一众显示科技有限公司

TEAM SOURCE DISPLAY TECH. CO, LTD.

Smart Module Specification

Module NO.: Gen4-STM32-35CT-01

Version: V1.0

☐ APPROVAL FOR SPECIFICATION ☐ APPROVAL FOR SAMPLE

For Customer's Acceptance:	
Approved by	Comment

Team Source Display:		
Presented by	Reviewed by	Approved by
hcr	Aron	Aron

Revision history

Version No.	Date	Page	Content	Remark
V1.0	2026-08-15	All	The initial release	Aron

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1 General Characteristics

1.1 Introduction

Gen4-STM32-35CT-01 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 TFT LCD panel, Backlight, Capacitive touch screen, Housing,and STM32L471 control board.This TFT LCD has a 3.5 (2:3) inch diagonally measured active display area with HVGA (320 horizontal by 480 vertical pixel) resolution.

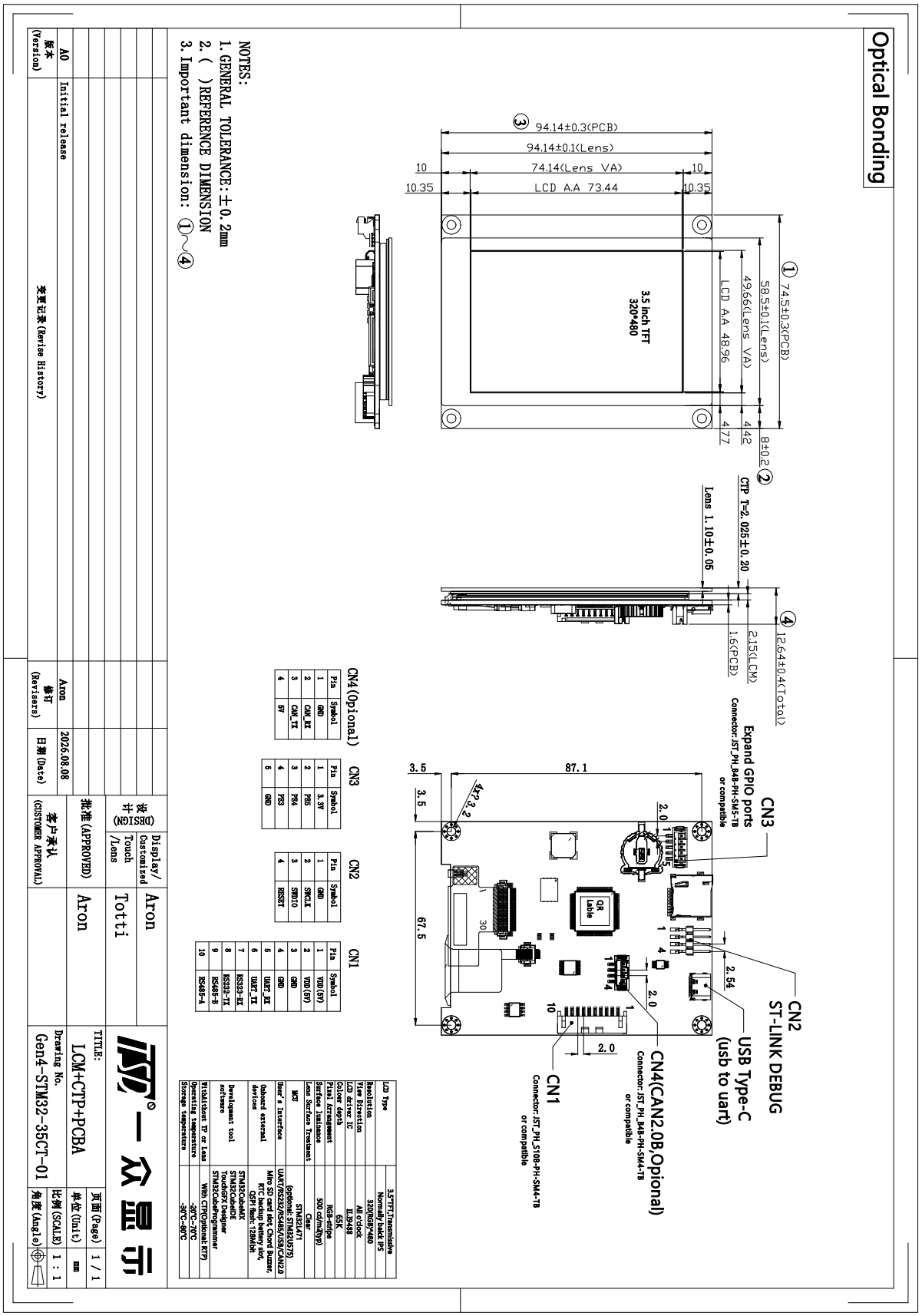
1.2 Feature

- Implementing multimodal human-computer interaction based on TouchGFX
- Integrated buzzer,support chord sounds
- High reliability and performance, widely used in HMI in industries such as smart home appliances, industrial control, healthcare, and instrumentation..
- Supports glove mode and wet finger operation mode

