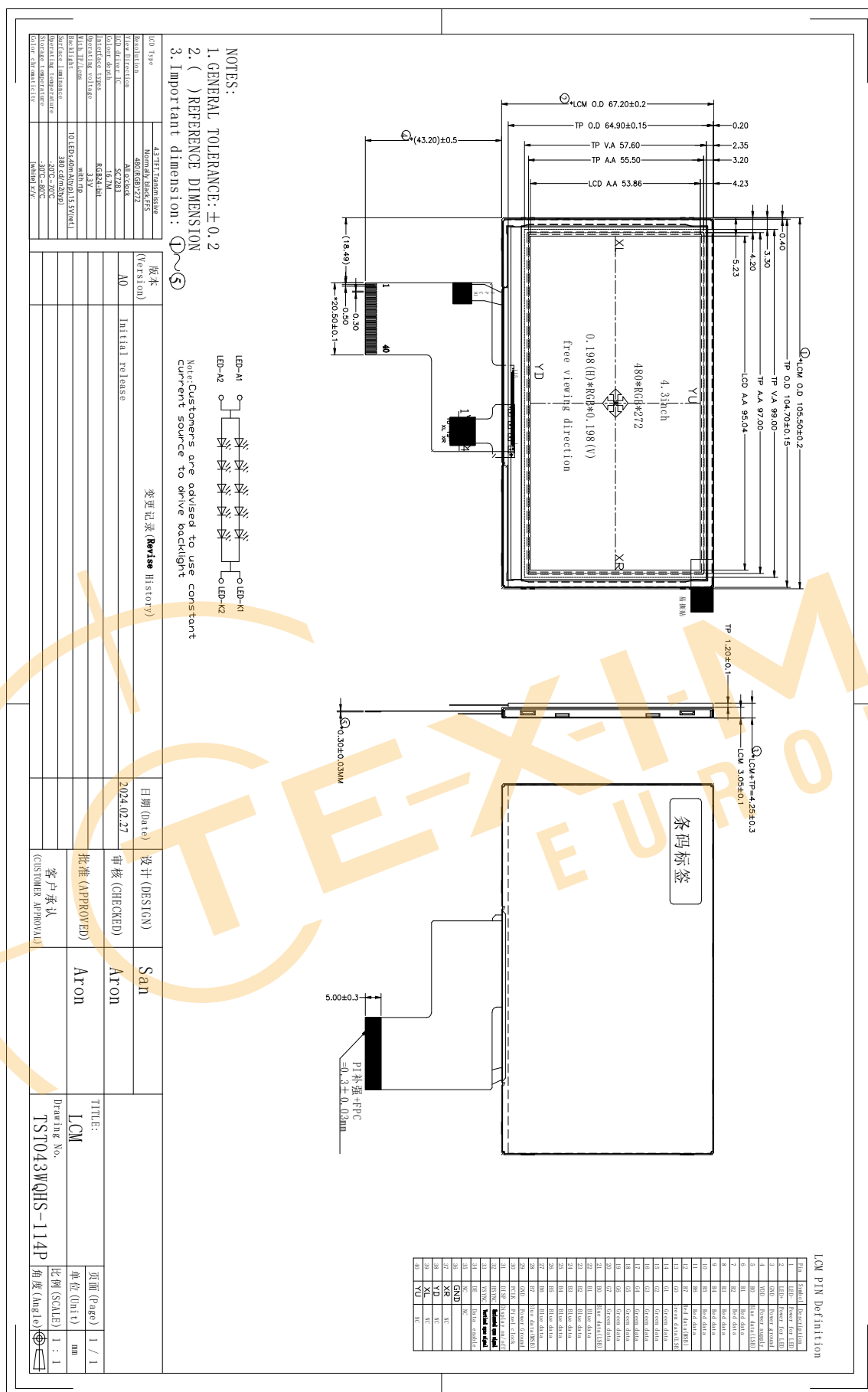
1. LCM Specification

1.1 Description

TST043WQHS-114P(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,and a resistive touch panel. 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)*4.25(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	SC7283	-
IC Package Type	COG	-
Interface	RGB24-bit	-
Power Supply Voltage	3.3	V
Backlight	White LED*10	pcs
Brightness	380(Typ)	cd/m^2
TP/Lens	With RTP	-

2. Mechanical Specification

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

Item	Specification
LCD Type	4.3"TFT Transmissive
Resolution	480(RGB)*272
View Direction	All o'clock
LCD driver IC	SC7283
Colour depth	16.7M
Interface type	RGB24 bit
Operating voltage	3.3V
Backlight	with rtp
With TP/Lens	10 LEDs,40mA(typ),15.5V(ref)
Surface luminance	380 cd/m2(typ)
Operating temperature	-20°C~70°C
Storage temperature	-30°C~80°C
Color chromaticity	(white) x,y

