SPECIFICATION

[◉] Preliminary Specification
[ ] Final Specification

Description **5.7” 640xRGBx480 TFT-LCD Module**

Part Number **P0570VGF1ME00**

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* This cover page is for your Comments and Signatures back to TIANMA.

Rev	Date	Page	Revision Items	Editor
1.0	2024/09/10	-	Preliminary spec	Hongwei Liu

CONTENTS

1. Summary

1.1 General Description

This is a 5.7 inch a-Si TFT-LCD module with Normal- Black technology. It is composed of a TFT-LCD panel, a driver circuit, PCB, and a LED backlight unit.

1.2 Features

- Ultra-wide viewing angle
- Interface: RGB

- Acquisition product for UL62368-1/CSA C22.2 No.62368-1-03
- Compliant with the European RoHS Directive (2011/65/EU) and Delegated Directive (2015/863/EU, Amending Annex II of 2011/65/EU)

2. General Specifications

Feature		Spec	Unit
Display Spec	Size	5.7 inches	
	Resolution	640(RGB)x480	
	Pixel Pitch	0.18x0.18	mm
	TFT Active Area	115.2x86.4	mm
	Technology Type	a-Si	
	Pixel Configuration	R.G.B Vertical Stripe	
	Display Mode	SFT, Normally Black	
	Surface Treatment	Clear	
	Viewing Direction	ALL	
Mechanical Characteristics	LCM (W x H x D)	127.2mm x 100.4mm x 5.8	mm
	Weight	TBD	g
Optical Characteristics	Luminance	300	cd/m^2
	Contrast Ratio	1000:1	
	NTSC	65	%
	Viewing Angle	88/88/88/88	degree
Electrical Characteristics	Interface	RGB 18 bits	
	Color Depth	262,144	color
	Power Consumption	（1500）	mW

Table 2.1 General TFT Specifications

3. Input / Output Terminals

3.1 CN1 Pin assignment (LCD Interface)

Connector Information	
LCD Module connector	101033-204010-HF

Table 3.1.1 Connector information

No	Symbol	I/O	Description	Comment
1	GND	P	Ground	
2	CLK	I	Clock signal; .	
3	HSYNC	I	Horizontal sync signal; negative polarity. Pull “low” when not used in DE mode.	
4	VSYNC	I	Vertical sync signal; negative polarity. Pull “low” when not used in DE mode.	
5	GND	P	Ground	
6	R0	I	Red Data input	
7	R1	I	Red Data input	
8	R2	I	Red Data input	
9	R3	I	Red Data input	
10	R4	I	Red Data input	
11	R5	I	Red Data input	
12	GND	P	Ground	
13	G0	I	Green Data input	
14	G1	I	Green Data input	
15	G2	I	Green Data input	
16	G3	I	Green Data input	
17	G4	I	Green Data input	
18	G5	I	Green Data input	
19	GND	P	Ground	
20	B0	I	Blue Data input	
21	B1	I	Blue Data input	
22	B2	I	Blue Data input	
23	B3	I	Blue Data input	
24	B4	I	Blue Data input	
25	B5	I	Blue Data input	
26	GND	P	Ground	
27	DE	I	Data input enable. Active High to enable the data input Pull “low” when not used in SYNC mode.	Note1
28	VDD	P	Power supply +3.3V	
29	VDD	P	Power supply +3.3V	
30	DPS	I	Selection of scan direction： High : Reverse scan	Note 4

			Low or Open : Normal scan	
31	NC	N	No connection	
32	NC	N	No connection	Note1
33	K1	P	Back light cathode	
34	K2	P	Back light cathode	Note1
35	K3	P	Back light cathode	
36	NC	N	No connection	
37	A1	P	Back light anode	
38	A2	P	Back light anode	
39	A3	P	Back light anode	
40	NC	N	No connection	

Table 3.1.2 Pin Assignment for LCD Interface

Note1: I/O definition: I---Input, O---Output, P---Power/Ground, N---No connection

Note2: All of the GND pins should be connected to the system ground.

Note3: This LCD module supports SYNC & DE mode,, the pin setting is different from each other. Please refer to the descriptions.

Note4: Scanning Direction :

The following figures are seen from a front view.

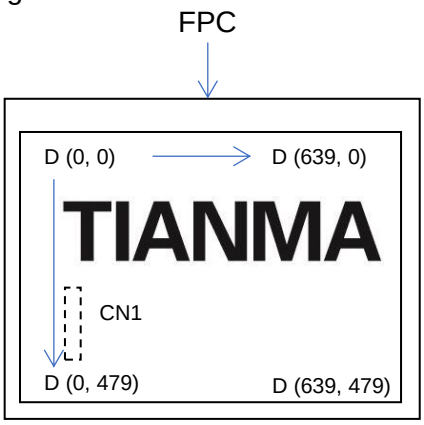


Figure1. Normal scan (DPS: Low or Open)

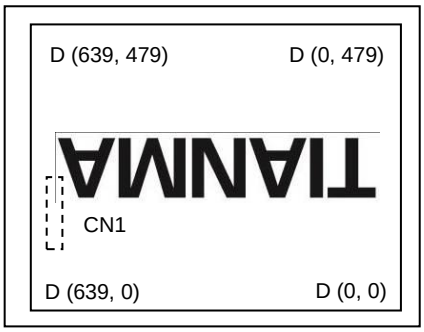


Figure2. Reverse scan (DPS: High)