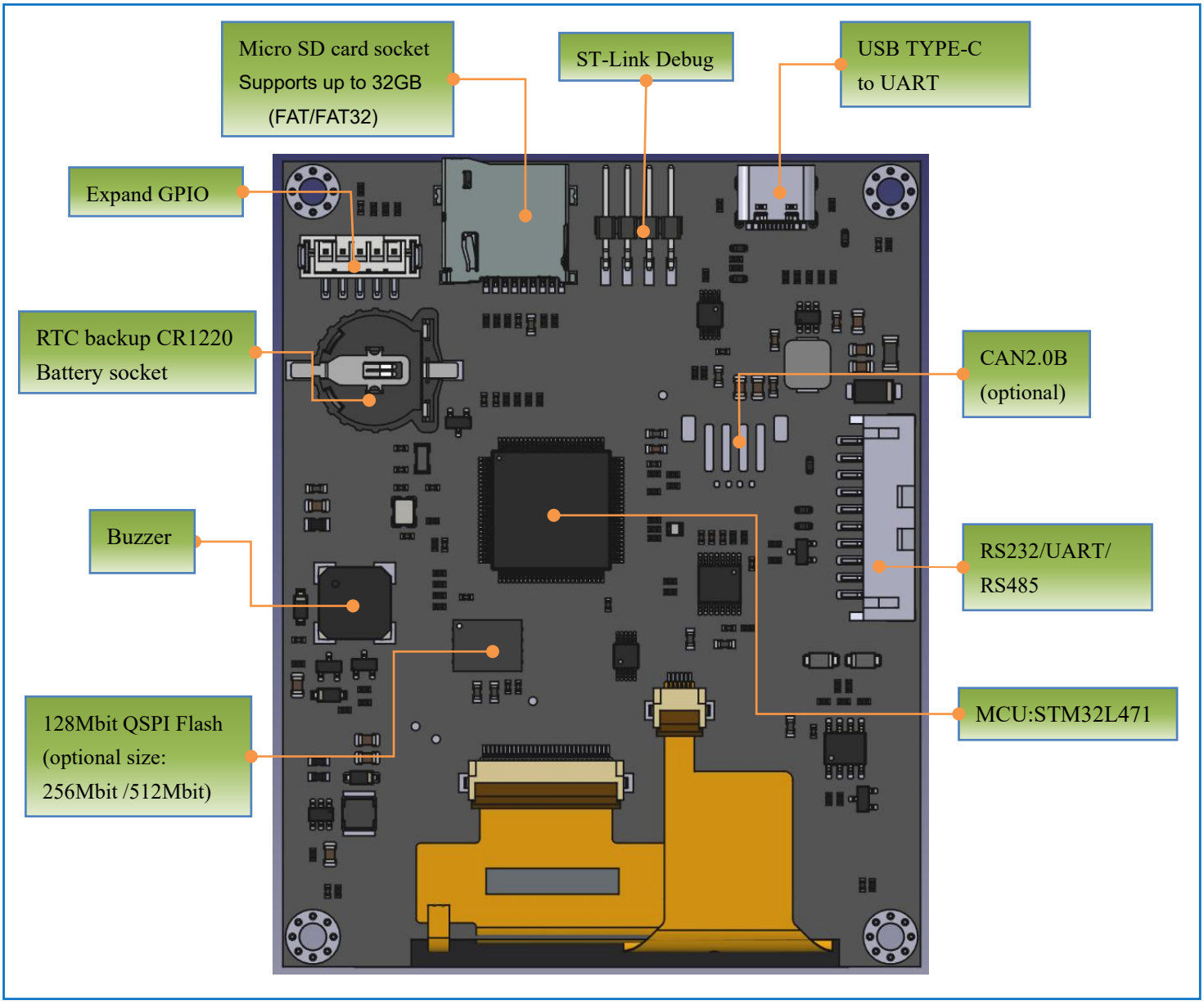
1.3 General Information

ITEM	Specification	Unit
LCD Type	a-Si TFT,Transmissive,Normally black	-
LCD Size	3.5	inch
Resolution (W x H)	320(RGB) × 480	pixel
Outline size	74.5(H) x 94.14(V) x12.64(T)	mm
Active Area	48.96 (H) x 73.44 V)	mm
Pixel Pitch	0.153(H) × 0.153(V)	mm
Viewing Direction	ALL o'clock	-
Color Depth	65K(RGB565)	-
Pixel Arrangement	RGB-stripe	-
Surface Luminance（With CTP）	500 (typ)	cd/m²
Lens Surface Treatment	Clear(optional: AG/AR coating)	-
MCU	Ultra-low-power,STM32L471 / Cortex-M4 / 80MHz	-
SRAM	96 KB+32 KB(with hardware parity check)	-
Flash Memory	512 KB(internal)+128Mbit QSPI flash(external, optional sizes:256Mbit/512Mbit)	-
User Interface	UART/RS232/RS485/USB Type-C to UART, 3pin GPIO, CAN2.0B(optional)	-
With/Without TP or Lens	With CTP(optional: RTP)	-
Development tool software	STM32CubeMX + STM32CubeIDE + TouchGFX Designer + STM32CubeProgrammer	-
Weight	76±1	g

2 Mechanical drawings



3 Block Diagram



4 Interface description

4.1 CN1 interface description

No.	Symbol	I/O	Function	Remark
1	VDD	P	Power supply (+5.0V)	
2	VDD	P	Power supply (+5.0V)	
3	GND	P	Ground	
4	GND	P	Ground	
5	UART_RX	I	UART receive input	UART1
6	UART_TX	O	UART transmit output	
