SPECIFICATION

产品说明书

Revision;1.0

版本：1.0

Model/型号：LCM12864-G212-FWN

江苏锦润光电有限公司	CUSTOMER/客户:
制作(PRO.)：简慧伟	确认(PRO.)：
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REVISION RECORD

修改记录

REV NO. 版本号	REV DATE 修改日期	CONTENTS 内容	REMARKS 注释
1.0	2023-5-31	First release	/

CONTENTS
内容

- GENERAL INFORMATION
  主要特征描述
- EXTERANL DIMENSIONS
  外形尺寸
- INTERFACE DESCRIPTION
  接口定义描述
- REFERENCE APPLICATION CIRCUIT
  参考应用电路
- TIMING CHARACTERISTICS
  时序特征
- COMMAND DESCRIPTION
  命令描述
- ABSOLUTE MAXIMUM RATINGS
  极限参数
- ELECTRICAL CHARACTERISTICS
  模块电气特性
- BACKLIGHT CHARACTERISTICS
  背光电气特性
- ELECTRO-OPTICAL CHARACTERISTICS
  光电参数
- RELIABILITY TEST CONDITIONS
  可靠性试验条件
- CONTACT INFORMATION
  联系信息

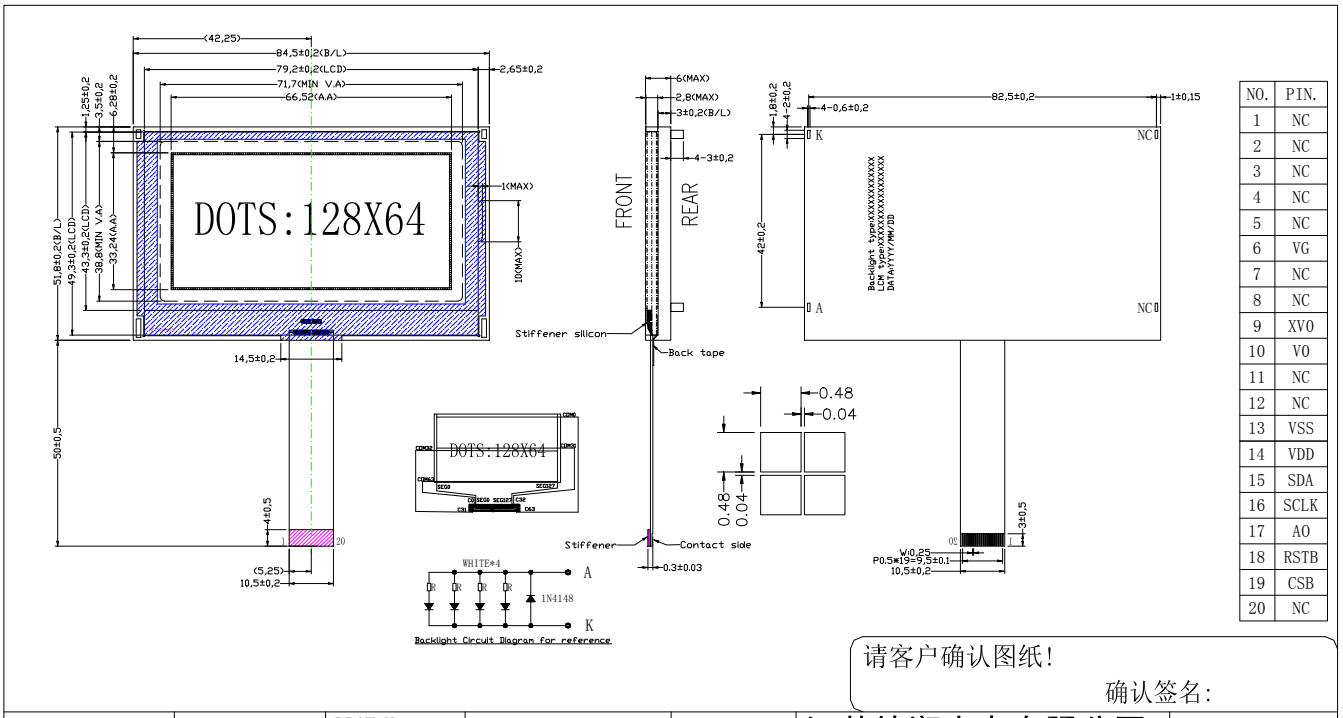
■ GENERAL INFORMATION

主要特征描述

ITEM OF GRNERAL INFORMATION 项目	CONTENTS 内容	UNIT 单位
LCD Type 液晶显示类型	DFSTN/NEGATIVE/TRANSMISSIVE	/
Recommended Viewing Direction 模块推荐使用方向	6:00	O’ Clock
Module area (W*H*T) 模块外围尺寸（宽*高*厚）	84.50×51.80×10.00MM	mm
Viewing area (W*H) 可视区域（宽*高）	71.70×38.80	mm
Active area (W*H) 有效区域（宽*高）	66.52×33.24	mm
Number of Dots 点阵	128×64	/
Pixel pitch (W*H) 像素间隙(宽*高)	0.52×0.52	mm
Driver IC 驱动集成电路	ST7567-G4D-1	/
Interface Type 接口类型	4-LINE Serial Interface	/
Input voltage 输入电压	3.0V	V
Module Power consumption 模块功耗	TBD	mW
