深圳市一众显示科技有限公司

SHEN ZHEN TEAM SOURCE DISPLAY TECH. CO, LTD.

TFT-LCD Module Specification

Module NO.: TST700MIWN-08P

Version: V1.2

☐ APPROVAL FOR SPECIFICATION ☐ APPROVAL FOR SAMPLE

For Customer's Acceptance:	
Approved by	Comment

Team Source Display:		
Presented by	Reviewed by	Approved by

Records of Revision

DATE	REF.PAGE PARAGRAPH DRAWING No.	REVISED No.	SUMMARY	REMARK
2017-07-25		V1.0	First Issue	
2017-10-11		V1.1	Modify ESD(Page 16)	
2021-2-22		V1.2	Added image sticking test	

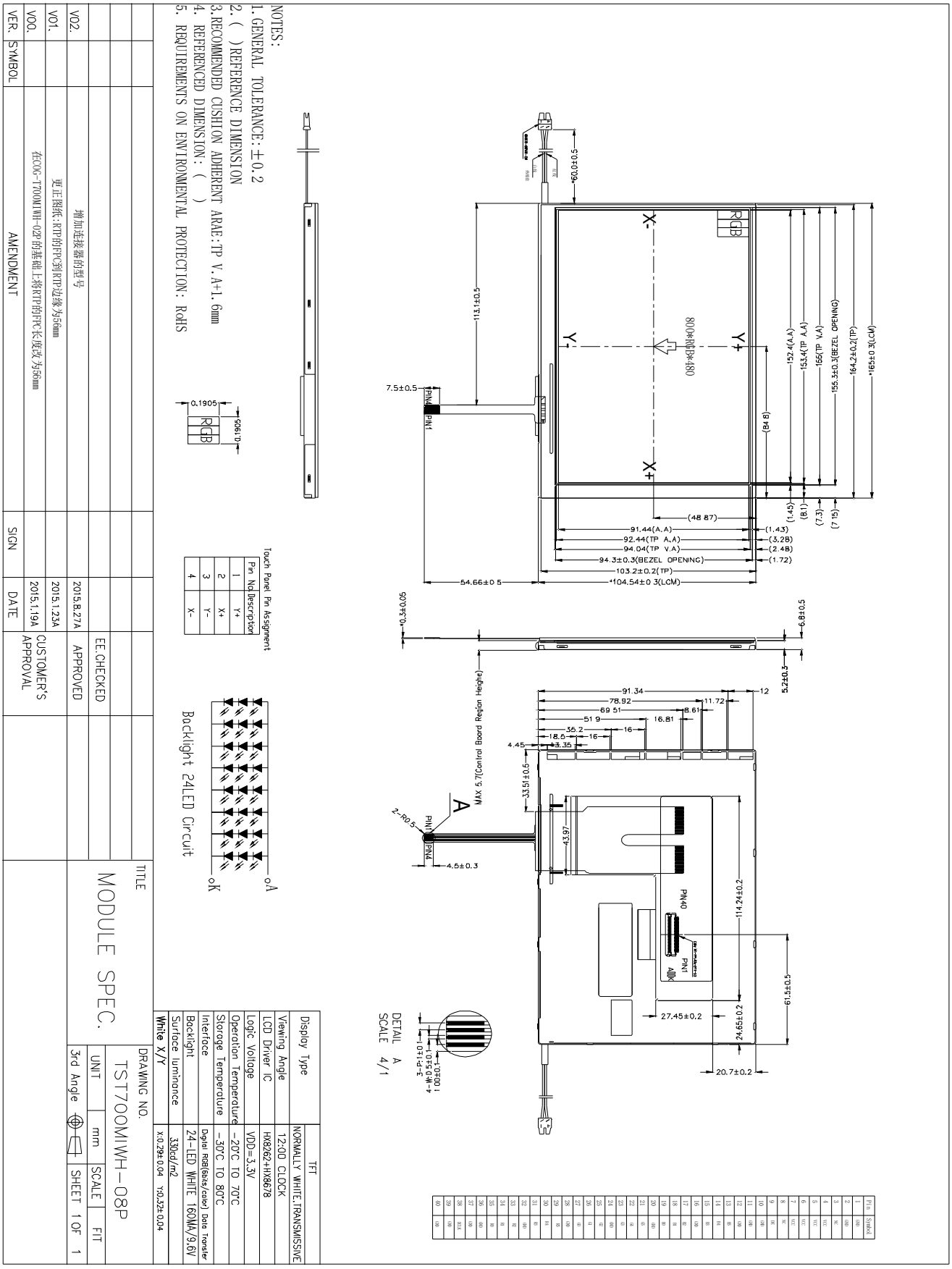
Website: www.tslcd.com/www.lcdlcm.com Email: tslcd@tslcd.com