4. Absolute Maximum Ratings

Item	Symbol	MIN	MAX	Unit	Remark
Power Voltage	VDD	-0.3	3.96	V	Note1
Operating Temperature	Top	-20	70	℃	
Storage Temperature	Tst	-30	80	℃	
Relative Humidity Note2	RH	--	≤95	%	Ta≤40℃
		--	≤85	%	40℃＜Ta≤50℃
		--	≤55	%	50℃＜Ta≤60℃
		--	≤36	%	60℃＜Ta≤70℃
		--	≤24	%	70℃＜Ta≤80℃
Absolute Humidity	AH	--	≤70	g/m³	Ta＞70℃

Table 4.1 Absolute Maximum Ratings

Note1: Input voltage include all in put data.
Note2: Ta means the ambient temperature. It is necessary to limit the relative humidity to the specified temperature range. Condensation on the module is not allowed.
Note3: The absolute maximum rating values of this product are not allowed to be exceeded at any times. A module should be used with any of the absolute maximum ratings exceeded, the characteristics of the module may not be recovered, or in an extreme condition, the module may be permanently destroyed

5. Electrical Characteristics

5.1 DC Characteristics for Panel Driving

Item		Symbol	MIN	TYP	MAX	Unit	Remark
Supply Voltage		VDD	3.0	3.3	3.6	V	
Input Signal Voltage	Low Level	VIL	DGND	--	0.3×VDD	V	
	High Level	VIH	0.7×VDD	--	VDD	V	
Output Signal Voltage	Low Level	VOL	DGND	--	DGND+0.4	V	
	High Level	VOH	VDD-0.4	--	VDD	V	
Power Consumption	60Hz	P	--	TBD	--	mW	White pattern

Table 5.1.1 Operating Voltages

Note1: Indicated the subsequent version may be updated.

5.2 DC Characteristics for Backlight Driving

Item	Symbol	MIN	TYP	MAX	Unit	Remark
Forward Current	IF	--	15	--	mA	15 LEDs (3 LED Parallel,5 LED Serial)
Forward Current Voltage	VF	13.5	14	14.5	V	
Backlight Power Consumption	WBL	--	630	—	mW	
LED life time	--	30000	50000	-	Hrs	

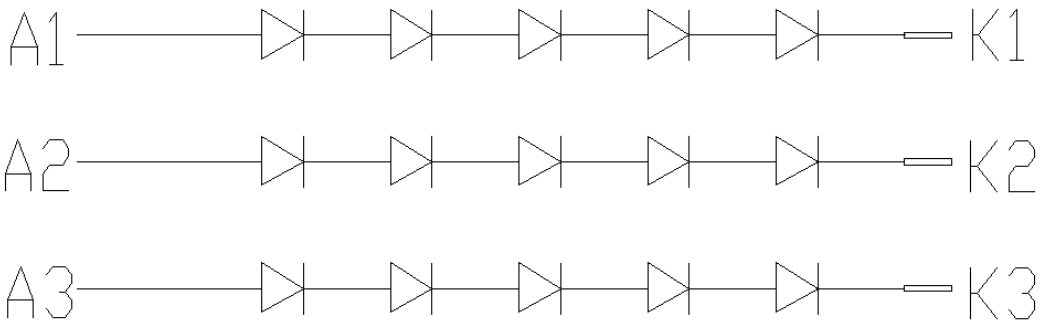
Table 5.2.1 LED Backlight Characteristics

Note1: I_F is defined for each channel.

Note2: Optical performance should be evaluated at Ta=25℃ only.

Note3: If LED is driven by high current, high ambient temperature & humidity condition, The life time of LED will be reduced.

Note4: Operating life means brightness goes down to 50% of initial brightness. Typical operating life time is estimated data.