Backlight Type 背光类型	LED WHITE	/

■ EXTERANL DIMENSIONS

外形尺寸



NO.	PIN.
1	NC
2	NC
3	NC
4	NC
5	NC
6	VG
7	NC
8	NC
9	XV0
10	V0
11	NC
12	NC
13	VSS
14	VDD
15	SDA
16	SCLK
17	A0
18	RSTB
19	CSB
20	NC

DISPLAY TYPE	DFSTN/NEGATIVE	DRAW No:	LCM12864-G212-FWN	REV: 0	江苏锦润光电有限公司 JiangSu Jinrun Optoelectronic CO.,LTD.			
VIEWING DIRECTION	6 O'CLOCK	DRAWING BY	JHW 31/05/2023	SHEET: 1/1				
DRIVE METHOD	1/65DUTY 1/9BIAS	CHECKED BY		UNIT: MM	SCALE:NTS	NO	DATE	CHANGE DESCRIPTION
DRIVE VOLTAGE	VDD=3.0V,VLCD=9.0V	APPROVED BY		IC No:	ST7567	1		
POLARIZER MODE	TRANSMISSIVE	BLACKLIGHT	VLED=4.0V@IF=60MA			2		
OPERATING TEMP	-20° TO +70°	STORAGE TEMP	-30° TO +80°	CUSTOMER No.		3		

■ INTERFACE DESCRIPTION

接口定义描述

Interface NO. 接口序号	Symbol 符号	I/O or connect to 输入/出或连接到	Description 描述
1~5、7~8、11~12、20	NC	-	No Connect.
6	VG	P	VG is the LCD driving voltage for segment circuits.
9	XV0	P	XV0 is the LCD driving voltage for common circuits at positive frame.
10	V0	P	V0 is the LCD driving voltage for common circuits at negative frame.
13	VSS	P	GND
14	VDD	P	Power Supply
15	SDA	I	4-LINE Serial DATA input.
16	SCLK	I	4-LINE Serial CLK input.
17	A0	I	Select Control Data or Display Data (H: Display data L: Control Data).
18	RSTB	I	RSTB selection signal(low active).
19	CSB	I	Chip selection signal(low active).