Contents

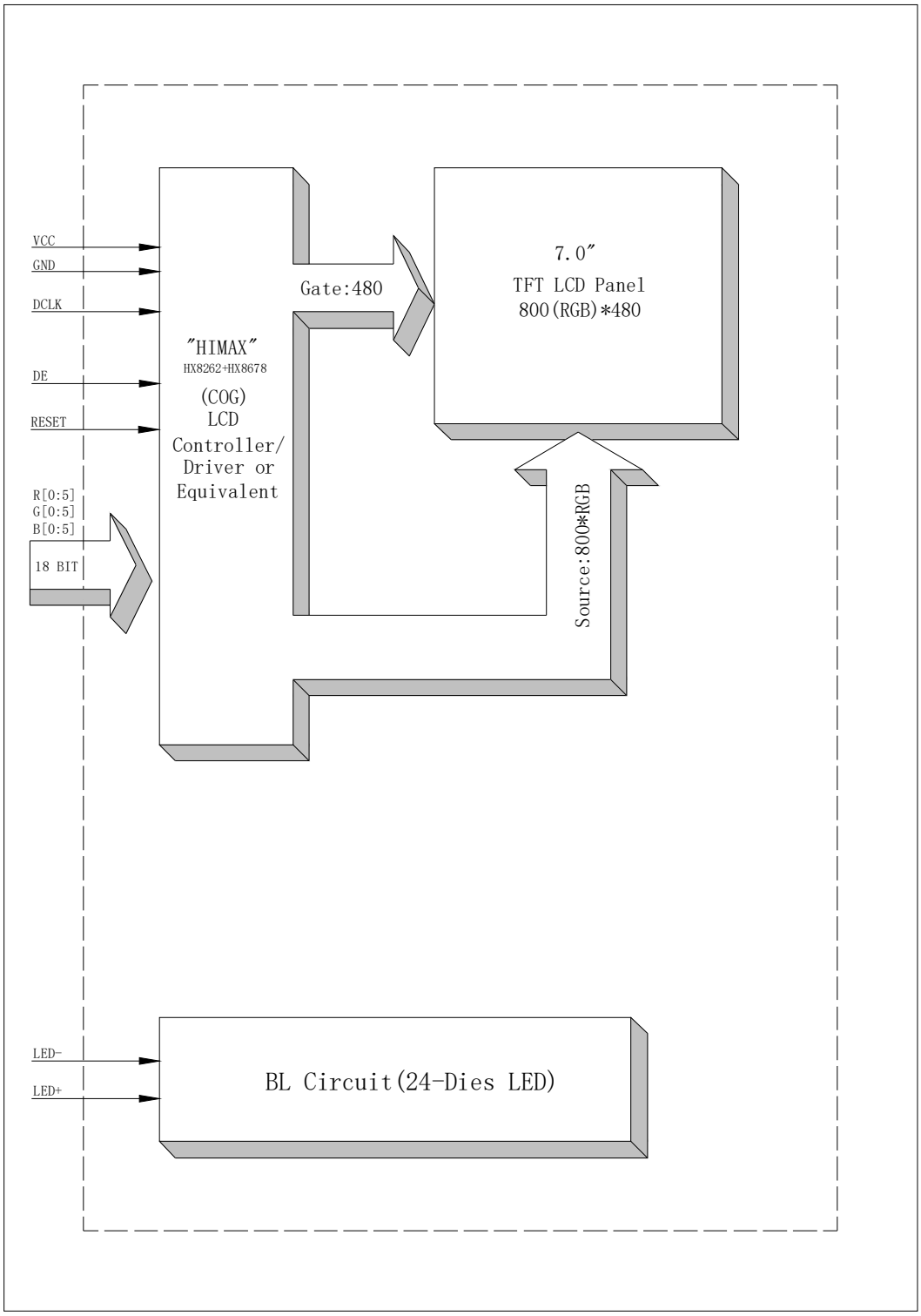
1. General Specification

Item	Contents	Unit
LCD TYPE	TFT/TRANSMISSIVE	
MODULE SIZE (W*H*T)	165.00*104.54*6.80	MM
ACTIVE SIZE (W*H)	152.40*91.44	MM
PIXEL PITCH (W*H)	0.1905*0.1905	MM
NUMBER OF DOTS	800*480	
DIVER IC	HX8262+HX8678	
INTERFACE TYPE	18-BIT RGB	
TOP POLARIZER TYPE	ANTI-GLARE	
RECOMMEND VIEWING DIRECTION	12	O'CLOCK
GRAY SCALE INVERSION DIRECTION	6	O'CLOCK
BACKLIGHT TYPE	24-LED WHITE	
TOUCH PANEL TYPE	RESISTIVE	

2. Mechanical Drawing



3. Block Diagram



4. Interface Pin Function

Pin No.	Symbol	Description
1	GND	Power ground
2	GND	Power ground
3	NC	No connect
4	VCC	Power supply
5	VCC	Power supply
6	VCC	Power supply
7	VCC	Power supply
8	NC	No connect
9	DE	Data Input Enable
10	GND	Power ground
11	GND	Power ground
12	GND	Power ground
13	B5	Blue data
14	B4	Blue data
15	B3	Blue data
16	GND	Power ground
17	B2	Blue data
18	B1	Blue data
19	B0	Blue data
20	GND	Power ground
21	G5	Green data
22	G4	Green data
23	G3	Green data
24	GND	Power ground
25	G2	Green data
26	G1	Green data
27	G0	Green data
28	GND	Power ground
29	R5	Red data
30	R4	Red data
31	R3	Red data
32	GND	Power ground
33	R2	Red data
34	R1	Red data