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

变更记录(Revise History)

版本 (Version)		日期(Date)
A0	Initial release	2024.02.27

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

TITLE: LCM
Drawing No.: TST043WQHS-114P

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

LCM O.D 67.20±0.2
TP O.D 64.90±0.15
TP V.A 57.60
TP A.A 55.50
LCD A.A 53.86

LCM O.D 105.505±0.2
TP O.D 104.70±0.15
TP V.A 99.00
TP A.A 97.00
LCD A.A 95.04

4.3inch
480*RGB*272
free viewing direction
0.198(H)*RGB*0.198(V)

LCM+TP=4.25±0.3
LCM 3.05±0.1
TP 1.20±0.1

PI补强+FPC =0.3±0.03mm

条 码 标 签

LCM PIN Definition

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

3. 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	XR	The touch panel pin
38	YD	The touch panel pin
39	XL	The touch panel pin
40	YU	The touch panel pin

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°C;	---	---	TBD	mA
LCD Driving Voltage		VOP	---	---	TBD	---	V

4.3 Backlight Specification

Table 4.3 Back-light Characteristics

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Supply Voltage	VF	Backlight Current IF=40mA	-	15.5	-	V
Supply Current	IF			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
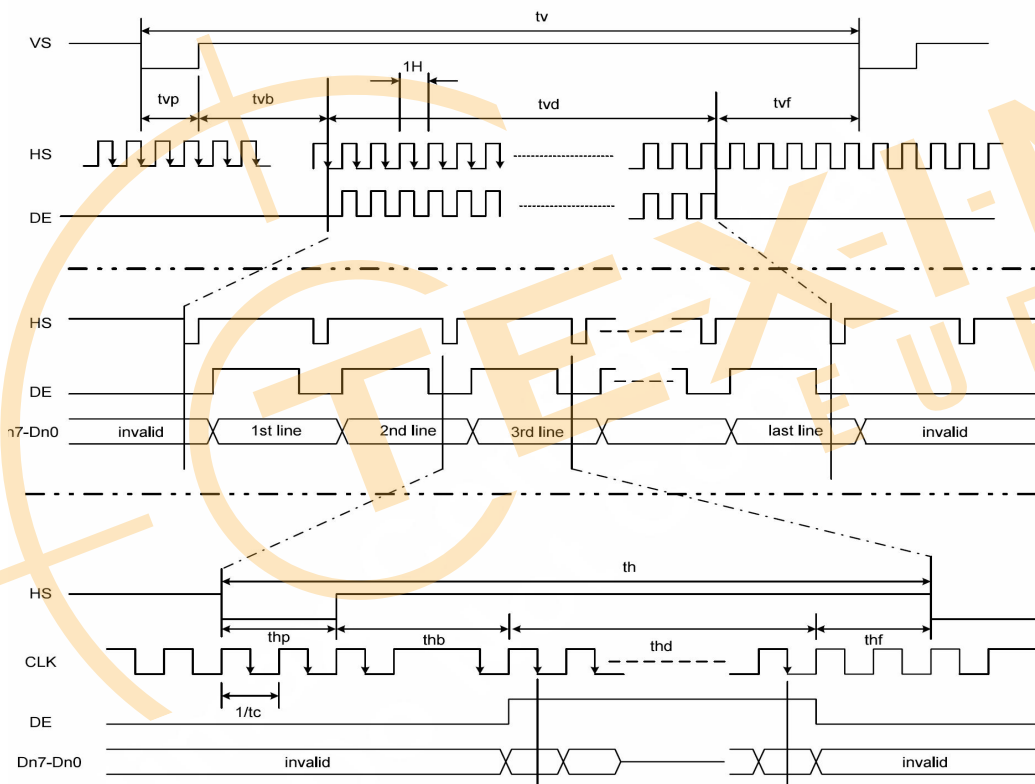
Parameter	Symbol	Spec. Min.	Spec. Typ.	Spec. Max.	Unit
Clock cycle	f_{CLK}[1]	-	9	15	MHz
Hsync cycle	1/th	-	17.14	-	KHz
Vsync cycle	1/tv	-	59.94	-	Hz
Horizontal Signal					
Horizontal cycle	th	525	525	605	CLK
Horizontal display period	thd	480	480	480	CLK
Horizontal front porch	thf	2	2	82	CLK
Horizontal pulse width	thp[2]	2	41	41	CLK
Horizontal back porch	thb[2]	2	2	41	CLK
Vertical Signal					
Vertical cycle	tv	285	286	399	H[1]
Vertical display period	tvd	272	272	272	H[1]
Vertical front porch	tvf	1	2	227	H[1]
Vertical pulse width	tvp[2]	1	10	11	H[1]
Vertical back porch	tvb[2]	1	2	11	H[1]