■ REFERENCE APPLICATION CIRCUIT

参考应用电路

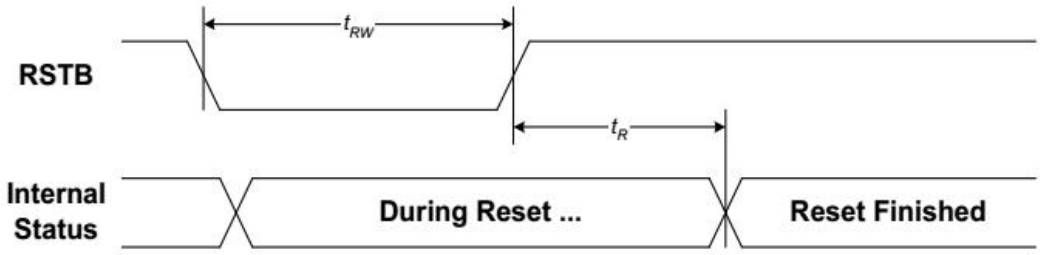
1、 BLOCK DIAGRAM

模块框图

■ TIMING CHARACTERISTICS

时序特征

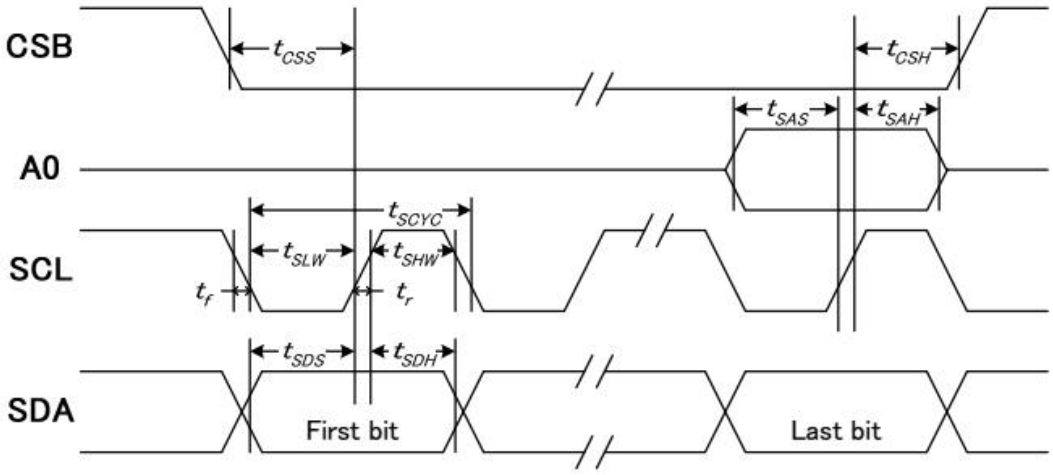
Hardware Reset Timing



(VDD1 = 3.3V , Ta =25°C)

Item	Symbol	Condition	Min.	Max.	Unit
Reset time	tR		—	1.0	us
Reset “L” pulse width	tRW		1.0	—	

System Bus Timing for 4-Line Serial Interface



(VDD1 = 3.3V , Ta =25°C)

Item	Signal	Symbol	Condition	Min.	Max.	Unit
Serial clock period	SCLK	tSCYC		50	—	ns
SCLK “H” pulse width		tSHW		25	—	
SCLK “L” pulse width		tSLW		25	—	
Address setup time	A0	tSAS		20	—	
Address hold time		tSAH		10	—	
Data setup time	SDA	tSDS		20	—	
Data hold time		tSDH		10	—	
CSB-SCLK time	CSB	tCSS		20	—	
CSB-SCLK time		tCSH		40	—	

