



# PRODUCT SPECIFICATION

**MODEL: ZTM050BOER1401**

<◇>PRELIMINARY SPECIFICATION

<◆>APPROVAL SPECIFICATION



CUSTOMER
APPROVED BY
DATE:

DESIGNED	CHECKED	APPROVED
韦耀将	谢王豪	

PREPARED BY:  
SHEN ZHEN ZTRH TECHNOLOGY CO., LTD

ZHENG TONG REN HE INDUSTRIAL PARK, NO. 113 GUIHUA ROAD, GUANLAN STREET,  
LONGHUA DISTRICT, SHENZHEN, GUANGDONG



REVISION STATUS

Version	Revise Date	Page	Content	Modified by
V1.0	2023.12.18	-	First Issued.	WYJ
-	-	-		

深圳市正通仁禾科技有限公司



TABLE OF CONTENTS

No.	CONTENTS	PAGE
	REVISION STATUS .....	1
	TABLE OF CONTENTS .....	3
1.	GENERAL DESCRIPTION .....	4
2.	MECHANICAL SPECIFICATION .....	5
3.	PIN DESCRIPTION .....	6
4.	ELECTRICAL CHARACTERISTICS .....	7
5.	INPUT SIGNAL TIMING .....	10
6.	OPTICAL CHARACTERISTICS .....	13
7.	RELIABILITY TEST ITEMS .....	15
8.	GENERAL PRECAUTION .....	16



## 1. GENERAL DESCRIPTION

### 1.1 DESCRIPTION

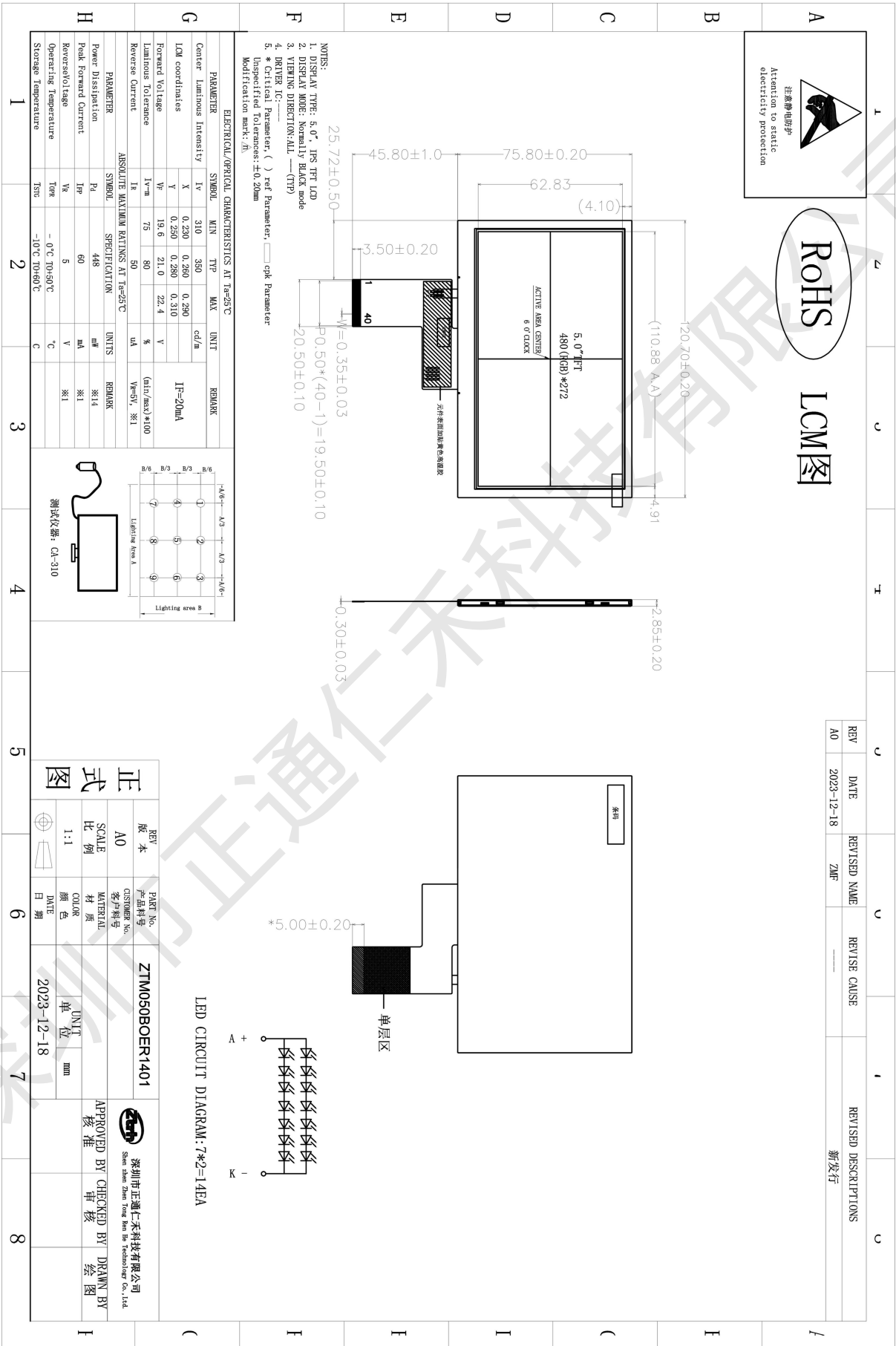
This LCM is a color active matrix thin film transistor (TFT) TN liquid crystal display (LCD) that uses amorphous silicon TFT as a switching device. It is composed of a TFT LCD panel, Driver IC, FPC and Backlight. This TFT LCD has a 5.0-inch diagonally measured active display area with (480 horizontal by 272 vertical pixel) resolution.