35	R0	Red data
36	GND	Power ground
37	GND	Power ground
38	DCLK	Pixel clock signal
39	GND	Power ground
40	GND	Power ground

5. Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Unit
Supply voltage for logic	VCC	-0.3	5	V
Supply voltage for analog	AVDD	6.5	13.5	V
Power supply	VGH	-0.3	40	V
Power supply	VGL	-20	0.3	V
Power supply	VGH-VGL	-	40	V
Supply current (One LED)	I_{LED}		30	mA
Operating temperature	T_{OP}	-20	+70	℃
Storage temperature	T_{ST}	-30	+80	℃
LED Reverse Voltage	VR	-	1.2	V

Note: The absolute maximum rating values of this product are not allowed to be exceeded at any times. Should a module be used with any of the absolute maximum ratings exceeded, the characteristics of the module may not be recovered, or in an extreme case, the module may be permanently destroyed.

6. Electrical Characteristics

6.1 Input Power

Item	Symbol	Min	Typ.	Max	Unit	Applicable terminal
Supply Voltage for Analog	VCC	3.0	3.3	3.6	V	
Supply Voltage for Logic	AVDD	10.2	10.4	10.6	V	
Power supply	VGH	16	18	19	V	
Power supply	VGL	-7	-6	-5	V	
Power supply	VCOM	4.1	4.6	5.1	V	
Input Voltage	V_{IL}	0	-	0.3DVDD	V	
	V_{IH}	0.7 DVDD	-	DVDD		
Input leakage Current	I_{LKG}	-		-	μA	