5.3 Recommended Power ON/OFF Sequence

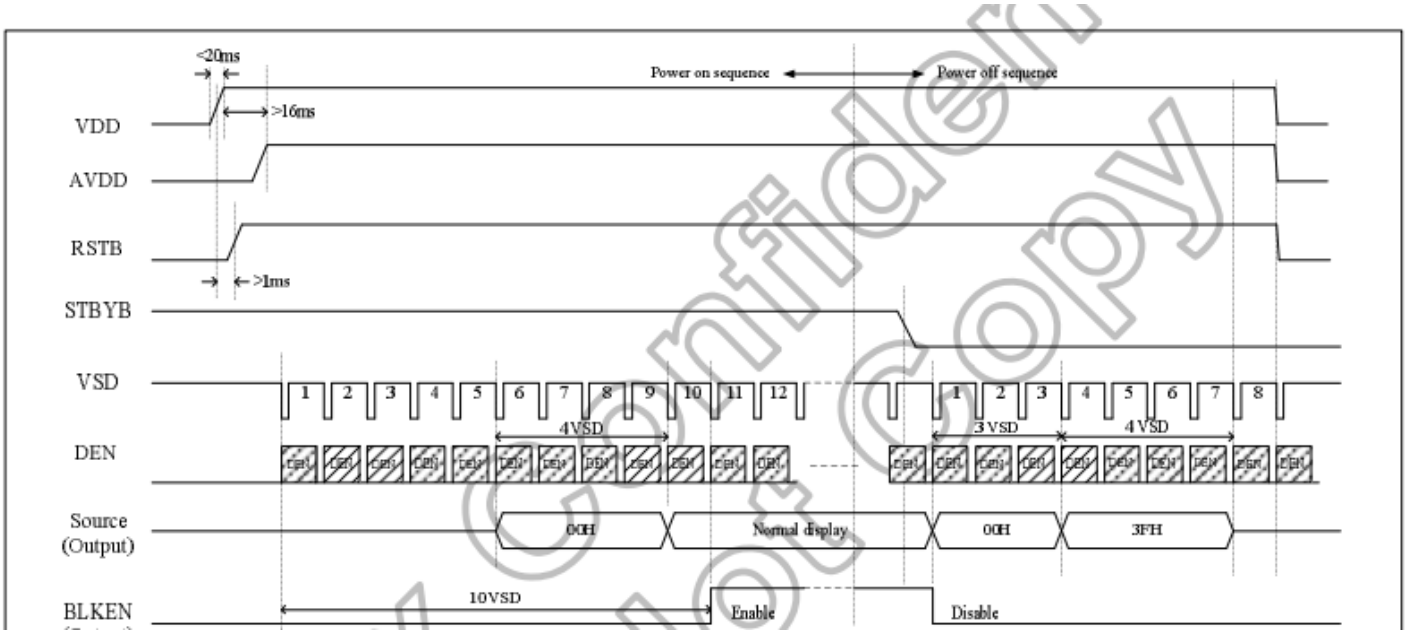


Figure 5.3.1 Power on/off sequence

Note1: The low level of these signals and analog powers are GND level.
Note2: All of the power and signals should be kept at GND level before power on. If there are residual voltages on them, the LCD might not work properly.
Note3: The power on/off sequence is the first version. It will be updated when the design is fixed.
Note4: BL is the voltage applied to backlight. Keep it turned off until the display has stabilized.

5.4 LCD Module Block Diagram

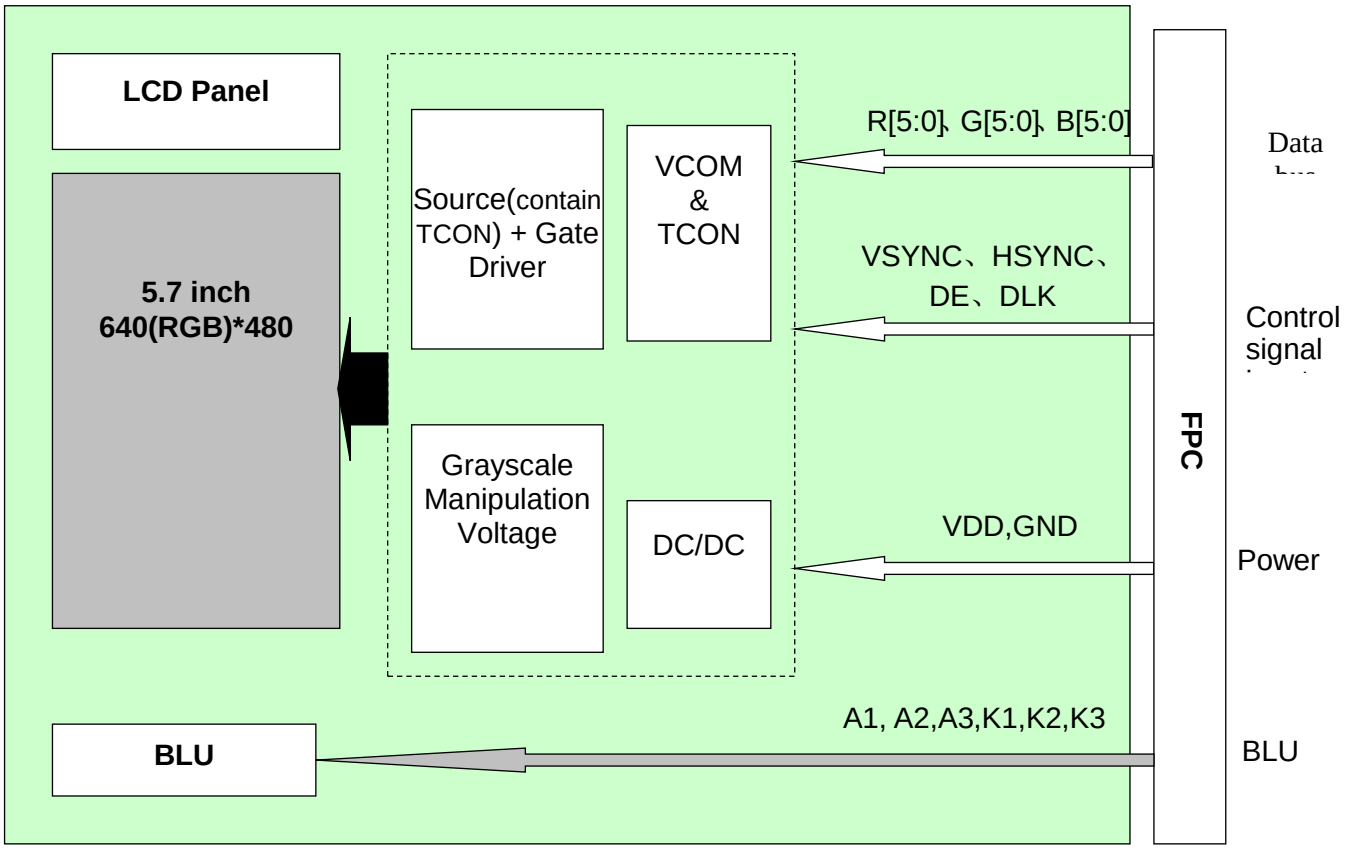


Figure 5.5.1 LCD Module Block Diagram

6. Timing Characteristics

6.1 AC characteristics

Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
HS setup time	T_{hst}	8	-	-	ns
HS hold time	T_{hhd}	8	-	-	ns
VS setup time	T_{vst}	8	-	-	ns
VS hold time	T_{vhd}	8	-	-	ns
Data setup time	T_{dsu}	8	-	-	ns
Data hold time	T_{dhd}	8	-	-	ns
DE setup time	T_{esu}	8	-	-	ns
DE hold time	T_{ehd}	8	-	-	ns
VDD Power On Slew rate	T_{POR}	-	-	20	ms
RSTB pulse width	T_{Rst}	10	-	-	us
CLKIN cycle time	T_{cph}	20	-	-	ns
CLKIN pulse duty	T_{cwh}	40	50	60	%
Output stable time	T_{sst}	-	-	6	us