### 1.2 FEATURES:

No.	Item	Specification	Unit
1	Panel Size	5.0"	inch
2	Number of Pixels	480×RGB (3)×272	pixels
3	Active Area	110.880(H)× 62.832(V)	mm
4	Pixel Pitch	0.231(H)× RGB×0.231(V)	mm
5	Outline Dimension	120.70(W)×75.80(H)×2.85(D)	mm
6	Number of Colors	16.7M	-
7	Display Mode	Normally Black	-
8	Viewing Direction	85/85/85/85 Typ	-
9	Display Format	RGB Vertical stripe	-
10	Surface Treatment	-	-
11	Interface	RGB-TTL	-
12	Backlight	White LED	-
13	Operation Temperature	-0~50	°C
14	Storage Temperature	-10~60	°C
15	Weight	-	g
16	Driver IC	ILI6485D	-



2. MECHANICAL SPECIFICATION





3. PIN DESCRIPTION

No.	Symbol	Function	Remark
1	LED-	LED Backlight(Cathode)	
2	LED+	LED Backlight(Anode)	
3	GND	Ground	
4	VDD	Power supply(Digital +3.0V)	
5	DG0	Data	
6	DG1		
7	DG2		
8	DG3		
9	DG4		
10	DG5		
11	DG6		
12	DG7		
13	NC	No connection	
14	NC	No connection	
15	NC	No connection	
16	NC	No connection	
17	NC	No connection	
18	NC	No connection	
19	NC	No connection	
20	NC	No connection	
21	NC	No connection	
22	NC	No connection	
23	NC	No connection	
24	NC	No connection	
25	NC	No connection	
26	NC	No connection	
27	NC	No connection	
28	NC	No connection	
29	GND	Ground	
30	DCLK	Clock signal	
31	DISP	Display on/off	
32	HSYNC	Horizontal sync input in RGB mode	
33	VSYNC	Vertical sync input in RGB mode	
34	DEN	No connection	
35	NC	NC	
36	GND	Ground	
37	XR(R)	TP Connect Pin	
38	YD(B)	TP Connect Pin	
39	XL(L)	TP Connect Pin	
40	YU(T)	TP Connect Pin	