6.2 Backlight Driving Conditions

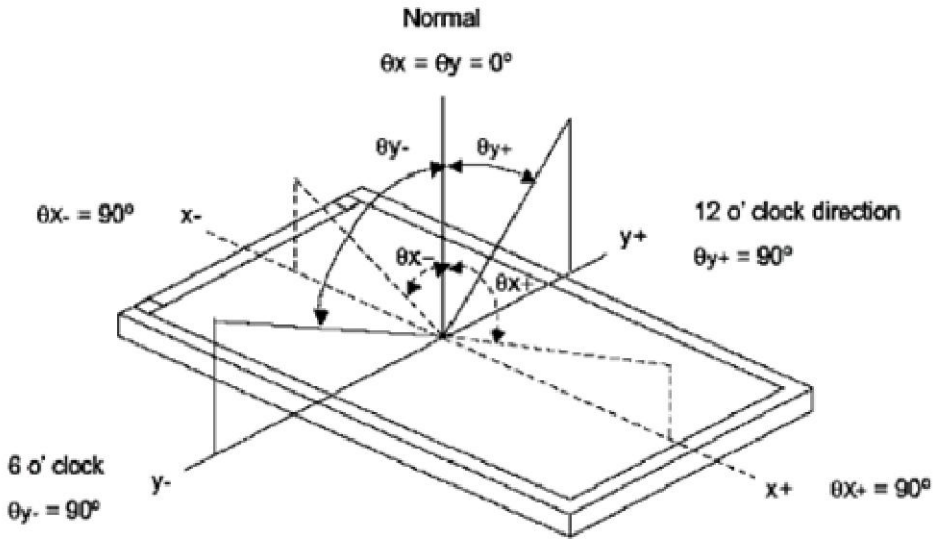
Item	Symbol	Value			Unit	Remark
		Min.	Typ.	Max.		
Voltage for LED Backlight	V_F	-	9.6	10.8	V	I_L =160mA
Current for LED Backlight	I_L		160		mA	
Power Consumption	P		1.536		W	
LED Life Time		30,000	50,000		Hr	Note

Note: Brightness to be decreased to 50% of the initial value at ambient temperature TA=25℃

7. Optical Characteristics

ITEM		SYMBOL	CONDITIONS	SPECIFICATIONS			UNIT	NOTE
				MIN	TYP.	MAX		
Luminance		L	I_L =160mA	260	330	400	Cd/m^2	
Contrast Ratio		CR	θ=0°	250	400			
Response Time		T_{ON}	25℃		5	10	ms	
		T_{OFF}			11	22		
CIE Color Coordinate	Red	X_R	Viewing normal angle	0.542	0.562	0.582		
		Y_R		0.330	0.350	0.370		
	Green	X_G		0.333	0.353	0.373		
		Y_G		0.548	0.568	0.588		
	Blue	X_B		0.130	0.150	0.170		
		Y_B		0.095	0.115	0.135		
	White	X_W		0.278	0.298	0.318		
		Y_W		0.291	0.321	0.331		
Viewing Angle	Hor.	θ_{X+}	CR≥10	65	70		Degree	
		θ_{X-}		65	70			
	Ver.	θ_{Y+}		55	60			
		θ_{Y-}		55	60			
Uniformity	Un			70	75		%	

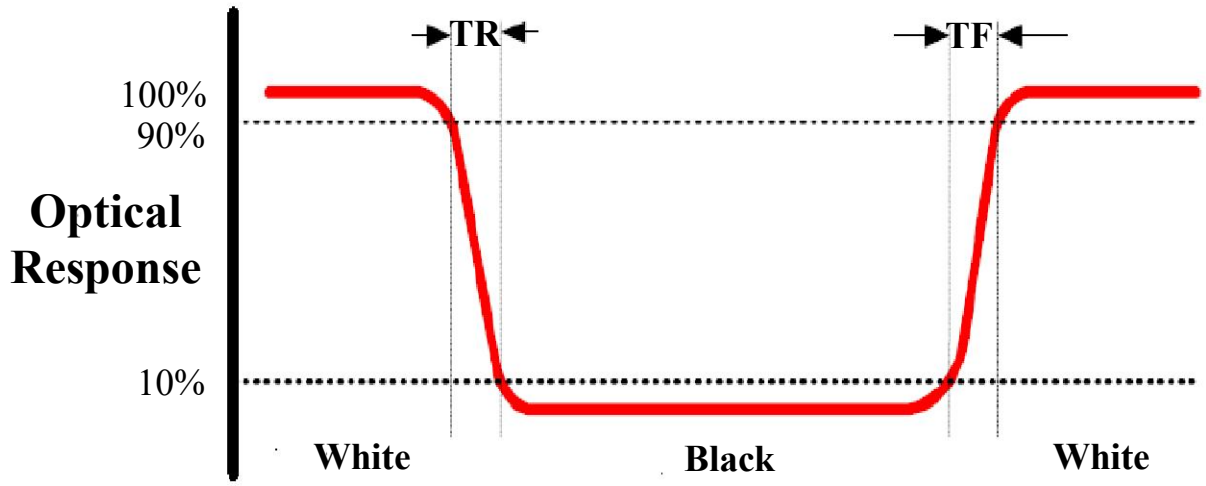
Note 1: Definition of Viewing Angle θx and θy:



Note 2: Definition of contrast ratio CR:

$$CR = \frac{\text{Luminance of white state}}{\text{Luminance of black state}}$$

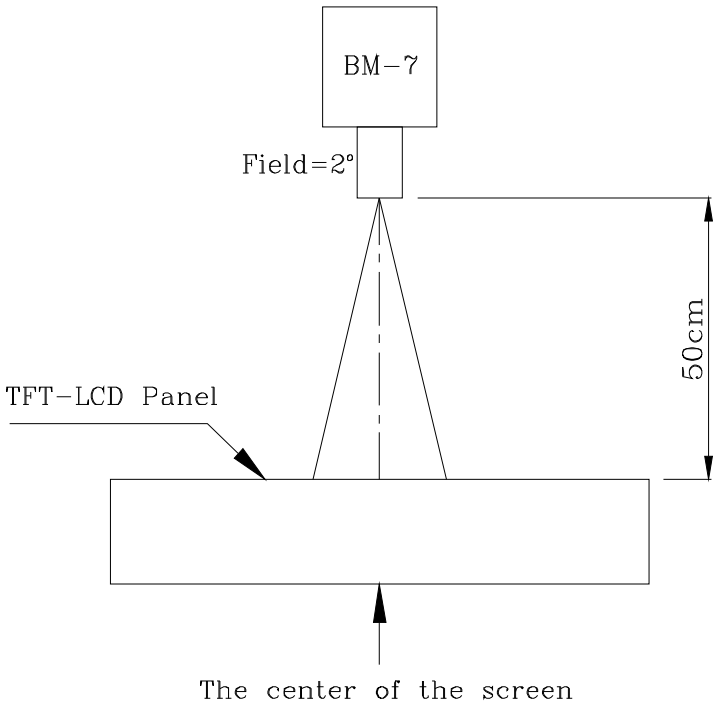
Note 3: Definition of Response Time(Tr,Tf)



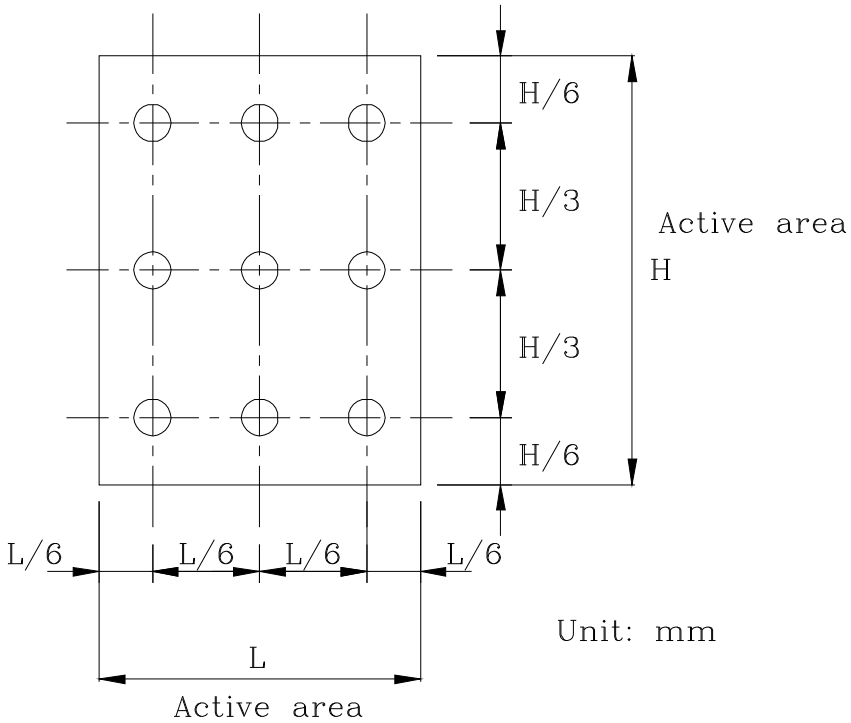
Note 4: Definition of Luminance

①The Brightness Test Equipment Setup

Field=2°（As measuring “black” image, field=2° is the best testing condition)