Table 6.1.1 Input Setup Timing Parameters Requirement

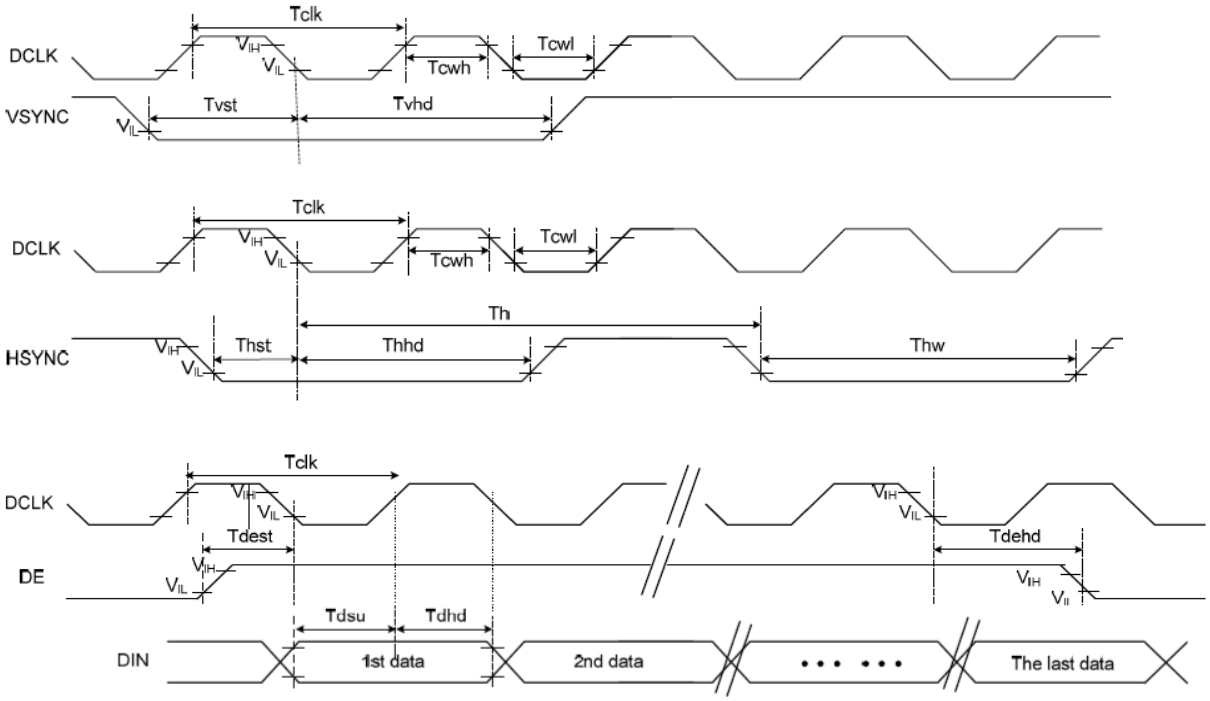


Figure 6.1.1 Clock and Data Input Timing Diagram

6.2 Data Input Timing Parameter Setting

- **Horizontal timing**

Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
Horizontal Display Area	thd		640		DCLK
DCLK frequency	fclk	-	24	50	MHz
One Horizontal Line	th		760		DCLK
HS pulse width	thpw	1	48	255	DCLK
HS Back Porch (Blanking)	thb		88		DCLK
HS Front Porch	thfp	1	32	255	DCLK
DE mode Blanking	th-thd	85	120	512	DCLK

- **Vertical timing**

Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
Vertical Display Area	tvd		480		T_H
VS period time	tv	513	525	767	T_H
VS pulse width	tvpw	3	3	255	T_H
VS Back Porch (Blanking)	tvb		32		T_H
VS Front Porch	tvfp	1	13	255	T_H
DE mode Blanking	tv-tvd	4	45	255	T_H