#### 4. ELECTRICAL CHARACTERISTICS

##### 4.1 ABSOLUTE MAXIMUM RATINGS

Item	Symbol	Values		Unit	Remark
		Min.	Max.		
Digital Supply Voltage	VDD	-0.3	4.6	V	

##### 4.2 TFT LCD MODULE

###### 4.2.1 Operating Conditions

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Digital Supply Voltage	VDD	3.0	3.3	3.6	V	
Logic Input Voltage	VIH	0.7VDD	-	VDD	V	
	VIL	GND	-	0.3VDD	V	

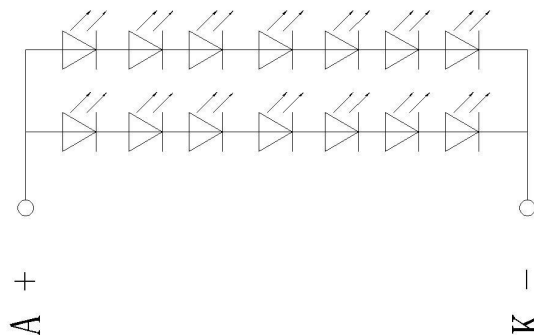
###### 4.2.2 Current Consumption

Item	Symbol	Condition	Values			Unit	Remark
			Min.	Typ.	Max.		
Digital Current	IVCI	VDD= 3.3V	-	-	-	mA	Note1

Note1: Typ. specification : Gray-level test Pattern

##### 4.3 BACKLIGHT UNIT

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
LED Current	Iled	-	20	-	mA	Total LED
Forward voltage	VF	19.6	21.0	22.4	V	IF=20mA
Reverse current	IR	-	-	50	μA	VR=5V, 1LED
Power dissipation	Pd	448			mW	Total LED
Peak forward current	IFP	60			mA	1LED
Reverse Voltage	VR	5			V	1LED

