



PRODUCT SPECIFICATION

MODEL: ZTM140XXE4505-1

<◇>PRELIMINARY SPECIFICATION

<◆>APPROVAL SPECIFICATION

CUSTOMER
APPROVED BY
DATE:

DESIGNED	CHECKED	APPROVED
张怡金	谢王豪	龙在忠

PREPARED BY:

SHEN ZHEN ZTRH TECHNOLOGY Co., LTD

ZHENG TONG REN HE INDUSTRIAL PARK, NO. 113 GUI HUA ROAD, GUAN LAN STREET,
LONG HUA DISTRICT, SHEN ZHEN, GUANG DONG

TEL : 0755-23407234



REVISION STATUS

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深圳市正通仁禾科技有限公司



1. GENERAL DESCRIPTION

1.1 DESCRIPTION

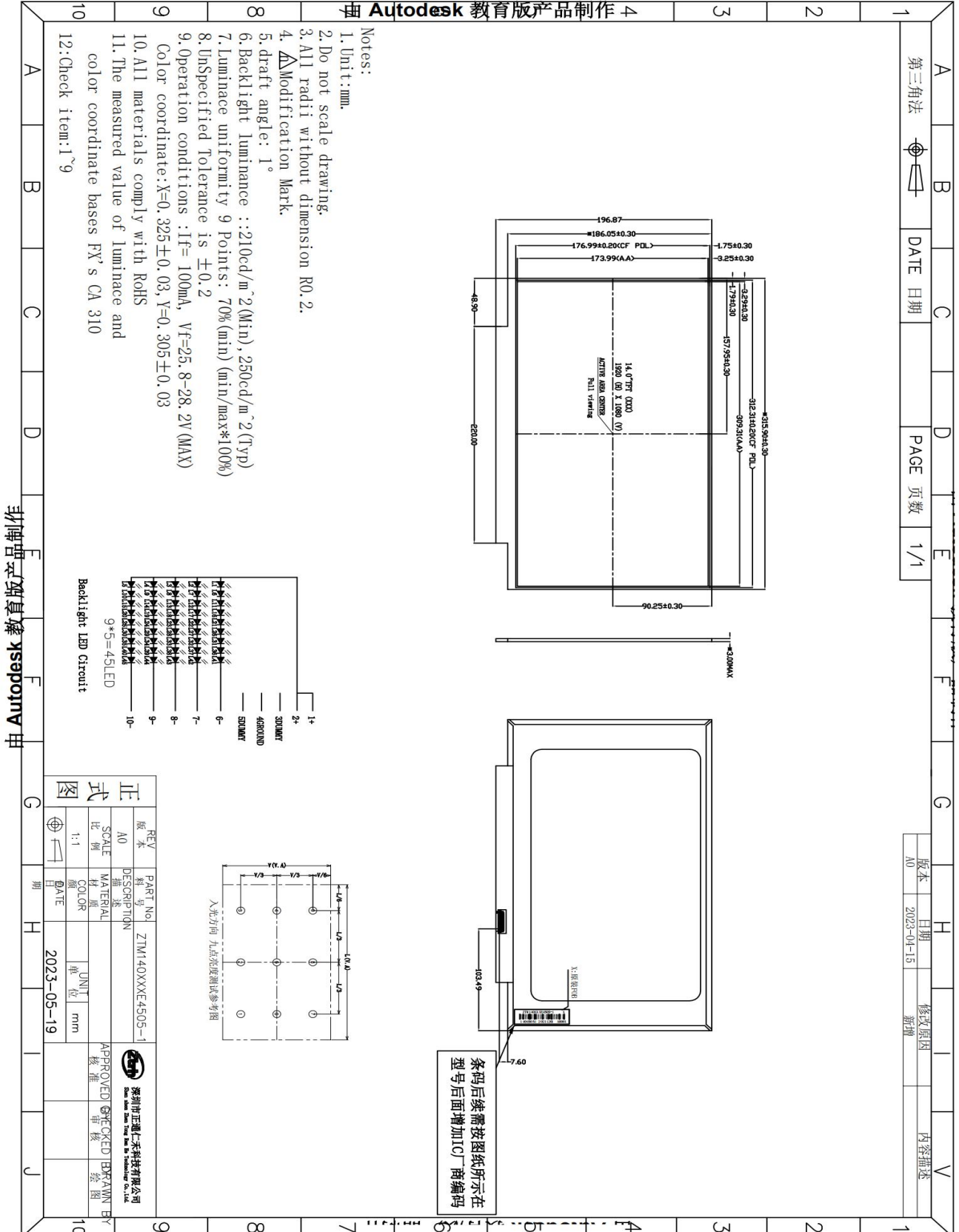
This LCM is a color active matrix thin film transistor (TFT) IPS liquid crystal display (LCD) that uses amorphous silicon TFT as a switching device. It is composed of a TFT LCD panel, Driver IC, FPC and Backlight. This TFT LCD has a 14.0-inch diagonally measured active display area with FHD resolution (1920 vertical by 1080 horizontal pixel array).