- **Horizontal timing**

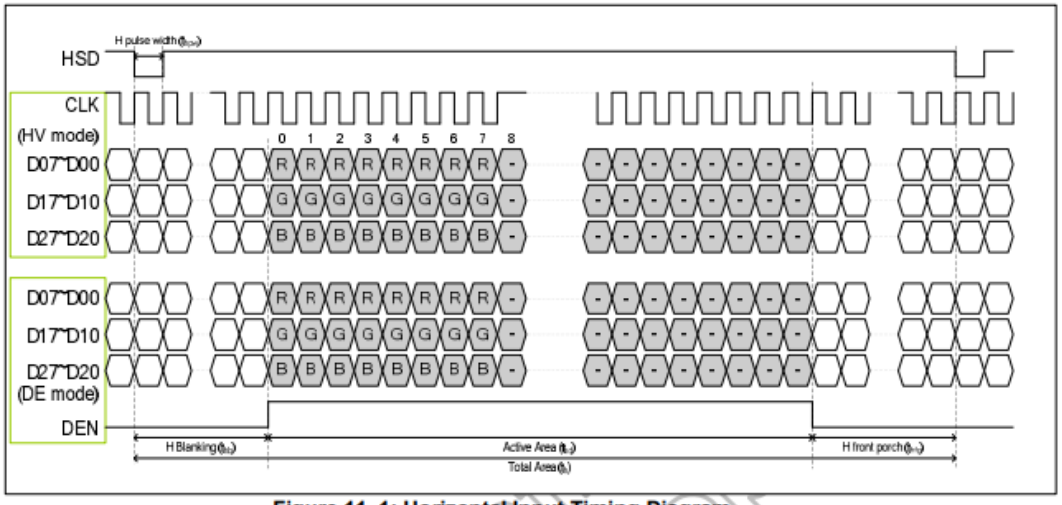


Figure 11. 1: Horizontal Input Timing Diagram

- **Vertical timing**

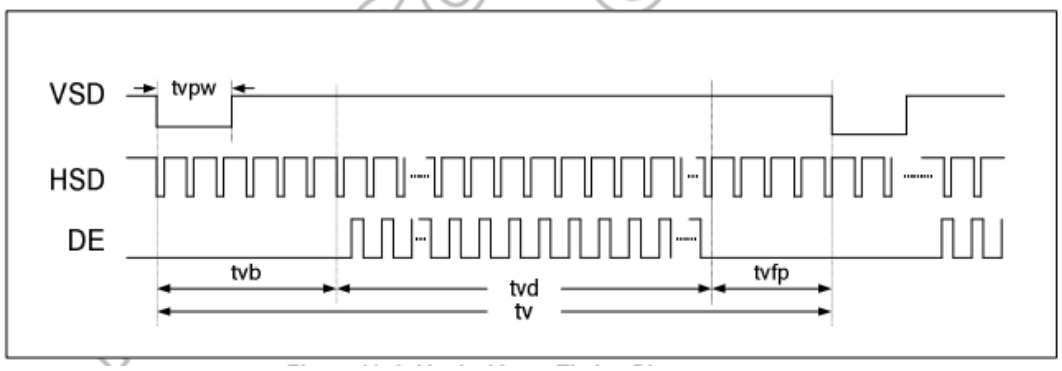


Table 6.2.1 Data Input Timing Parameters

6.3 SYNC Mode Timing Diagram

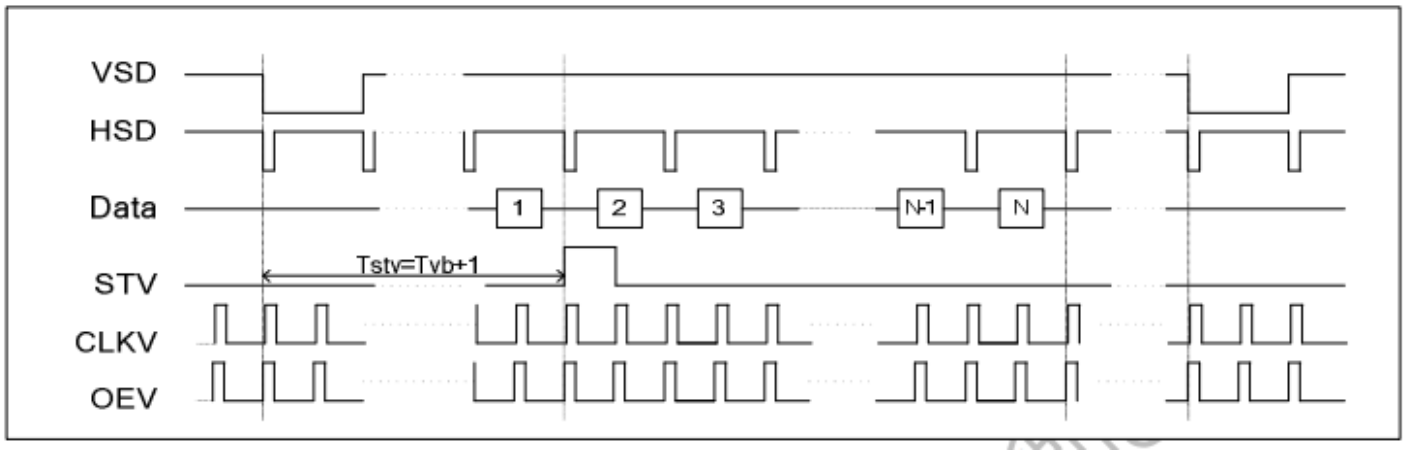


Figure 6.3.1 Data Input Timing Diagram Under SYNC Mode

6.4 DE Mode Timing Diagram

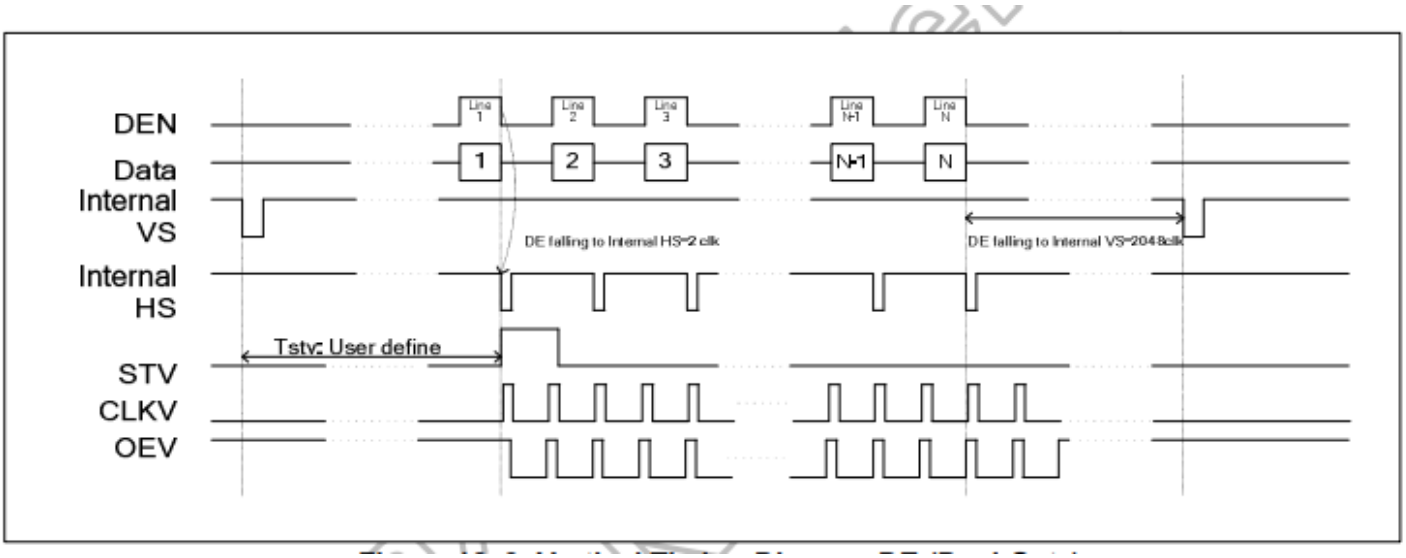


Figure 6.4.1 Data Input Timing Diagram Under SYNC-DE Mode

7. Optical Characteristics

Item		Symbol	Condition	Min	Typ	Max	Unit	Remark
View Angles		θT	CR≧10	75	88		degree	Note2,3
		θB		75	88			
		θL		75	88			
		θR		75	88			
Contrast Ratio		CR	θ=0°	800	1000			Note 3
Response Time		T_{ON}	25℃		35	45	ms	Note 4
		T_{OFF}						
Chromaticity	**White**	x	Backlight is on	(0.262)	(0.312)	(0.362)		Note 1,5
		y		(0.291)	(0.341)	(0.391)		
	Red	x		(0.572)	(0.622)	(0.672)		Note 1,5
		y		(0.275)	(0.325)	(0.375)		
	Green	x		(0.265)	(0.315)	(0.365)		Note 1,5
		y		(0.562)	(0.612)	(0.662)		
	Blue	x		(0.104)	(0.154)	(0.204)		Note 1,5
		y		(0.030)	(0.080)	(0.130)		
Uniformity		U		75	80		%	Note 6
NTSC		-		60	65		%	Note 5
Luminance		L		220	300		cd/m^2	Note 7