Please refer ST7567 DATASHEES

具体请详细参考 ST7567 规格书

■ COMMAND DESCRIPTION

命令描述

INSTRUCTION	A0	R/W (RWR)	COMMAND BYTE								DESCRIPTION
			D7	D6	D5	D4	D3	D2	D1	D0	
(1) Display ON/OFF	0	0	1	0	1	0	1	1	1	D	D=1, display ON D=0, display OFF
(2) Set Start Line	0	0	0	1	S5	S4	S3	S2	S1	S0	Set display start line
(3) Set Page Address	0	0	1	0	1	1	Y3	Y2	Y1	Y0	Set page address
(4) Set Column Address	0	0	0	0	0	1	X7	X6	X5	X4	Set column address (MSB)
	0	0	0	0	0	0	X3	X2	X1	X0	Set column address (LSB)
(5) Read Status	0	1	0	MX	D	RST	0	0	0	0	Read IC Status
(6) Write Data	1	0	D7	D6	D5	D4	D3	D2	D1	D0	Write display data to RAM
(7) Read Data	1	1	D7	D6	D5	D4	D3	D2	D1	D0	Read display data from RAM
(8) SEG Direction	0	0	1	0	1	0	0	0	0	MX	Set scan direction of SEG MX=1, reverse direction MX=0, normal direction
(9) Inverse Display	0	0	1	0	1	0	0	1	1	INV	INV =1, inverse display INV =0, normal display
(10) All Pixel ON	0	0	1	0	1	0	0	1	0	AP	AP=1, set all pixel ON AP=0, normal display
(11) Bias Select	0	0	1	0	1	0	0	0	1	BS	Select bias setting 0=1/9; 1=1/7 (at 1/65 duty)
(12) Read-modify-Write	0	0	1	1	1	0	0	0	0	0	Column address increment: Read:+0 , Write:+1
(13) END	0	0	1	1	1	0	1	1	1	0	Exit Read-modify-Write mode
(14) RESET	0	0	1	1	1	0	0	0	1	0	Software reset
(15) COM Direction	0	0	1	1	0	0	MY	-	-	-	Set output direction of COM MY=1, reverse direction MY=0, normal direction
(16) Power Control	0	0	0	0	1	0	1	VB	VR	VF	Control built-in power circuit ON/OFF
(17) Regulation Ratio	0	0	0	0	1	0	0	RR2	RR1	RR0	Select regulation resistor ratio
(18) Set EV	0	0	1	0	0	0	0	0	0	1	Double command!! Set electronic volume (EV) level
	0	0	0	0	EV5	EV4	EV3	EV2	EV1	EV0	
(19) Set Booster	0	0	1	1	1	1	1	0	0	0	Double command!! Set booster level: BL=0: 4X BL=1: 5X
	0	0	0	0	0	0	0	0	0	BL	
(20) Power Save	0	0	Compound Command								Display OFF + All Pixel ON
(21) NOP	0	0	1	1	1	0	0	0	1	1	No operation
(22) Test	0	0	1	1	1	1	1	1	1	-	Do NOT use. Reserved for testing.

Note: Symbol "-" means this bit can be "H" or "L".

Please refer ST7567 DATASHEES

具体请详细参考 ST7567 规格书

■ MAXIMUM ABSOLUTE RATINGS

极限参数

Parameter of absolute maximum ratings 参数	Symbol 符号	Min 最小值	Max 最大值	Unit 单位
Supply voltage for logic 逻辑电压	VDD	-0.3	3.6	V
Supply Voltage for LCD LCD 电压	VLCD	-0.3	16	V
Input Voltage 输入电压	Vin	-0.3	3.6	V
Supply Current for Backlight 背光电流	If(Ta=25° C)	-	80	mA
Operating temperature 操作温度	TOP	-20	70	° C
Storage temperature 储存温度	TST	-30	80	° C

Note: Absolute maximum ratings means the product can withstand short-term, NOT more than 200 hours. If the product is a long time to withstand these conditions, the life time would be shorter.

备注:极限条件仅指产品能短暂承受的范围,不可超过 200 小时。如果产品长时间在极限条件,将有损产品的使用寿命。

■ ELECTRICAL CHARACTERISTICS

模块电气特性

DC CHARACTERISTICS

直流特性

Parameter of DC characteristics 参数	Symbol 符号	Min 最小值	Typ 典型值	Max 最大值	Unit 单位
Supply voltage for logic 逻辑电压	VDD	2.8	3.0	3.3	V
Supply Voltage for LCD LCD 电压	VLCD	8.8	9.0	9.2	V
Input voltage 'H' level 输入高电平	VIH	0.8VDD	-	VDD	V
Input voltage 'L' level 输入低电平	VIL	0	-	0.2VDD	V
Output voltage 'H' level 输出高电平	VOH	0.8VDD	-	VDD	V
Output voltage 'L' level 输出低电平	VOL	0	-	0.2VDD	V
Supply Current 模块电流	Idd	-	3	5	mA

■ BACKLIGHT CHARACTERISTICS

背光电气特性

Item of backlight characteristics 项目(Yellow-Green Blacklight)	Symbol 符号	Min. 最小值	Typ. 典型值	Max. 最大值	Unit 单位	Condition 条件
Forward voltage 正向电压	Vf	3.7	4.0	4.3	V	If=60mA
Number of LED 灯数	-	-	4	-	Piece	-
Blacklight Colour 背光颜色	-	-	WHITE	-	-	-