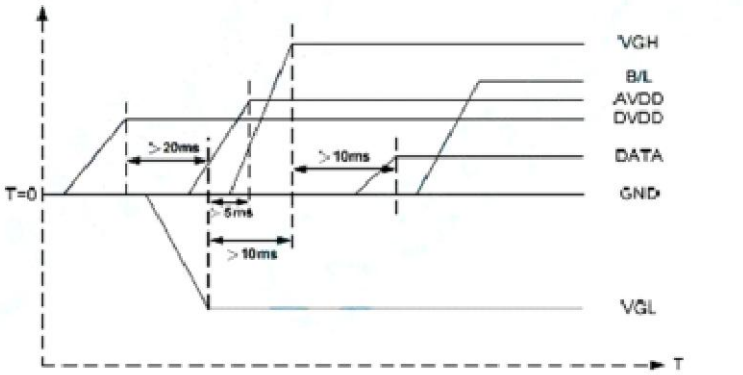
②The Brightness Test Point Setup



8. Timing Characteristics

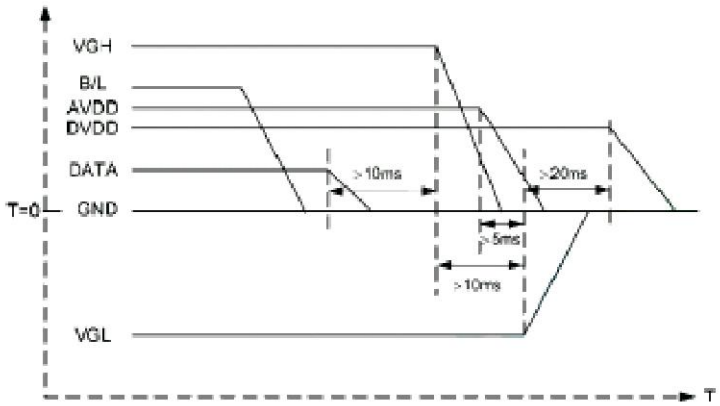
8.1 Power Sequence

Power on



DV_{DD}→VGL→AVDD→VGH→Data→B/L

Power off



B/L→Data→VGH→AVDD→VGL→DV_{DD}

8.2 AC electrical characteristics

Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
HS setup time	T_{hst}	6	-	-	ns
HS hold time	T_{hhd}	6	-	-	ns
VS setup time	T_{vst}	6	-	-	ns
VS hold time	T_{vhd}	6	-	-	ns
Data setup time	T_{dsu}	6	-	-	ns
Data hold time	T_{dhd}	6	-	-	ns
DE setup time	T_{esu}	6	-	-	ns
Source output settling time	T_{ST}	-	-	15	μs
Source output loading R	R_{SL}	-	2	-	K ohm
Source output loading C	C_{SL}	-	60	-	pF

8.3 RGB Timing Table

- **Sync mode**

Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
CLK frequency	F_{CPH}	29.93	33.26	36.59	MHz
CLK period	T_{CPH}	-	30.06	-	ns
CLK pulse duty	T_{CWH}	40	50	60	%
HS period	T_H	930	1056	1057	T_{CPH}
HS pulse width	T_{WH}	1	128	-	T_{CPH}
HS-first horizontal data time	T_{HS}	STHD[7:0]+88			T_{CPH}
HS Active Time	T_{HA}	-	800	-	T_{CPH}
VS period	T_V	490	525	526	T_H
VS pulse width	T_{WV}	1	2	-	T_H
VS-DE time	T_{VS}	STVD[6:0]+8			T_H
VS Active Time	T_{VA}	-	480	-	T_H

