NISIN

模组规格承认书

LCM Specifications for Approval

客户： 客户型号：			NS241VG2401AL		
批准 APPROVED	审核 CHECKED	拟制 DESIGNED	批准 APPROVED	审核 CHECKED	拟制 DESIGNED

R-R-020-A0

修改记录

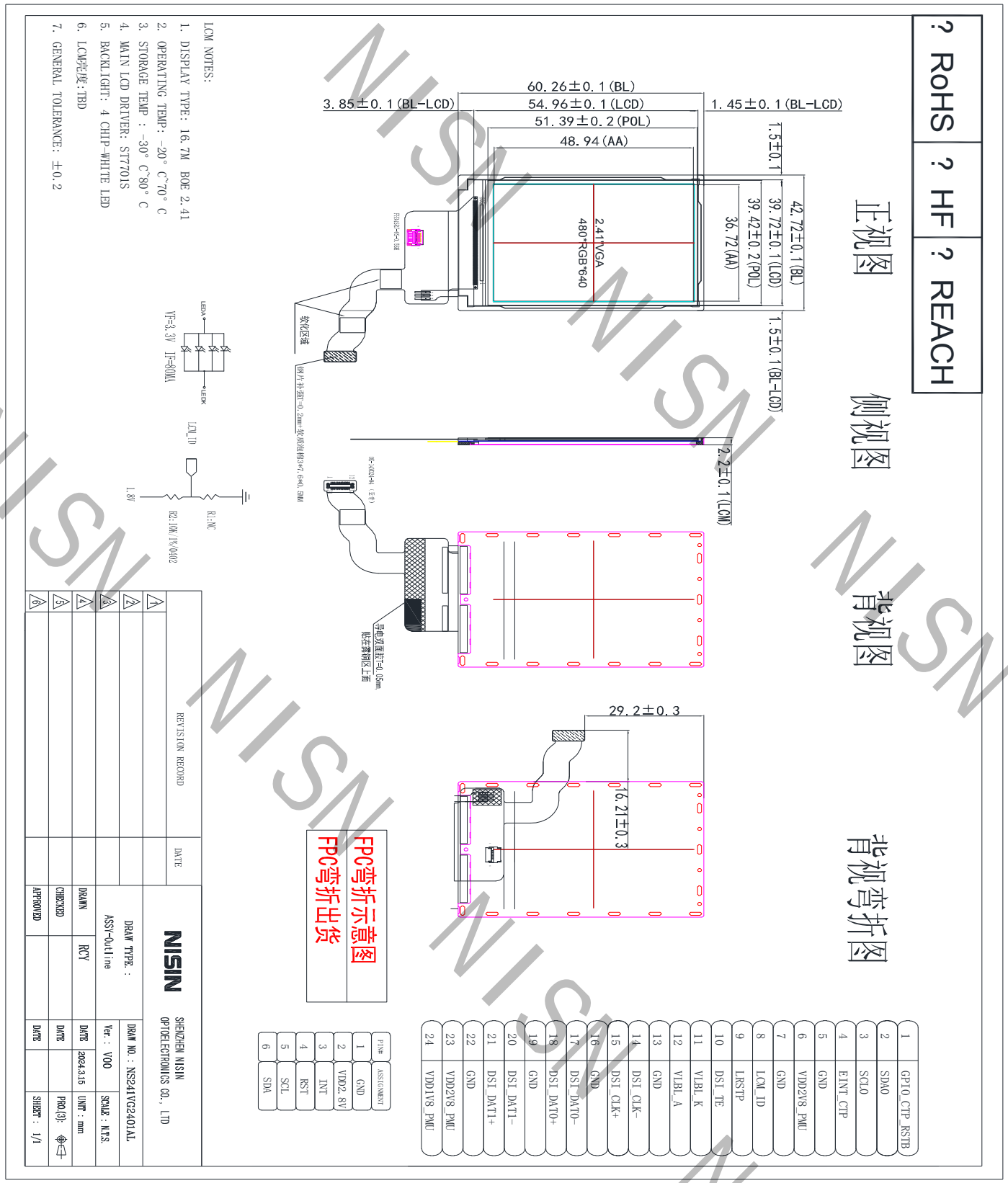
日期	版本	修改内容	页数	拟制
2024-4-1	V00	初版发行	所有	

目录

1.产品规格（Product Specifications）

面板类型（Panel Type）	TFT
面板尺寸(Panel Size)	2.41 inch
显示类型（Display Type）	Normally black
分辨率（Resolution）	480(RGB) x 640 (dot)
显示点间距（Dot Pitch）	76.5 Um X 76.5 Um
显示色彩（color）	16.7M
视角（View Angle）	ALL
显示驱动 IC（Display Driver IC）	ST7701S
接口类型（Interface Type）	MIPI 2 通道
触摸类弄（TP Type）	
触摸 IC （TP IC）	
触摸接口类型（TP Interface）	
外形尺寸（Dimensions）	42.72*60.26*2.2(mm)
显示区尺寸（Display area）	36.72*48.94(mm)
背光（Back Light）	
触摸点数 Touch points	
触摸按键 Touch Key Number	

2. 产品图纸（Product Drawings）



3.接口定义（The Interface Definition）

见 CAD 图纸

4.电性特性（Electrical Characteristics）

7 DRIVER ELECTRICAL CHARACTERISTICS

7.1 Absolute Operation Range

Item	Symbol	Rating	Unit
Supply Voltage	VDD	- 0.3 ~ +3.6	V
Supply Voltage (Logic)	VDDI	- 0.3 ~ +3.6	V
Driver Supply Voltage	VGH-VGL	-0.3 ~ +30.0	V
Logic Input Voltage Range	VIN	-0.3 ~ VDDI + 0.5	V
Logic Output Voltage Range	VO	-0.3 ~ VDDI + 0.5	V
Operating Temperature Range	TOPR	-30 ~ +85	℃
Storage Temperature Range	TSTG	-40 ~ +125	℃

Table 1 Absolute Operation Range