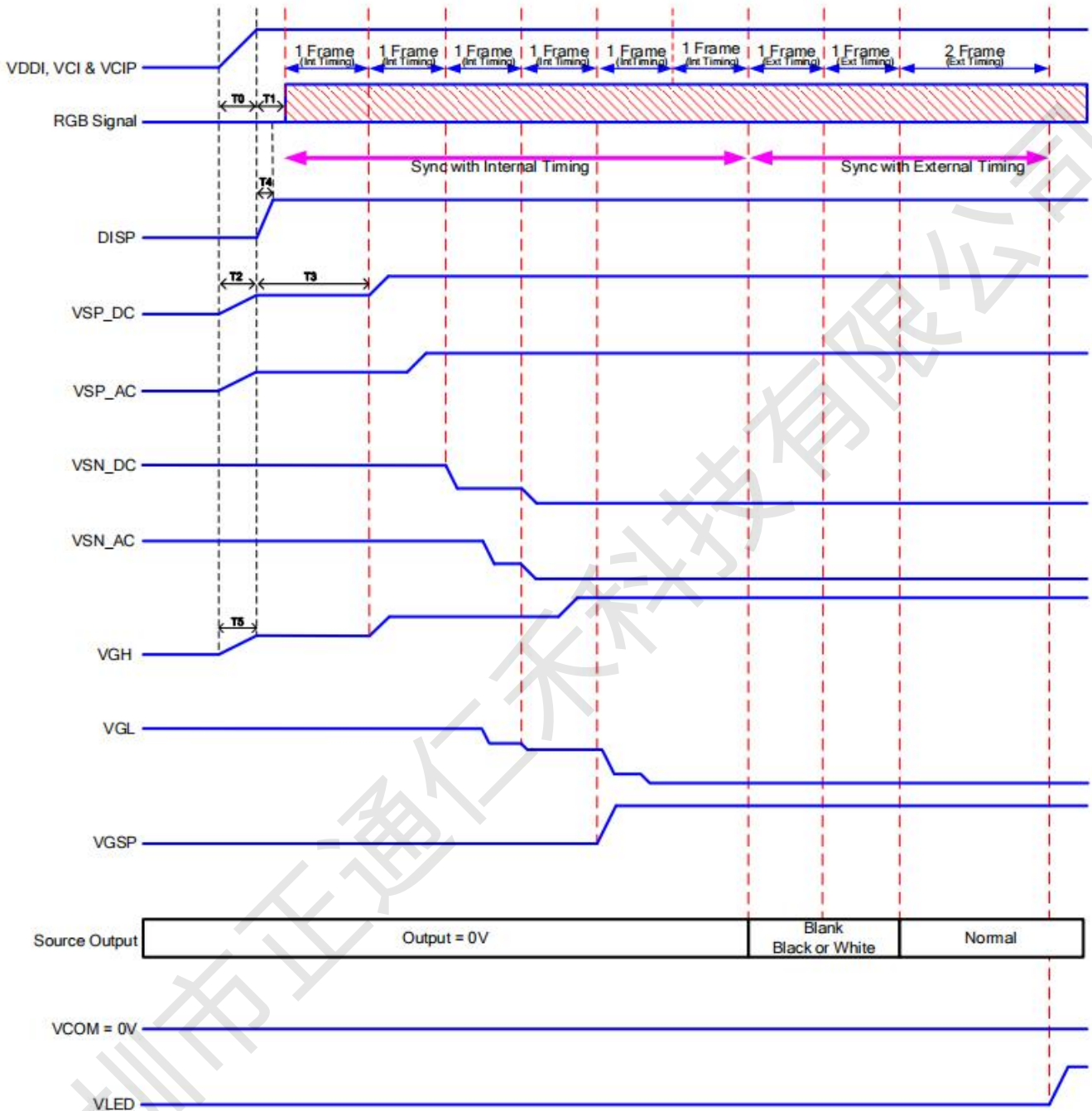


LED CIRCUIT DIAGRAM: 7\*2=14EA



4.4 POWER ON/OFF SEQUENCE

4.4.1 Power ON



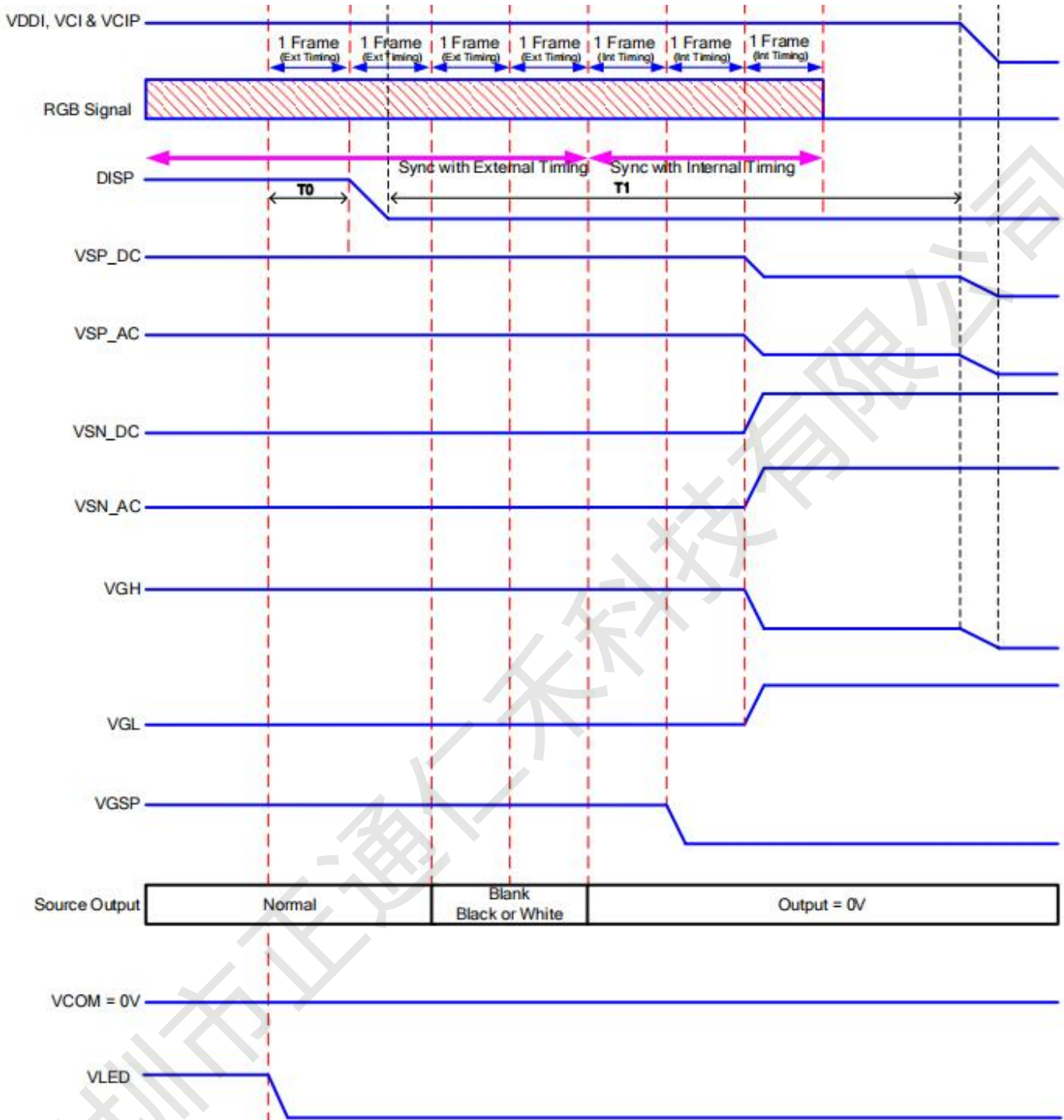
Item	Description	Min. Time
T0	Determined by the external power.	
T1	Time from stable VDDI, VCI, VCIP set-up to the first frame.	T1=0
T2	Time from VSP_DC=0V to VSP_DC=3.3V.	T2=T0
T3	Time from VSP_DC =3.3V to VSP_DC =6.0V.	T3=T1+ (1*Frame)
T4	Time from stable VDDI, VCI, VCIP set-up to DISP asserted.	T4=0
T5	Time from VGH=0V to VGH=3.3V.	T5=T0

Note: Recommend the LCM power on rise time T0= 0~ 1ms.





4.4.2 Power OFF



Item	Description	Min. Time
T0	Time from backlight power off to DISP="L".	1*Frame
T1	Time from DISP="L" to LCM Power off.	5*Frame



5. INPUT SIGNAL TIMING

5.1 AC CHARACTERISTICS

AC Electrical Characteristics (VDD=VDDI= 3.3V, AGND= 0V, TA=25°C)

Item	Symbol	Min.	Typ.	Max.	Unit	Conditions
System operation timing						