Note: (1) Unit: CLK=1/ f_{CLK} , H= th,
(2) It is necessary to keep tvp+tvb=12 and thp+thb=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		640	800	-	-
Response Time		T_R		-	30	-	ms
		T_F					ms
Chromaticity	Red	X_R	Θ=0	-0.03	tbd	+0.03	-
		Y_R			tbd		-
	Green	X_G			tbd		-
		Y_G			tbd		-
	Blue	X_B			tbd		-
		Y_B			tbd		-
	White	X_W			tbd		-
		Y_W			tbd		-
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	300	380		cd/m^2

7.Touch Panel specifications

ITEM	VALUE			UNIT	REMARK
	Min	Typ	Max		
Linearity	-	-	1.5	%	Analog X and Y directions
Terminal Resistance	100	-	500	Ω	x
	300	-	1100		y
Insulation Resistance	20	-	-	MΩ	DC 25V
Voltage	-	3	-	V	DC
Chattering	-	-	10	ms	100kΩ pull-up
Transparency	78	-	-	%	-
Operation Force	80	-	120	g	-
Endurance	1,000,000	-	-	Touches	100g Operation Force
	-	-	100,000	Slides	
Surface Hardness	3	-	-	H	

8. Reliability Test Items

No.	Test Items	Test Condition	Remarks
1	High Temperature Storage	T = 80℃ for 72hr	Module (Without Contamination)
2	Low Temperature Storage	T = -30℃ for 72hr	
3	High Temperature Operating	T = 70℃ for 72hr	
4	Low Temperature Operating	T = -20℃ for72hr (But no condensation of dew)	
5	High Temp. and High Humidity Operating	T = 50℃ /90% for 72hr (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.
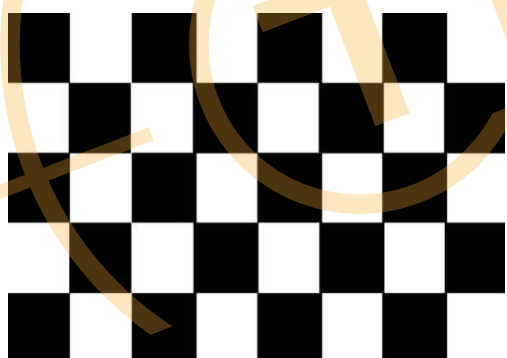
5*8 chess pattern   Gray127

9 About Image Sticking

9.1 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.

9.2 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.

9.3   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.

9.4   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

P11/13

environment of approximately 35° to 50^oC. 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.

9.5   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.

9.6Others

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

10.1Handling 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.

10.2Storage

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.

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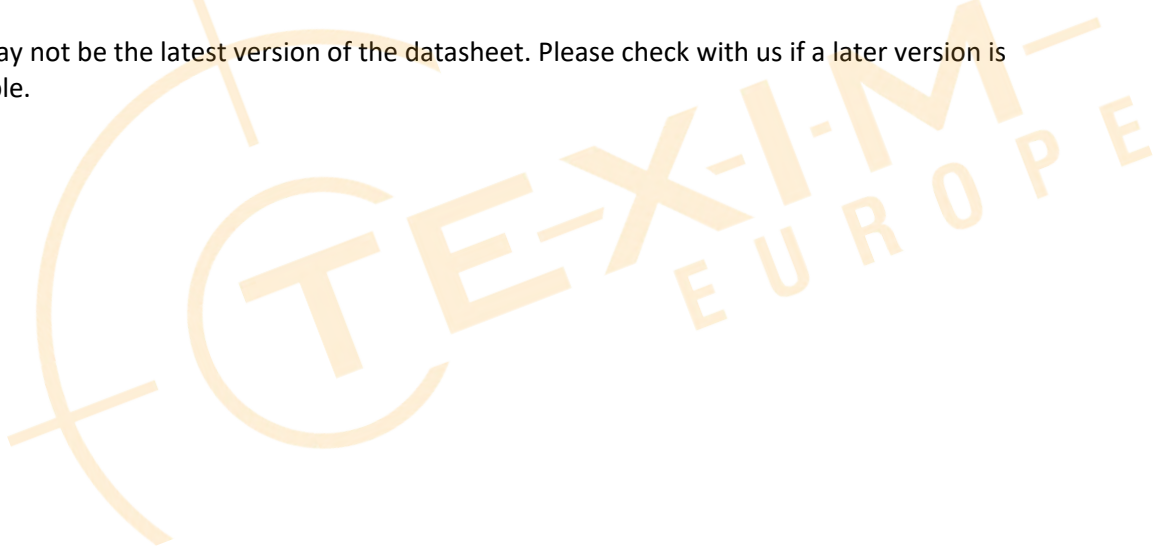
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