Note: If one of the above items is exceeded its maximum limitation momentarily, the quality of the product may be degraded. Absolute maximum limitation, therefore, specify the values exceeding which the product may be physically damaged. Be sure to use the product within the recommend range.

7.2 DC Characteristics

Parameter	Symbol	Condition	Specification			Unit	Related Pins
			MIN.	TYP.	MAX.		
Power & Operation Voltage							
System Voltage	VDD	Operating voltage	2.5	2.8	3.6	V	
Interface Operation Voltage	VDDI	I/O Supply Voltage	1.65	1.8	3.3	V	
Gate Driver High Voltage	VGH		11.5		17	V	
Gate Driver Low Voltage	VGL		-7.6		-12	V	
Gate Driver Supply Voltage		| VGH-VGL |	-		30	V	
Input / Output							
Logic-High Input Voltage	VIH		0.7VDDI		VDDI	V	Note 1
Logic-Low Input Voltage	VIL		VSS		0.3VDDI	V	Note 1
Logic-High Output Voltage	VOH	IOH = -1.0mA	0.8VDDI		VDDI	V	Note 1
Differential Input High Threshold Voltage	VIT+			0	50	mV	MIPI_CLK MIPI_Data
Differential Input Low Threshold Voltage	VIT-		-50	0		mV	
Single-ended Receiver Input Operation Voltage Range	VIR		0.5		1.2	V	
Logic-Low Output Voltage	VOL	IOL = +1.0mA	VSS		0.2VDDI	V	Note 1
Logic-High Input Current	IIH	VIN = VDDI			1	uA	Note 1
Logic-Low Input Current	IIL	VIN = VSS	-1			uA	Note 1
Input Leakage Current	IIL	IOH = -1.0mA	-0.1		0.1	uA	Note 1
VCOM Voltage							
VCOM amplitude	VCOM			VSS		V	
Source Driver							
Gamma Reference Voltage(Positive)	VAP		4.4		6.4	V	
Gamma Reference Voltage(Negative)	VAN		-2.6		-4.6	V	
Source Output Settling Time	Tr	Below with 99% precision			10	us	Note 2