VDD power source slew time	TPOR	-	-	20	ms	From 0V to 99% VDD
GRB pulse width	tRSTW	10	50	-	us	R=10Kohm, C=1uF
Input/ Output timing						
CLK pulse duty	Tcw	40	50	60	%	
VSYNC setup time	Tvst	12	-	-	ns	
VSYNC hold time	Tvhhd	12	-	-	ns	
HSYNC setup time	Thst	12	-	-	ns	
HSYNC hold time	Thhd	12	-	-	ns	
Data setup time	Tdsu	12	-	-	ns	
Data hold time	Tdhd	12	-	-	ns	
DE setup time	Tdest	12			ns	
DE hold time	Tdehd	12			ns	
SD output stable time	Tst	-	-	12	us	Output settled within +20mV Loading = 6.8k+28.2pF.
GD output rise and fall time	Tgst	-	-	6	us	Output settled (5%~95%), Loading = 4.7k+29.8pF
3-wire serial communication						
Delay between CSB and VSYNC	Tcv	1			us	
CS input setup time	Ts0	50			ns	
Serial data input setup time	Ts1	50			ns	
CS input hold time	Th0	50			ns	
Serial data input hold time	Th1	50			ns	
SCL pulse high width	Twh1	50			ns	
SCL pulse low width	Twl1	50			ns	
CS pulse high width	Tw2	400			ns	