1.2 FEATURES:

No.	Item	Specification	Unit
1	Panel Size	14.0"	inch
2	Number of Pixels	1920×RGB (3)×1080	pixels
3	Active Area	309.312(H)×173.988(V)	mm
4	Pixel Pitch	161.1(H)×161.1(V)	um
5	Outline Dimension	315.90(W)×186.05(H)×3.0(D) (W/PCB) 315.90(W)×196.87(H)×3.0(D)(PCB)	mm
6	Number of Colors	16.2M(6bit+FRC)	-
7	Display Mode	Normally Black	-
8	Viewing Direction	85/85/85/85	-
9	Display Format	RGB Vertical stripe	-
10	Surface Treatment	Anti-Glare Coating	-
11	Interface	2L-EDP	-
12	Backlight	White LED	-
13	Operation Temperature	0~+50	°C
14	Storage Temperature	-20~+60	°C
15	Weight	-	g
16	Tcon IC	-	-
17	Color temperature	-	-



2. MECHANICAL SPECIFICATION





3. PIN DESCRIPTION

FPC Connector is used for the module electronics interface.

3.1 DRIVING INTERFACE OF PWB

No.	Symbol	Function	Remark
1	NC	No connection	
2	H_GND	High Speed Ground	
3	Lane1_N	Complement Signal Link Lane 1	
4	Lane1_P	True Signal Link Lane 1	
5	H_GND	High Speed Ground	
6	Lane0_N	Complement Signal Link Lane 0	
7	Lane0_P	True Signal Link Lane 0	
8	H_GND	High Speed Ground	
9	AUX_CH_P	True Signal Auxiliary Channel	
10	AUX_CH_N	Complement Signal Auxiliary Channel	
11	H_GND	High Speed Ground	
12	LCD_VDD	LCD logic and driver power(3.3V)	
13	LCD_VDD	LCD logic and driver power(3.3V)	
14	NC	No connection	
15	LCD_GND	LCD logic and driver ground	
16	LCD_GND	LCD logic and driver ground	
17	HPD	HPD signal pin	
18	BL_GND	Backlight ground	
19	BL_GND	Backlight ground	
20	BL_GND	Backlight ground	
21	BL_GND	Backlight ground	
22	BL_ENABLE	Backlight ON/OFF(+3.3V Input)	
23	BL_PWM_DIM	System PWM	
24	NC	No connection	
25	NC	No connection	
26	BL_PWR	Backlight power 5V-21V(12V typ)	
27	BL_PWR	Backlight power 5V-21V(12V typ)	
28	BL_PWR	Backlight power 5V-21V(12V typ)	
29	BL_PWR	Backlight power 5V-21V(12V typ)	
30	NC	No connection	



4. ELECTRICAL CHARACTERISTICS

4.1 ABSOLUTE MAXIMUM RATINGS

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Power Supply Voltage	VCCS	-0.3	+4	V	(1)
Converter Input Voltage	LED_VCCS	-0.3	26	V	(1)
Converter Control Signal Voltage	LED_PWM,	-0.3	26	V	(1)
Converter Control Signal Voltage	LED_EN	-0.3	26	V	(1)

Note (1) Stresses beyond those listed in above "ELECTRICAL ABSOLUTE RATINGS" may cause permanent damage to the device. Normal operation should be restricted to the conditions described in "ELECTRICAL CHARACTERISTICS".

4.2 LCD ELECTRONICS SPECIFICATION

Parameter		Symbol	Value			Unit	Note
			Min.	Typ.	Max.		
Power Supply Voltage		VCCS	3.0	3.3	3.6	V	(1)
BIST Control Level		BIST on	2.2	3.3	3.6	V	(1)
		BIST off	0	-	0.5	V	(1)
Ripple Voltage		V _{RP}	-	-	100	mV	(1)
Inrush Current		I _{RUSH}	-	-	1.5	A	(1)(2)
Power Supply Current	Mosaic	I _{LCD}	-	150		mA	(3)
Power consumption	Mosaic	P _{LCD}	-	0.5		W	(3)

Note (1) The ambient temperature is $T_a = 25 \pm 2 \text{ }^\circ\text{C}$.