Table 7.1 Optical Parameters

Test Conditions:

1. I_F= **15** mA, and the ambient temperature is 25℃.
2. The test systems refer to Note1 and Note2.

Note1: Definition of optical measurement system.

The optical characteristics should be measured in dark room. After 5 Minutes operation, the optical characteristics are measured at the center point of the LCD screen.

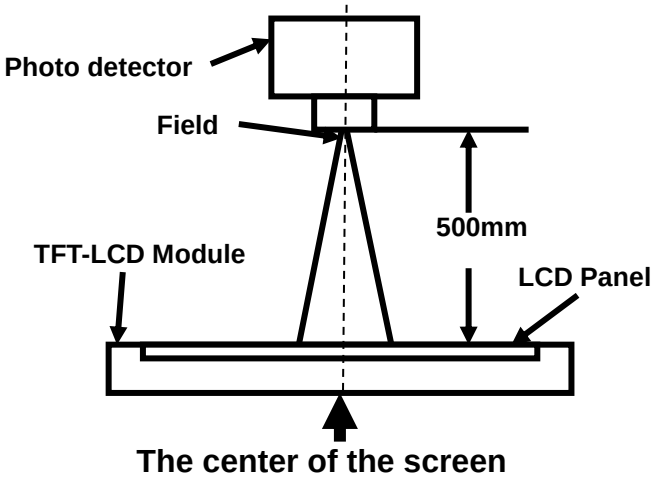


Fig1. Measurement Set Up

Note2: Definition of viewing angle range and measurement system. Viewing angle is measured at the center point of the LCD 。

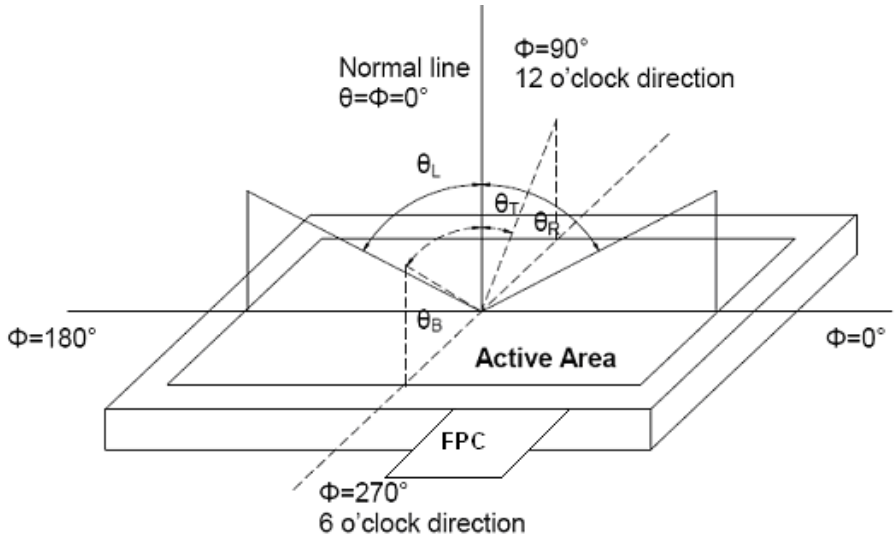


Fig2. Measurement viewing angle

Note3: Definition of contrast ratio

$$\text{Contrast ratio (CR)} = \frac{\text{Luminance measured when LCD is on the "White" state}}{\text{Luminance measured when LCD is on the "Black" state}}$$

Note4: Definition of Response time

For SFT LCM, the response time is defined as the LCD optical switching time interval between “White” state and “Black” state. Rise time (T_r) is the time between photo detector output intensity changed from 10% to 90%. And fall time (T_f) is the time between photo detector output intensity changed from 90% to 10%.