5.2 PARALLEL RGB INPUT TIMING TABLE

480RGB X 272 Resolution Timing Table							
Item	Symbol	Min.	Typ.	Max.	Unit	Remark	
DCLK Frequency	Fclk	24	27	30	MHz		
DCLK Period	Tclk	42	37	33	ns		
HSYNC	Period Time	Th	1446	1491	1558	DCLK	
	Display Period	Thdisp	-	1440	-	DCLK	
	Back Porch	Thbp	3	43	43	DCLK	By H_Blanking setting
	Front Porch	Thfp	3	8	75	DCLK	
	Pulse Width	Thw	2	4	75	DCLK	
VSYNC	Period Time	Tv	276	292	321	H	
	Display Period	Tvdisp	-	272	-	H	
	Back Porch	Tvbp	2	12	12	H	By V_Blanking setting
	Front Porch	Tvfp	2	8	37	H	
	Pulse Width	Tvw	2	4	37	H	

Note:1. It is necessary to keep Tvbp =12 and Thbp =43 in sync mode. DE mode is unnecessary to keep it.

2. Thbp+Thfp >=6

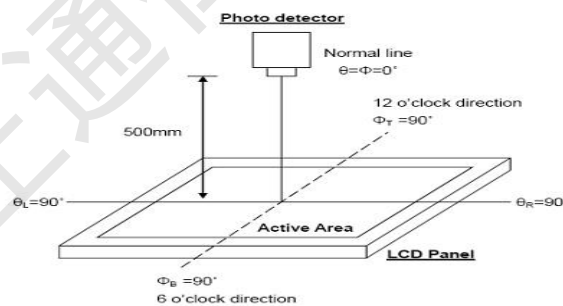


6.OPTICAL CHARACTERISTICS

Ta=25±2℃

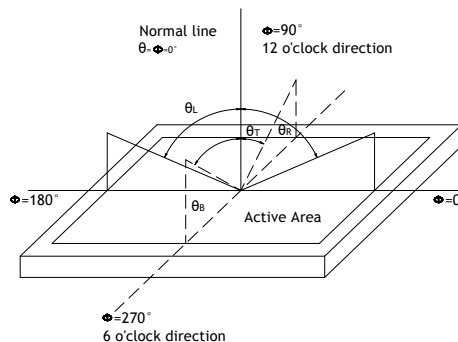
Item	Symbol	Min.	Typ.	Max.	Unit	Note	
Contrast Ratio	CR	800	1000	-		Note1 Note4	
Luminance(center)	L	310	350	-	cd/m2	Note1 Note6 Note7	
Luminous tolerance	LU	75	80		%	Note7	
Response Time	Rising + Falling	-	30	35	ms	Note1 Note3	
Viewing Angle K=Contrast Ratio>10	Horizontal	$\theta x^+$	-	85	-	degree	Note2
		$\theta x^-$	-	85	-		
	Vertical	$\theta y^+$	-	85	-		
		$\theta y^-$	-	85	-		
Color Chromaticity (CIE1931)	Red	x	Typ- 0.03	0.634	Typ+ 0.03	Note1 Note5 Note7	
		y		0.347			
	Green	x		0.338			
		y		0.610			
	Blue	x		0.140			
		y		0.089			
	White	x		0.256			
		y		0.273			
Color gamut (NTSC ratio)		55	60		%		

Note1: Definition of optical measurement system (CA-310)



Note2: Definition of viewing angle range and measurement system

Viewing angle is measured at the center point of the LCD by CONOSCOPE (ergo-80).