Note: (1) $T_{HS}+T_{HA}<T_H$

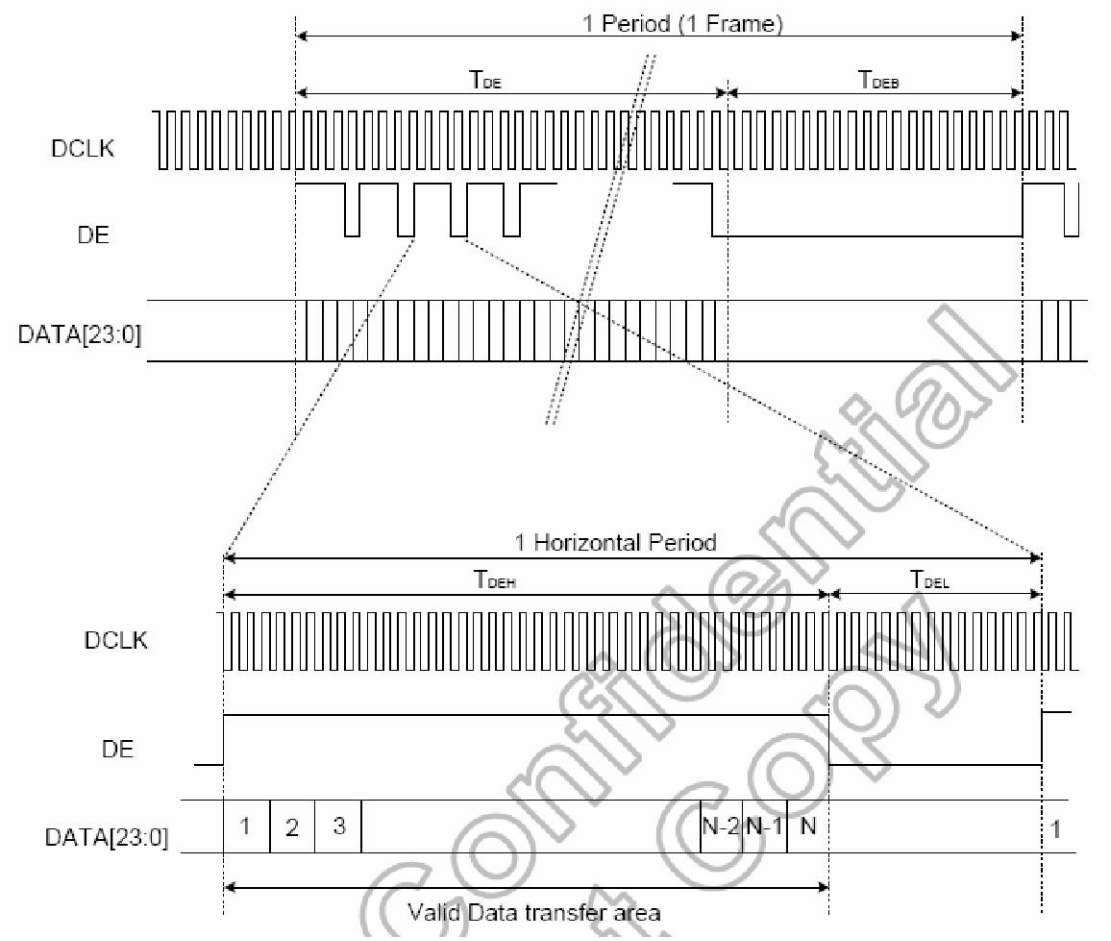
- **DE mode**

Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
CLK frequency	F_{CPH}	29.4	33.26	42.48	MHz
CLK period	T_{CPH}	-	30.06	-	ns
CLK pulse duty	T_{CWH}	40	50	60	%
DE period	$T_{DEH}+T_{DEL}$	1000	1056	1200	T_{CPH}
DE pulse width	T_{DEH}	-	800	-	T_{CPH}
DE frame blanking	T_{DEB}	10	45	110	$T_{DEH}+T_{DEL}$
DE frame width	T_{DE}	-	480	-	$T_{DEH}+T_{DEL}$

Note: (1)DE frame blanking(T_{DEB}) must be the integer of DE period($T_{DEH}+T_{DEL}$)

Parameter	Symbol	Spec. Min.	Typ.	Max.	Unit
OEV pulse width	T_{OEV}	-	150	-	T_{CPH}
CKV pulse width	T_{CKV}	-	133	-	T_{CPH}
DE(internal)-STV time	T_1	-	4	-	T_{CPH}
DE(internal)-CKV time	T_2	-	40	-	T_{CPH}
DE(internal)-OEV time	T_3	-	23	-	T_{CPH}
DE(internal)-POL time	T_4	-	157	-	T_{CPH}
STV pulse width	-	-	1	-	T_H