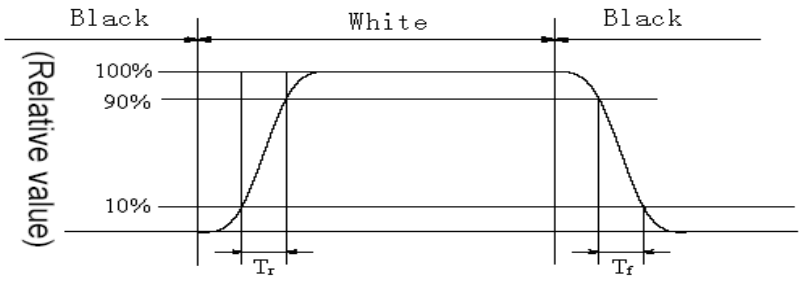


Fig3. Response Time Testing(SFT)

Note5: Definition of color chromaticity (CIE1931)

Color coordinates measured at center point of LCD.

Note6: Definition of Luminance Uniformity

Active area is divided into 9 measuring areas (Refer Fig.5). Every measuring point is placed at the center of each measuring area.

Luminance Uniformity (U) = Lmin/ Lmax

Lmax: The measured Maximum luminance of all measurement position.

Lmin: The measured Minimum luminance of all measurement position.

L-------Active area length; W----- Active area width

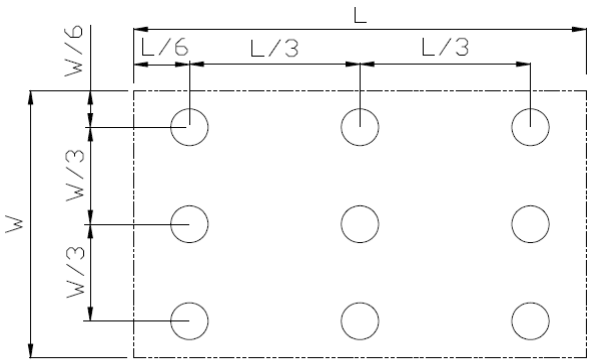


Fig4. Luminance Uniformity Measurement Locations(9 points)

Note7: Definition of Luminance:

Measure the luminance of white state at center point.