Note3: Definition of Response time



The response time is defined as the LCD optical switching time interval between “White” state and “Black” state. Rise time (TON) is the time between photo detector output intensity changed from 90% to 10%. And fall time (TOFF) is the time between photo detector output intensity changed from 10% to 90%.

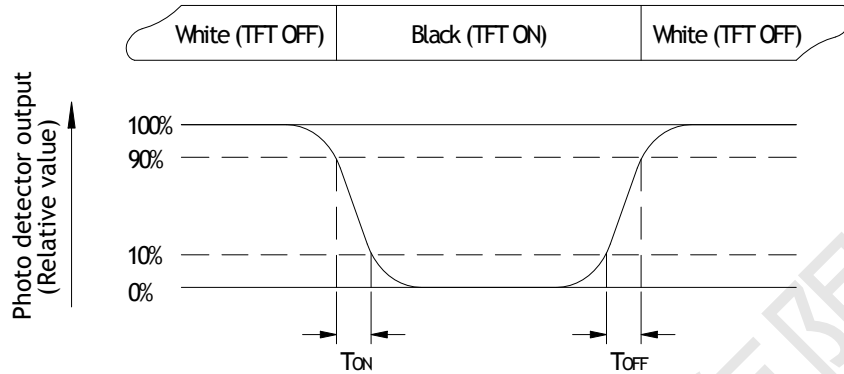


Fig. 6-3 Definition of response time

Note4: Definition of contrast ratio

$$\text{Contrast ratio(CR)} = \frac{\text{Luminance measured when LCD on the Whitestate}}{\text{Luminance measured when LCD on the Blackstate}}$$

“White state “: The state is that the LCD should drive by Vwhite.

“Black state”: The state is that the LCD should drive by Vblack.

Vwhite: To be determined Vblack: To be determined.

Note5: Definition of color chromaticity (CIE1931)

Color coordinates measured at center point of LCD.

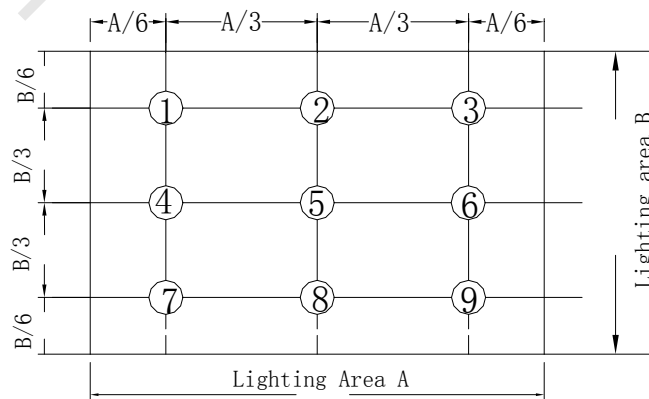
Note6: All input terminals LCD panel must be ground while measuring the center area of the panel. The LED driving condition is IL=40mA

Note7: Definition of Luminance Uniformity

Active area is divided into 9 measuring areas. Every measuring point is placed at the center of each measuring area.

$$\text{Luminance Uniformity (U)} = \text{Lmin} / \text{Lmax}$$

L----Active area length, W---- Active area width



Bmax: The measured maximum luminance of all measurement position.

Bmin: The measured minimum luminance of all measurement position.