Note (2) I_{RUSH}: the maximum current when VCCS is rising

I_{IS}: the maximum current of the first 100ms after power-on

Measurement Conditions: Shown as the following figure.

Test pattern: Mosaic

Note (3) The specified power supply current is under the conditions at VCCS = 3.3 V, $T_a = 25 \pm 2 \text{ }^\circ\text{C}$, DC Current and $f_v = 60 \text{ Hz}$, whereas a power dissipation check pattern below is displayed.



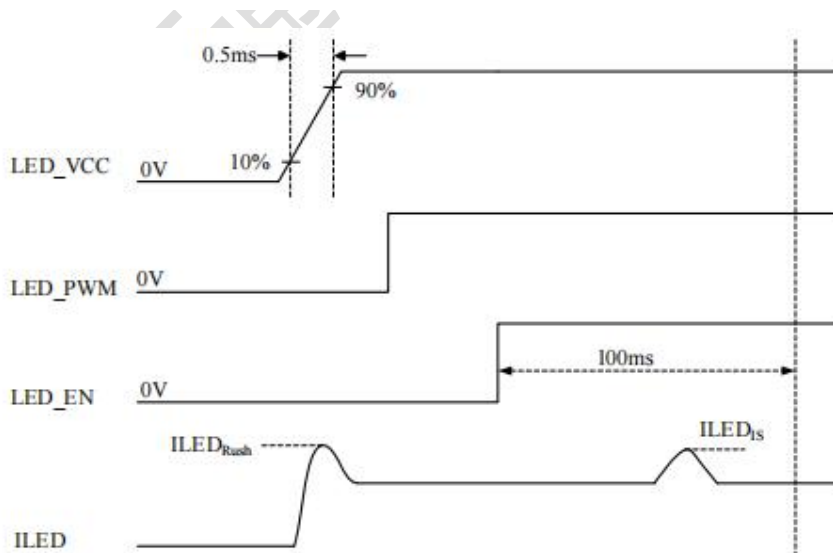
4.3 BACKLIGHT UNIT

Parameter	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
Converter Input power supply voltage	LED_Vccs	5.0	12.0	21.0	V	
Converter Inrush Current	I _{LED_RUSH}	-	-	1.5	A	(1)
EN Control Level	Backlight On	1.5	-	3.6	V	
	Backlight Off	0	-	0.6	V	
PWM Control Level	PWM High Level	1.5	-	3.6	V	
	PWM Low Level	0	-	0.5	V	
PWM Control Duty Ratio		1	-	100	%	
PWM Control Permissive Ripple Voltage	V _{PWM_pp}	-	-	100	mV	
PWM Control Frequency	f _{PWM}	200	-	1000	Hz	
LED Power consumption	P _L	-	-	2.76	W	(2)
LED Power Current	LED_VCCS =Typ.	-	-	230	mA	(3)

Note (1) I_{LED_RUSH}: the maximum current when LED_VCCS is rising,

I_{LED_IS}: the maximum current of the first 100ms after power-on,

Measurement Conditions: Shown as the following figure. LED_VCCS = Typ, Ta = 25 ± 2 °C, f_{PWM} = 200 Hz, Duty=100%.