■ ELECTRO-OPTICAL CHARACTERISTICS

光电参数

Item of backlight characteristics 项目	Symbol 符号	Condition 条件	Min. 最小值	Typ. 典型值	Max. 最大值	Unit 单位	Remark 注释	Note 备注
Response time 响应时间	Tr	θ=0° ø=0° Ta=25℃	170	200	230	ms	FIG 1	4
	Tf		200	230	260			
Contrast ratio 对比度	Cr		3	5	-	-	FIG 2	1
Luminance uniformity 均匀度	δ WHITE		70	-	-	%		3
Surface Luminance 表面亮度	Lv		-	-	-	cd/m2		2
Viewing angle range 视角范围	θ	ø = 90°	-	38	-	deg	FIG 3	6
		ø = 270°	-	25	-	deg		
		ø = 0°	-	33	-	deg		
		ø = 180°	-	33	-	deg		

Note1. Contrast Ratio(CR) is defined mathematically by the following formula. For more information see FIG 2.

$$\text{Contrast Ratio(CR)} = \frac{\text{Average Surface Luminance with all white pixels (P1, P2, ……)}}{\text{Average Surface Luminance with all black pixels (P1, P2, ……)}}$$

备注 1. 对比度是由以下公式计算所得。详见 FIG 2.

$$\text{对比度} = \frac{\text{显示白色画面时平均表面亮度(P1,P2,…)}}{\text{显示黑色画面时平均表面亮度(P1,P2,…)}}$$

Note2. Surface luminance is the LCD surface luminance with all white pixels. For more information see FIG 2.

Lv = Average Surface Luminance with all white pixels(P1, P2,……)

备注 2. 表面亮度是在显示白色画面时，测试的亮度值，详见 FIG 2.

Lv = 平均的表面亮度(P1, P2,……)

Note3. The uniformity in surface luminance(δ WHITE) is determined by measuring luminance at each test position, and then dividing the maximum luminance of all white pixels by minimum luminance of all white pixels. For more information see FIG 2.

$$\delta\text{WHITE} = \frac{\text{Minimum Surface Luminance with all white pixels(P1, P2,……)}}{\text{Maximum Surface Luminance with all white pixels(P1, P2,……)}}$$

备注 3. 均匀度是在显示白色画面时，测试 P1 到 P9 的亮度，然后再用 9 个点亮度的最小值除以最大值。详见 FIG 2.

$$\text{均匀度} = \frac{\text{白色画面下表面亮度最小值 (P1, P2,……)}}{\text{白色画面下表面高度最大值 (P1,P2,……)}}$$

Note4. Response time is the time required for the display to transition from White to black(Rise Time,

Tr) and from black to white(Decay Time,Tf).For additional information see FIG 1.

备注 4.响应时间是 Tr(上升时间)与 Tf(下降时间)的和;Tr 指显示白色画面转为显示黑色画面需要时间, Tf 指显示黑色画面转为显示白色画面需要时间。详见 FIG 1.

Note5.CIE(x, y)chromaticity is the Center point value.For more information see FIG 2.

备注 5.选择中心点分别测试 x,y 值。详见 FIG 2.

Note6. Viewing angle is the angle at which the contrast ratio is greater than a specific value.For TFT module,the specific value of conrast ratio is 10; For monochrome and color stn module,the specific value of conrast ratio is 2.The angles are determined for the horizontal or x axis and the vertical or y axis with respect to the z axis which is normal to the LCD surface.For more information see FIG 3.

备注 6. 视角指对比度大于等于一个特定值时的可视范围，对 TFT 屏，对比度特定值为 10，对黑白屏，CSTN 屏，对比度特定值为 2。视角由横轴（x 轴），竖轴（y 轴）同 Z 轴（垂直于 LCD 表面）之间的夹角来定义。详见 FIG 3.

Note7.For Viewing angle and response time testing, the testing data is base on Autronic-Melchers’s ConoScope. Series Instruments. For contrast ratio, Surface Luminance, Luminance uniformity and CIE, the testing data is base on CS-2000 photo detector.