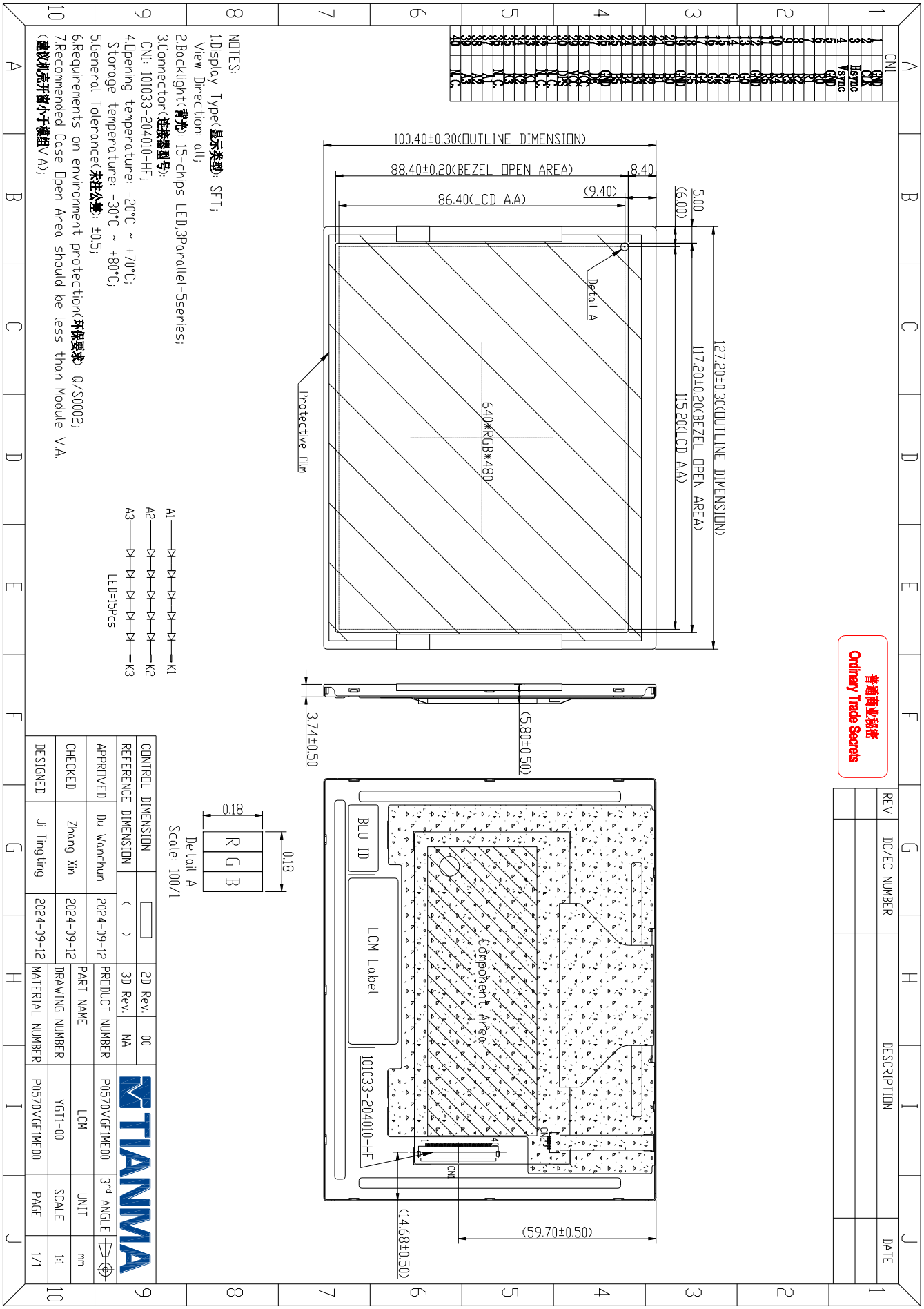
8. Reliability Test

No	Test Item	Condition	Remarks
1	High Temperature Operation	+70℃，240H	IEC60068-2-1:2007 GB2423.2-2008
2	Low Temperature Operation	-20℃，240H	IEC60068-2-1:2007 GB2423.1-2008
3	High Temperature Storage	+80℃，240H	IEC60068-2-1:2007 GB2423.2-2008
4	Low Temperature Storage	-30℃，240H	IEC60068-2-1:2007 GB2423.1-2008
5	Operation at High Temperature and Humidity(operation)	+60℃，90%RH，240H	IEC60068-2-78 :2001 GB/T 2423.3-2016
6	Thermal Shock (non-operation)	-30℃，30min~80℃，30min，change time：5min，100cycle	Start with cold temperature, End with high temperature, IEC60068-2-14:1984, GB/T 2423.22-2012
7	ESD	C=150pF，R=330Ω，5point/panel Air：±8kv，5times； Contact：±4kv，5times； （Environment：15℃~35℃， 30%~60%，86Kpa~106Kpa）	IEC61000-4-2:2001 GB/T 17626.2-2018
8	Package Vibration	5-20-200HZ，PSD：0.01-0.01-0.001 Total:0.781g2/HZ,x/y/z 30min）	GB/T 4857.23-2021
9	Package Drop Test	Height: X cm,1 corner, 3edges, 6 surfaces Note：X＞10Kg:60cm；≤10Kg:80cm	IEC60068-2-32:1990 GB/T2423.8—1995

Table 8.1 RA test condition

Note1: Temperature is the ambient temperature of sample
Note2: Before cosmetic and function test, the product must have enough recovery time, at least **24** hours at room temperature.
Note3: In the standard condition, there shall be no practical problem that may affect the display function. After the reliability test, the product's function only be guaranteed, but not for all of the cosmetic specification.

9. Mechanical Drawing



10. Packing Instruction

No	Item	Model (Material)	Dimensions(mm)	Unit Weight(Kg)	Q'ty	Remark
1	LCM module					
2	Tray					
3	Dust Proof Bag					
4	BOX					
5	Carton					
6	Total weight					

TBD

11. Precautions for Use of LCD Modules

11.1 Handling Precautions

(1) The display panel is made of glass. Do not subject it to mechanical shock by dropping it, etc.
(2) If the display panel is damaged and the liquid crystal fluid inside it leaks out be sure not to get any in your mouth. If the fluid comes into contact with your skin or clothes promptly wash it off using soap and water.
(3) Do not apply excessive force to the display surface or the bezel since this may cause the color tone to vary.
(4) The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle the polarizer carefully.
(5) If the display surface is contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If it is still not completely clear use a moist cloth with one of the following solvents:
- Isopropyl alcohol
- Ethyl alcohol

Solvents other than those mentioned above may damage the polarizer. Specifically, do not use the following:
- Water
- Ketone
- Aromatic solvents

(6) Do not disassemble the LCD Module.
(7) If powered off, do not apply the input signals.
(8) To prevent destruction of the module by static electricity, be careful to maintain an optimum work environment.
(9) Be sure to ground your body when handling the LCD Modules.
(10) Tools used for assembly, must be properly grounded.
(11) To reduce the amount of static electricity generated, do not conduct assembly or other work under very low humidity conditions.
(12) The LCD Module is covered with a film to protect the display surface, remove film slowly under the ionizer.

11.2 Storage precautions

(1) When storing the LCD modules avoid exposure to direct sunlight or to the light of fluorescent lamps.
(2) The LCD modules should be stored within the rated storage temperature range. The recommend condition is: Temperature: 0 ~ 35 ℃ at normal humidity.
(3) The LCD modules should be stored in a room without acid, alkali or other harmful gas.

11.3 Transportation Precautions

The LCD modules should not be dropped or subject to violent mechanical shock during transportation. Also they should avoid excessive pressure, water, high humidity and direct sunlight.

11.4 Screen saver Precautions

Not display the fixed pattern for a long time. Use a screen saver, if the fixed pattern is displayed on the screen

11.5 Safety Precautions

(1) When you waste damaged or unnecessary LCDs, it is recommended to crush LCDs into pieces and wash them off with solvents such as acetone and ethanol, which should later be burned
(2) Be sure to turn off the power supply when inserting or disconnecting the LED backlight cable.
(3) LED driver should be designed to limit or stop its function when over current is detected on the LED.