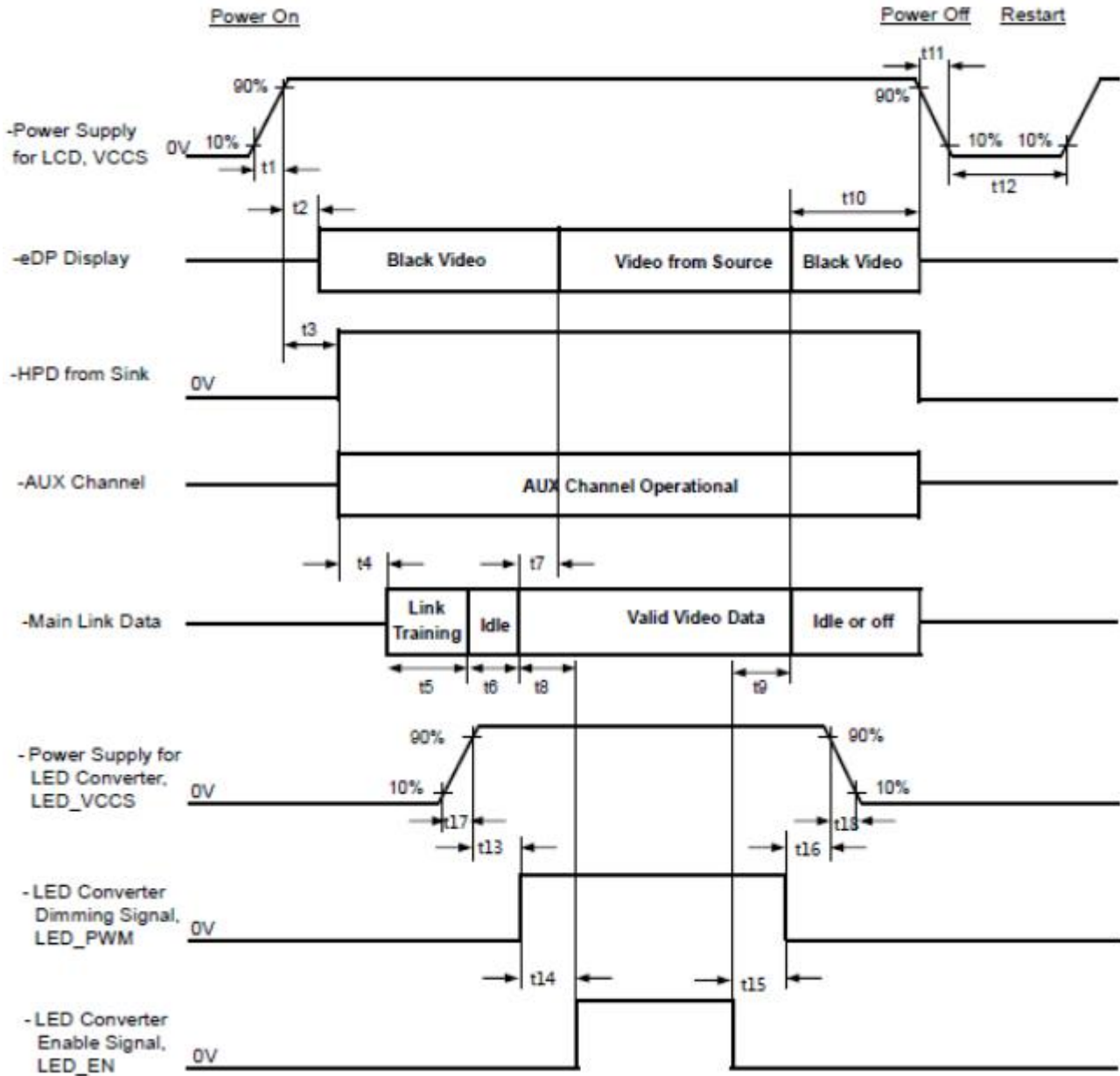


Note(2) P_L = I_L × V_L (With LED converter transfer efficiency);

Note (3) The specified LED power supply current is under the conditions at "LED_VCCS = 12V(Typ).", Ta = 25 ± 2 °C, f_{PWM} = 200 Hz, Duty=100%.



4.4 POWER ON/OFF SEQUENCE



Parameter	Description	Reqd. By	Value		Unit	Notes
			Min	Max		
t1	Power rail rise time, 10% to 90%	Source	0.5	10	ms	-
t2	Delay from LCD,VCCS to black video generation	Sink	0	200	ms	Automatic Black Video generation prevents display noise until valid video data is received from the Source (see Notes:2 and 3 below)
t3	Delay from LCD,VCCS to HPD high	Sink	0	200	ms	Sink AUX Channel must be operational upon HPD high (see Note:4 below)