备注 7.视角和响应时间，测试数据基于 Autronic-Melchers’s ConoScope.系列。而对比度，表面亮度，均匀度，CIE 坐标,测试数据基于 CS-2000 photo detector。

Note8.For TN type TFT transmissive module,Gray scale reverse occurs in the direction of panel viewing angle

备注 8. TN 型 TFT 全透产品,在视角方向会发生灰度反转。

FIG 1. The definition of Response Time

响应时间

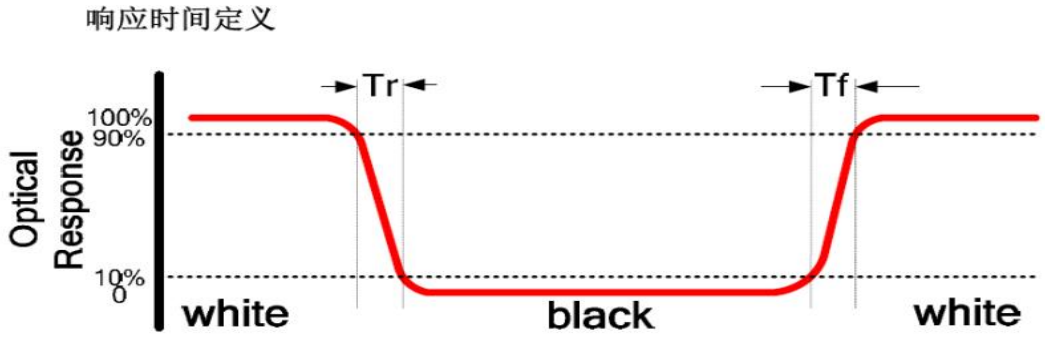


FIG 2.Measuring method for Contrast ratio,surface luminance,Luminance uniformity,CIE(x, y) chromaticity.

对比度、表面亮度、均匀度、CIE 坐标测试方法

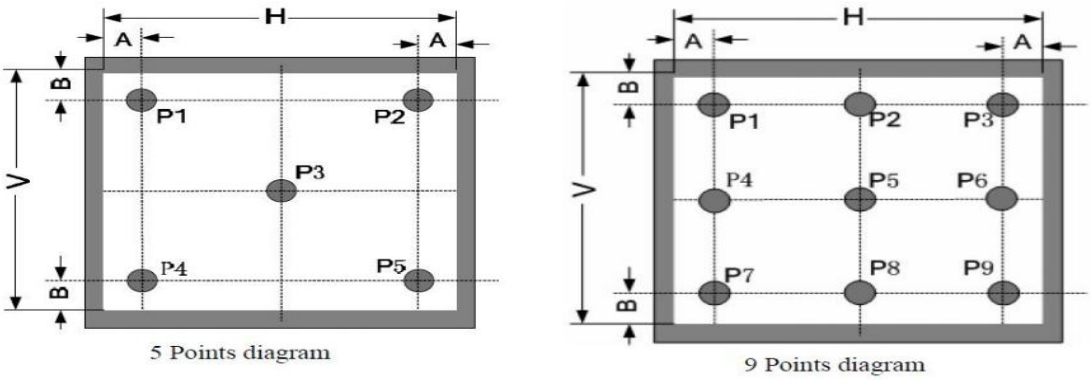


Fig2 Note1: For TFT Module Test point:9 points(as 9 Points diagram)

A : H/6 B : V/6

H,V : Active Area(AA) size

Measurement instrument:CS-2000;Light spot size ø=5mm,350mm distance from the LCD surface to detector lens.

Fig2 Note2: For non-TFT Module and Dot-Matrix type Module

2.1 If the minimum side size is bigger than 20 mm,the testing method is the same as TFT module.

2.2 If the minimum side size is less than 20 mm,then testing 5 point datas (as 5 Points diagram),Both A and B are 5 mm.

2.3 Measurement instrument: CS-2000 is priority selected to measure.Light spot size ø=5mm, 350mm distance from the LCD surface to detector lens.

2.4 Measurement instrument : ConoScope will be selelected to measure If CS-2000 cannot meet the measurement requirement. Light spot size ø =0.2-2.0mm.About 2-3mm distance from the LCD surface to detector lens,but suggest to confirm the best distance on focusing the picture to be clearest when actually measuring.