8.4 Data input format



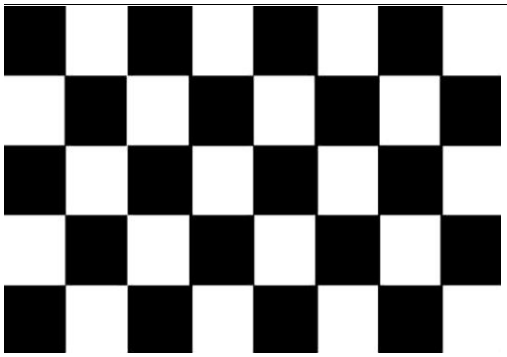
9. Standard Specification for Reliability

9.1 Standard Specification for Reliability of LCD Module

Item	Test Conditions	Remark
High temperature storage	Ta=80℃ 240hrs	NOTE1 , NOTE4
Low temperature storage	Ta=-30℃ 240hrs	NOTE1 , NOTE4
High temperature operation	Ta=70℃ 240hrs	NOTE2 , NOTE4
Low temperature operation	Ta=-20℃ 240hrs	NOTE2 , NOTE4
Operate at high temperature and humidity	+60℃, 90%RH 240hrs	NOTE4
Thermal Shock	-20℃/30min~+60℃/30min for a total 100 cycles, start with cold temperature and end with high temperature.	NOTE4
Vibration Test	Frequency range:10~55HZ Stroke:1.5mm Swap:10HZ~55HZ~10HZ 2 hours of each direction of X.Y. Z (6 hours for total)	
Mechanical shock	200G 2ms, ±X, ±Y, ±Z 3 times for each direction	
Package vibration test	Random vibration :1.5G*G/HZ from 10-500 HZ,-6dB/Octave from 200-500HZ of each direction of X.Y. Z (6 hours for total)	
Packing drop test	Height:60cm 1 corner ,3 edges ,6 surfaces	
Electrical Static Discharge	Air: ±4KV 150pF/330Ω 5 times	
	Contact: ±2KV 150pF/330Ω 5 time	
Image Sticking	25℃,60%RH (ref.to Remark(1))/30 minutes	

Note 1: Ta is the ambient temperature of samples.
Note 2: Ts is the temperature of panel's surface.
Note 3: In the standard condition, there shall be no practical problem that may affect the display function. After the reliability test, the product only guarantees operation, but don't guarantee all of the cosmetic specification.
Note 4: Before cosmetic and function test, the product must have enough recovery time, at least 2 hours at room temperature.

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

9.2 About Image Sticking

9.2.1 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.

9.2.2 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.

9.2.3 How to Avoid Image Sticking?

- Try not to operate the LCD with a “fixed” image on the screen for more than 2 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.

9.2.4 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.

9.2.5 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.

9.3 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 General Precautions

10.1. Safety

- Liquid crystal is poisonous. Do not put it in your mouth. If liquid crystal touches your skin or clothes, wash it off immediately by using soap and water.

10.2. Handling

- The LCD panel is plate glass. Do not subject the panel to mechanical shock or to excessive force on its surface.
- The polarizer attached to the display is easily damaged. Please handle it carefully to avoid scratch or other damages.
- To avoid contamination on the display surface, do not touch the module surface with bare hands.
- Keep a space so that the LCD panels do not touch other components.
- Put cover board such as acrylic board on the surface of LCD panel to protect panel from damages.
- Transparent electrodes may be disconnected if you use the LCD panel under environmental conditions where the condensation of dew occurs.

- Do not leave module in direct sunlight to avoid malfunction of the ICs.

10.3. Static Electricity

- Be sure to ground module before turning on power or operating module.
- Do not apply voltage which exceeds the absolute maximum rating value.

10.4. Storage

- Store the module in a dark room where must keep at 25±10℃ and 65%RH or less.
- Do not store the module in surroundings containing organic solvent or corrosive gas.
- Store the module in an anti-electrostatic container or bag.

10.5. Cleaning

- Do not wipe the polarizer with dry cloth. It might cause scratch.
- Only use a soft sloth with IPA to wipe the polarizer, other chemicals might permanent damage to the polarizer.

11 Packing Method

----TBD