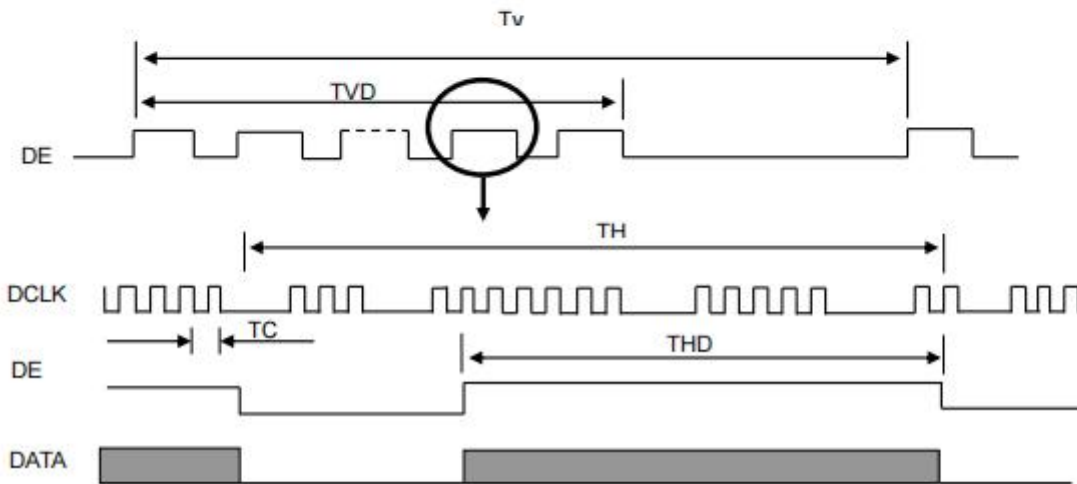
t4	Delay from HPD high to link training initialization	Source	0	-	ms	Allows for Source to read Link capability and initialize
t5	Link training duration	Source	0	-	ms	Dependant on Source link training protocol
t6	Link idle	Source	0	-	ms	Min Accounts for required BS-Idle pattern. Max allows for Source frame synchronization
t7	Delay from valid video data from Source to video on display	Sink	0	50	ms	Max value allows for Sink to validate video data and timing. At the end of T7, Sink will indicate the detection of valid video data by setting the SINK_STATUS bit to logic 1 (DPCD 00205h, bit 0), and Sink will no longer generate automatic Black Video
t8	Delay from valid video data from Source to backlight on	Source	80	-	ms	Source must assure display video is stable
t9	Delay from backlight off to end of valid video data	Source	50	-	ms	Source must assure backlight is no longer illuminated. At the end of T9, Sink will indicate the detection of no valid video data by setting the SINK_STATUS bit to logic 0 (DPCD 00205h, bit 0), and Sink will automatically display Black Video. (See Notes: 2 and 3 below)
t10	Delay from end	Source	0	500	ms	Black video will be



5.Input Signal Timing

Signal	Item	Symbol	Min.	Typ.	Max.	Unit	Note
DCLK	Frequency	1/Tc	146.8	147.8	148.8	MHz	-
DE	Vertical Total Time	TV	-	1120	-	TH	-
	Vertical Active Display Period	TVD	1080	1080	1080	TH	-
	Vertical Active Blanking Period	TVB	-	40	-	TH	-
	Horizontal Total Time	TH	-	2200	-	Tc	-
	Horizontal Active Display Period	THD	1920	1920	1920	Tc	-
	Horizontal Active Blanking Period	THB	-	280	-	Tc	-

Note (1) Display timing signal should be contained and transferred by Display Port Main Link stream data packing described in VESA Display Port Standard V1.4

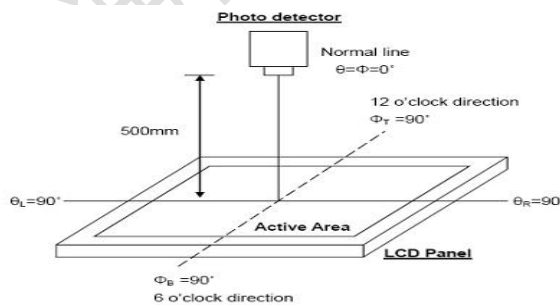


6.OPTICAL CHARACTERISTICS

Ta=25±2℃

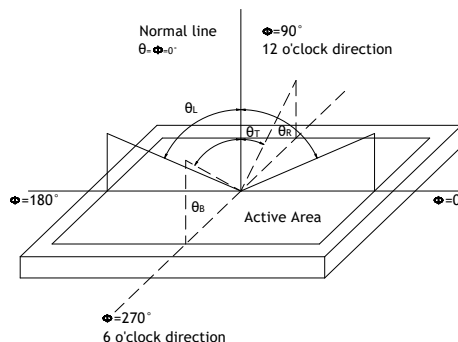
Item	Symbol	Min.	Typ.	Ma x.	Unit	Note	
Contrast Ratio	CR	1000	1200	-		Note1 Note4	
Luminance(center)	L	210	250	-	cd/m2	Note1 Note6 Note7	
Luminous tolerance	LU	70	75		%	Note7	
Response Time	Rising + Falling	-	20	25	ms	Note3	
Viewing Angle K=Contrast Ratio>10	Horizontal	θ_{x^+}	-	89	-	degree	Note2
		θ_{x^-}	-	89	-		
	Vertical	θ_{y^+}	-	89	-		
		θ_{y^-}	-	89	-		
Color Chromaticity (CIE1931)	Red	x	TYP- 0.03	0.6136	TY P+ 0.0 3	Note1 Note5 Note6	
		y		0.3832			
	Green	x		0.3679			
		y		0.5618			
	Blue	x		0.1336			
		y		0.0364			
	White	x		0.3229			
		y		0.3072			
Color gamut (NTSC%)	NTSC	-	45	-	%		

Note1: Definition of optical measurement system (BM-7)



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%.