Fig2 Note3: For non-TFT Module and non-Dot-Matrix type Module

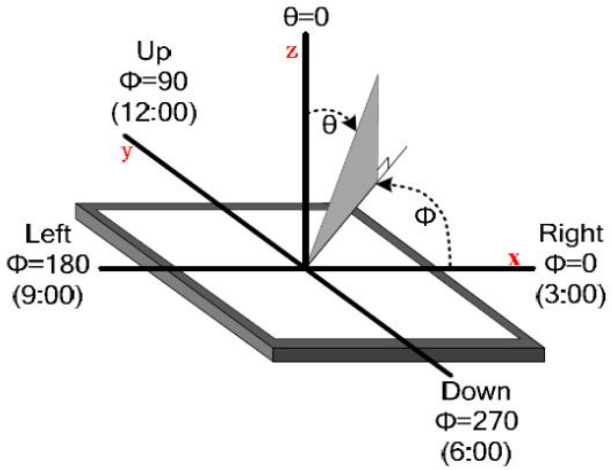
The test point is defined by the fact size and shape of module,but the center point and four edges should be selected.

3.1 Measurement instrument: CS-2000 is priority selected to measure.Light spot size Æ=5mm, 350mm distance from the LCD surface to detector lens.

3.2 Measurement instrument : ConoScope will be selelected to measure If CS-2000 cannot meet the measurement requirement. Light spot size Æ=0.2-2.0mm. About 2-3mm distance from the LCD surface to detector lens,but suggest to confirm the best distance on focusing the picture to be clearest when actually measuring.

FIG.3. The definition of viewing angle

视角定义



■ RELIABILITY TEST CONDITIONS

可靠性试验条件

No. 序号	Test Item 试验项目	Test Condition 试验条件	Inspection after test 判断标准
1	High Temperature Storage 高温存放	80 ±2℃/200 hours	Inspection after 2~4hours storage at room temperature, the sample shall be free from defects: 试验结束后,已测试的 LCD 样品必须在室内正常温湿度环境下放置 2~4 个小时以上才能进行功能和外观检查，样品不允许有以下缺陷： 1.Air bubble in the LCD; 模块中有气泡； 2.Sealleak; 封口松脱； 3.Non-display;不显示； 4.missing segments; 漏笔 5.Glass crack;玻璃破碎； 6.Current Idd is twice higher than initial value.电流 Idd 大于初时值的 2 倍
2	Low Temperature Storage 低温存放	-30 ±2℃/200 hours	
3	High Temperature Operating 高温操作	70±2℃/24 hours	
4	Low Temperature Operating 低温操作	-20±2℃/24 hours	
5	Temperature Cycle storage 冷热循环存放	-30±2℃~25~80±2℃×10cycles (30min.) (5min.) (30min.)	
6	Damp proof Test operating 防潮试验操作	60℃±5℃×90%RH/12 hours	
7	Vibration Test 振荡试验	Frequency：10Hz~55Hz~10Hz Amplitude:1.5mm, X，Y，Z direction For total 3hours (Packing condition)	
8	Dropping test 跌落试验	Drop to the ground from 1m height, one time,every side of carton.(Packing condition)	
9	ESD test 静电试验	Voltage:±4KV R: 330Ω C: 150pF Air discharge, 10time	

Remark:注意：

1. The test samples should be applied to only one test item.
   每个被测试的模块只能用于其中的一个测试项目。
2. Sample size for each test item is 3~5pcs.
   每个测试项目的样品数量为 3～5 片.
3. For Damp Proof Test, Pure water(Resistance＞10MΩ) should be used.
   对于防潮试验，试验箱的用水必须是电阻大于 10M 欧姆的纯水。
4. In case of malfunction defect caused by ESD damage, if it would be recovered to normal state after resetting,it would be judged as a good part.
   如果由静电引起产品故障,当放置一段时间后能够恢复正常, 则不视为产品缺陷。
5. EL evaluation should be excepted from reliability test with humidity and temperature: Some defects such as black spot/blemish can happen by natural chemical reaction with humidity and Fluorescence EL has.
   带 EL 片的可靠性测试在高温高湿条件下,荧光粉会发生自然化学反应而产生黑点或瑕疵,因此不在高温高湿条件测试范围内.
6. FailureJudgment Criterion:Basic Specification,Electrical Characteristic,Mechanical Characteristic, Optical Characteristic.
   故障判断标准:基本规格,电气特性,机械特性,光电特性

■ CONTACT INFORMATION

联系信息

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