7	RS232-RX	I	RS232 receive input	UART3
8	RS232-TX	O	RS232 transmit output	
9	RS485-B	I/O	RS485 Driver Output/Receiver Input Inverting	UART2
10	RS485-A	I/O	RS485 Driver Output/Receiver Input Non-inverting	

Note (1) I: input, O: output, P: Power

Note (2) Connector Part No.: PH2.0-10P JST or equivalent

4.2 CN2 interface description

N0.	Symbol	I/O	Description	Remark
1	GND	P	Ground	
2	SWCLK	I	JTCK-SWCLK	
3	SWDIO	I/O	JTMS-SWDIO	
4	RESET	I	Syetem reset pin. Active low.	

Note (1) I: input, O: output, P: Power Note (2) Connector : 4pin, pitch 2.54mm

4.3 CN3 interface description

N0.	Symbol	I/O	Description	Remark
1	3.3V	P	Power output (+3.3V)	
2	PE5	I/O	TIM3_CH3/GPIO	
3	PE4	I/O	TIM3_CH2/GPIO	
4	PE3	I/O	TIM3_CH1/GPIO	
5	GND	P	Ground	

Note (1) I: input, O: output, P: Power Note (2) Connector : 5pin, pitch 2.0mm, JST

5 Absolute Maximum Ratings

PARAMETER	SYMBOL	MIN	MAX	UNIT
Power Supply Voltage	VDD	-0.3	5.5	V
I/O port operating voltage	V_{IO}	-0.3	3.3	V
Operating Temperature	TOP	-20	70	℃
Storage Temperature	TST	-30	80	℃
Storage Humidity	RH	-	90%(Max 60℃)	RH

Note (1) Permanent damage to the device may occur if maximum values are exceeded. Function operation should be restricted to the conditions described under Normal Operating Conditions.