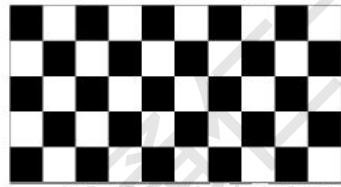


7. RELIABILITY TEST ITEMS

7.1 TEMPERATURE AND HUMIDITY

Test Item	Test Condition	Remark
High Temperature Storage	Ta=60°C; 96hrs	IEC60068-2-1 : 2007 GB2423.2-2008
Low Temperature Storage	Ta=-10°C;96hrs	IEC60068-2-1 : 2007 GB2423.1-2008
High Temperature Operation	Ta=50°C; 96Hrs	IEC60068-2-1 : 2007 GB2423.2-2008
Low Temperature Operation	Ta=-0°C; 96hrs	IEC60068-2-1 : 2007 GB2423.1-2008
High Temperature High Humidity Operation	Ta=40°C · 80%RH · 96Hrs(no condensation)	IEC60068-2-78 : 2001 GB/T2423.3-2006
Thermal Shock	-10°C(0.5h) ~ 60°C(0.5h) / 72 cycles	Start with cold temperature · End with high temperature · IEC60068-2-14:1984,GB2423.22-2002
Image Sticking	25°C ; 1hrs	Note1

Note1:Condition of image sticking test :25°C±2°C  
Operation with test pattern sustained for 1 hrs,then change to gray pattern immediately.after 5 mins,the mura must be disappeared completely



(a) Test Pattern (chess board Pattern )



(b) Gray Pattern

7.2 VIBRATION&SHOCK

Test item	Conditions	Remark
Packing Shock (non-operation)	980m/s <sup>2</sup> ,6ms, ±x,y,z 3times for direction	IEC60068-2-27 : 1987 GB/T2423.5-1995
Packing Vibration (non-operation)	Frequency range:10 HZ~50HZ Stroke:1.0mm,sweep:10 HZ ~50HZ x,y,z 2 hours for each direction	IEC60068-2-32 : 1990 GB/T2423.8-1995

7.3 ESD

Test item	Conditions	Remark	
Electro Static Discharge Test (non-operation)	150pF · 330Ω · Contact:±4KV,Air:±8KV	1	Class C
	200pF · 0Ω · ±200V contact test	2	

Note: Measure point :

1. LCD glass and metal bezel
2. IF connector pins
3. ESD class C:some performance degradation allowed.Restart Self-recoverable.  
No data lost,no hardware failures.



## 8. GENERAL PRECAUTION

### 8.1 SAFETY

1. Do not swallow any liquid crystal, even if there is no proof that liquid crystal is poisonous.
2. If the LCD panel breaks, be careful not to get liquid crystal to touch your skin.
3. If skin is exposed to liquid crystal, wash the area thoroughly with alcohol or soap.

### 8.2 STORAGE CONDITIONS

1. Store the panel or module in a dark place where the temperature is  $23\pm 5^{\circ}\text{C}$  and The humidity is below  $50\pm 20\%RH$ .
2. Store in anti-static electricity container.
3. Store in clean environment, free from dust, active gas, and solvent.
4. Do not place the module near organics solvents or corrosive gases.
5. Do not crush, shake, or jolt the module.

### 8.3 HANDLING PRECAUTIONS

1. Avoid static electricity which can damage the CMOS LSI.
2. The polarizing plate of the display is very fragile. So, please handle it very carefully.
3. Do not give external shock.
4. Do not apply excessive force on the surface.
5. Do not wipe the polarizing plate with a dry cloth, as it may easily scratch the Surface of plate.
6. Do not use ketonics solvent & Aromatic solvent, use with a soft cloth soaked with a cleaning naphtha solvent.
7. Do not operate it above the absolute maximum rating.
8. Do not remove the panel or frame from the module.
9. When the module is assembled, it should be attached to the system firmly, Be careful not to twist and bend the module.
10. Wipe off water droplets or oil immediately. If you leave the droplets for a long time, staining and discoloration may occur.
11. If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth in case of contact with hands, legs or clothes, it must be washed away thoroughly with soap.

### 8.4 WARRANTY

1. The period is within twelve months since the date of shipping out under normal using and storage conditions.
2. Do not repaired or modified the LCM. It may cause function to lose efficacy, Starry does not warrant the LCM.
3. All process and material comply ROHS