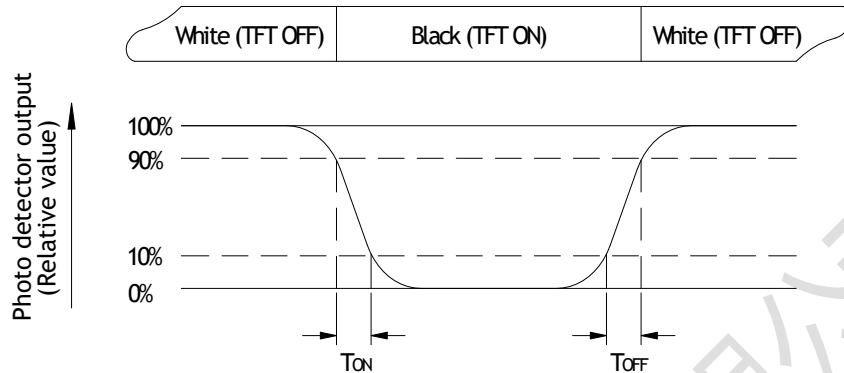


Fig. 6-3 Definition of response time

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.

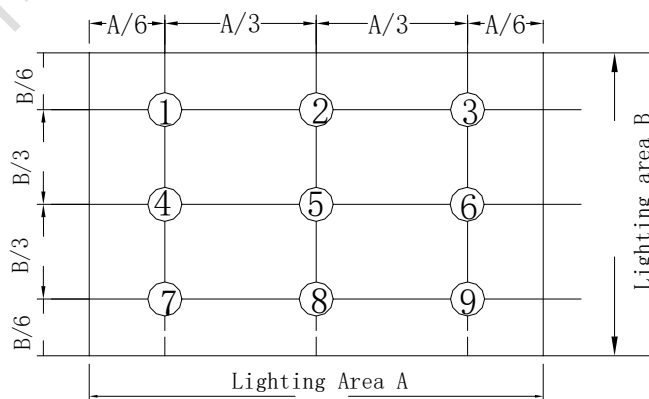
Note6: All input terminals LCD panel must be ground while measuring the center area of the panel. The LED driving condition is IL=100mA

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.

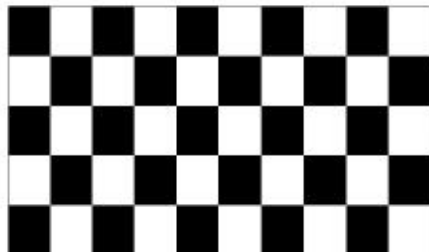
7. RELIABILITY TEST ITEMS

7.1 TEMPERATURE AND HUMIDITY

Test Item	Test Condition	Remark
High Temperature Storage	Ta=60°C; 120hrs	IEC60068-2-1: 2007 GB2423.2-2008
Low Temperature Storage	Ta=-20°C;120hrs	IEC60068-2-1: 2007 GB2423.1-2008
High Temperature Operation	Ta=50°C, 120Hrs	IEC60068-2-1: 2007 GB2423.2-2008
Low Temperature Operation	Ta=-0°C; 120hrs	IEC60068-2-1: 2007 GB2423.1-2008
High Temperature High Humidity Operation	Ta=50°C, 80%RH, 120Hrs(no condensation)	IEC60068-2-78: 2001 GB/T2423.3-2006
Thermal Shock	-20°C (0.5h) ~ 60°C (0.5h) / 96 cycles	Start with cold temperature , End with high temperature, IEC60068-2-14:1984,GB2423.22-2002
Image Sticking	25°C ; 0.5hrs	Note1

Note1:Condition of image sticking test :25°C±2°C

Operation with test pattern sustained for 0.5 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)	686m/s ² ,1ms, ±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:±8KV,Air:±15KV	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. 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 $50\pm 20\%\text{RH}$.
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 care fully.
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.