Note (2) Specified values are for LED converter (Refer to 7 for further information).

6 Electrical Characteristics

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT
Power Supply Voltage	VDD	4.5	5.0	5.5	V
I/O port operating voltage	V_{IO}	3.0	3.3	3.6	V
Power Input Current	I_{DD}	-	165	200	mA
MCU Stop2 mode (touch in idle mode)	I_{DD}	-	18	20	mA
Input Voltage ' H ' level	VIH	$0.7V_{IO}$	-	V_{IO}	V
Input Voltage ' L ' level	VIL	GND	-	$0.3V_{IO}$	
LED Life Time	-	20000	30000	-	Hrs

Note (1) The lifetime of LED is defined as the time when it continues to operate under the conditions at Ta = 25 ±2 ℃ until the brightness becomes ≦ 50% of its original value.

Note (2) Please note that LED life will be shorter than the average life described in the specification if operate in higher ambient temperature.

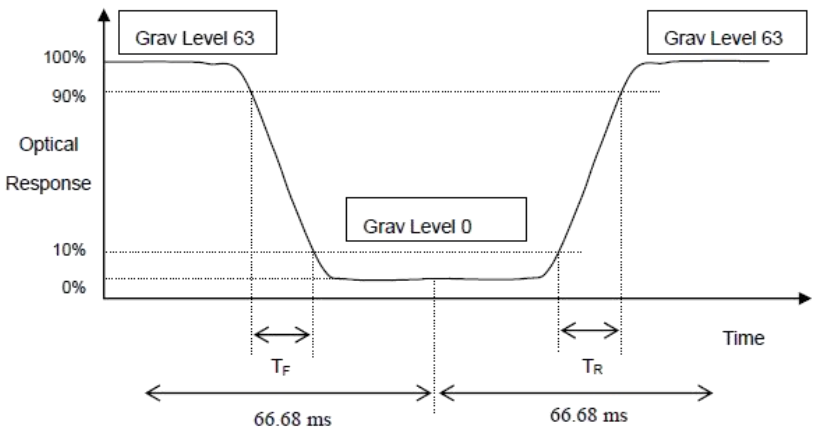
7 LCD Optical specifications

Item	Symbol	Condition	Specification			Unit	Remark
			Min	Typ	Max		
Response time	Tr+Tf	θ = 0°	-	30	-	ms	Note3
Contrast ratio	CR	θ = 0°	600	700	-		Note4
Color Gamut(NTSC)	S	θ = 0°	65	70	-	%	
Luminance(White) with CTP	L	θ = 0°	450	500	-	cd/m^2	Note2,6
Uniformity (White)	-	θ = 0°	80	-	-	%	Note7
Viewing angle	Top	CR≧10	-	80	-	Deg.	Note5
	Bottom	CR≧10	-	80	-		
	Left	CR≧10	-	80	-		
	Right	CR≧10	-	80	-		
Color chromaticity （CIE1931）	Wx	θ = 0°	-0.03	0.298	+0.03		Note2,6
	Wy			0.323			
	Rx			0.635			
	Ry			0.346			
	Gx			0.326			
	Gy			0.590			
	Bx			0.152			
	By			0.049			

Note 1: Ambient temperature = 25° C.

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:

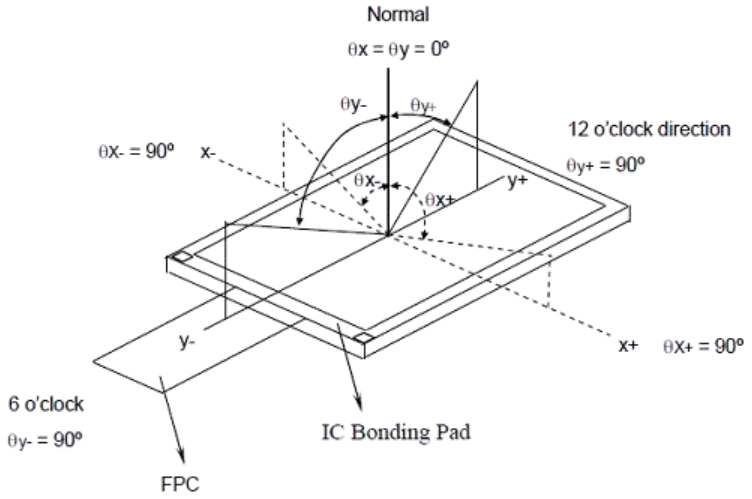


Note 4: Definition of contrast ratio:

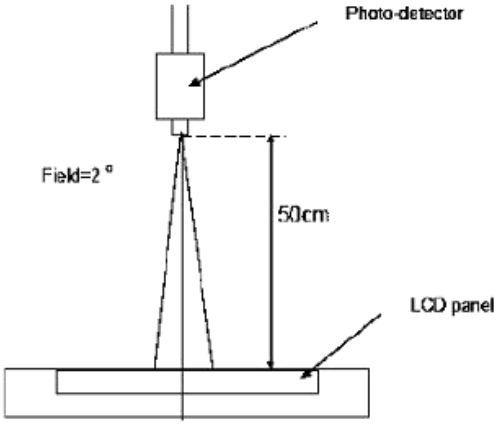
Contrast ratio is calculated by the following formula.

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

Note 5: Definition of viewing angle



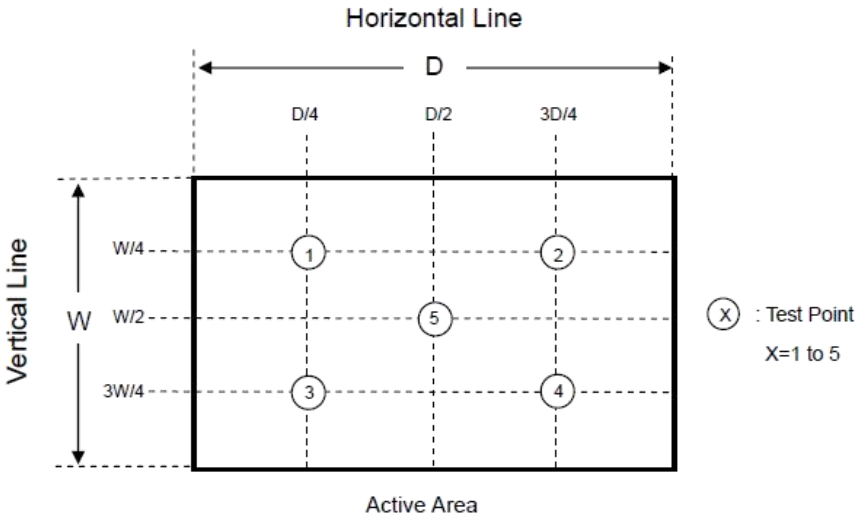
Note 6: Optical characteristic measurement setup.



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)]



8 RELIABILITY TEST

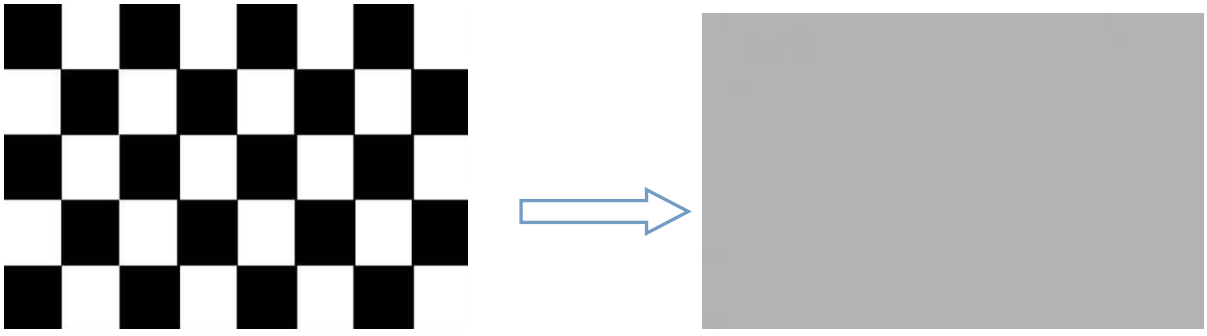
NO.	TEST ITEM	TEST CONDITION	Criterion
1	High Temperature Storage	80±2°C/96 hours	IEC60068-2-1, GB/T2423.2
2	Low Temperature Storage	-30±2°C/96 hours	IEC60068-2-1, GB/T2423.1
3	High Temperature Operating	70±2°C/96 hours	IEC60068-2-1, GB/T2423.2
4	Low Temperature Operating	-20±2°C/96 hours	IEC60068-2-1, GB/T2423.1
5	Temperature Cycle	-30±2°C(30 min.) , 80± 2°C (30min.) , 10cycles	IEC60068-2-14, GB/T2423.22
6	High Temperature & Humidity Storage	60°C ±2°C × 90%RH/96 hours	IEC60068-2-78, GB/T2423.3
7	Vibration Test	Frequency 10Hz~55Hz Stroke: 1.5mm Sweep: 10Hz~150 Hz~10Hz 2 hours For each direction of X, Y, Z	IEC60068-2-6, GB/T2423.10
8	Shock Test (non operation)	"100G.6msmec,1/2 Sine Wave ±X ±Y ±Z each axis 3 times"	IEC60068-2-27,GB/T 2423.5
9	Electrostatic Discharge Test	C=150pF, R=330 Ω Air: ±8KV 150pF/330Ω 9 times Contact: ±4KV,9 times	IEC61000-4-2, GB/T17626.2
10	Image Sticking(残影)	25℃,60%RH/30 minutes	Note2

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

Note 2: Switch the image to Grey 63 after displaying the 5*8 chess pattern for 30 minutes, the after image disappears within 5 minutes.

采用 5x8 的黑白棋盘格画面保持 30 分钟，然后切换到 63 灰阶，5 分钟内图像消失。



5*8 chess pattern　　Gray127

8.1 About Image Sticking(关于残影)

8.1.1 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.

8.1.2 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.

8.1.3 How to Avoid Image Sticking?（如何避免残影）

- Try not to operate the LCD with a “fixed” image on the screen for more than 30 minutes.
-尽量不要在屏幕上显示“固定”图像的情况下操作 LCD 超过 30 分钟。
- 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.
-如果在高温环境中操作显示器，并且显示的图像与下面对“软件开发人员”中的建议相反，则图像粘贴可能在 30 分钟内发生。相应地调整屏幕保护程序设置。
1) 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.
-在长时间不活动时，如商店关门或不使用设备的轮班时，应关闭设备电源。
2)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.

-使用黑色或中灰色背景的屏幕保护程序，如果设备处于非活动状态超过 5-10 分钟，屏幕保护程序会自动设置为打开。

3)Avoid placing the monitor in poorly ventilated areas or in areas that will create excess heat around the monitor for software developers.

-避免将显示器放置在通风不良的区域或显示器周围产生过多热量的区域。

4)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.

-在定义屏幕中的图标、按钮或窗口时，尝试使用块模式而不是不同的线作为边界，将显示划分为不同的区域。

5) 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.

-如果需要显示静态图像，请尝试在两种不同颜色的边界处使用与中间灰度级对称的颜色，并偶尔稍微移动边界线。

6) Try to utilize medium gray hues for those areas that will have prolonged display times or remain static as other menu elements change.

-对于那些显示时间较长或随着其他菜单元素的变化而保持静止的区域，请尝试使用中等灰度色调。

8.1.4 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.

8.1.5 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.

8.2 Others

1. Issues that are not defined in this document shall be discussed and agreed with both parties. (Customer and supplier) 本文件中未定义的问题应由双方讨论并达成一致。（客户和供应商）。

2. Unless otherwise agreed upon in writing, the criteria shall be applied to both parties. (Customer and supplier)除非另有书面约定，否则该标准适用于双方。（客户和供应商）。

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 25 ℃, 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 anti-static 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.