Table 2 Basic DC Characteristics

7.5.4 MIPI Interface Characteristics:

7.5.4.1 High Speed Mode

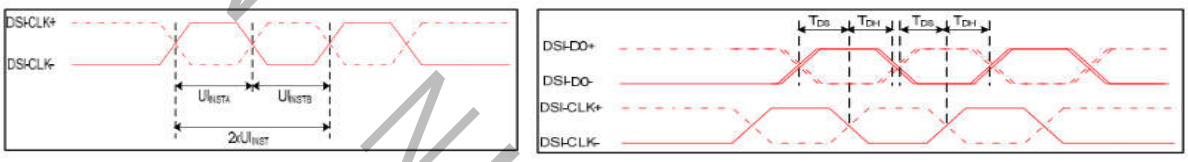


Figure 4 DSI clock channel timing

Figure 5 Rising and falling time on clock and data channel

VDDI=1.8,VDD=2.8, AGND=DGND=0V, Ta=25 ℃

Signal	Symbol	Parameter	MIN	MAX	Unit	Description
DSI-CLK+/-	$2xUI_{INSTA}$	Double UI instantaneous	4	25	ns	
DSI-CLK+/-	UI_{INSTA} UI_{INSTB}	UI instantaneous halfs	2	12.5	ns	$UI = UI_{INSTA} = UI_{INSTB}$
DSI-Dn+/-	tDS	Data to clock setup time	0.15	-	UI	
DSI-Dn+/-	tDH	Data to clock hold time	0.15	-	UI	

Table 7 Mipi Interface- High Speed Mode Timing Characteristics

7.5.4.2 Lowe Power Mode

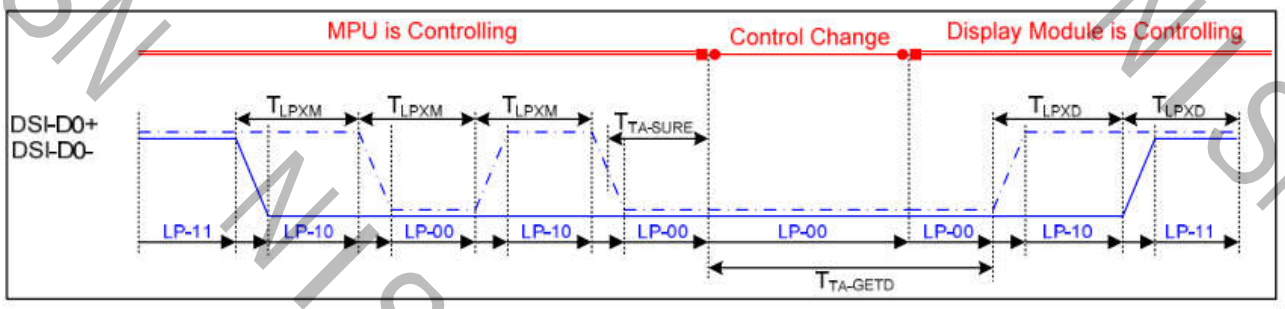


Figure 6 Bus Turnaround (BTA) from display module to MPU Timing

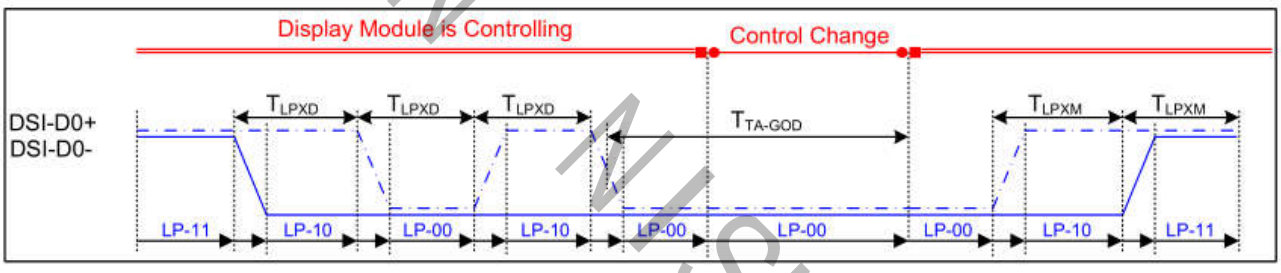


Figure 7 Bus Turnaround (BTA) from MPU to display module Timing

VDDI=1.8,VDD=2.8, AGND=DGND=0V, Ta=25 ℃

Signal	Symbol	Parameter	MIN	MAX	Unit	Description
DSI-D0+/-	TLPXM	Length of LP-00,LP-01, LP-10 or LP-11 periods MPU→Display Module	50	75	ns	Input
DSI-D0+/-	TLPXD	Length of LP-00,LP-01, LP-10 or LP-11 periods MPU→Display Module	50	75	ns	Output
DSI-D0+/-	TTA-SURED	Time-out before the MPU start driving	T_{LPXD}	$2xT_{LPXD}$	ns	Output
DSI-D0+/-	TTA-GETD	Time to drive LP-00 by display module	$5xT_{LPXD}$		ns	Input
DSI-D0+/-	TTA-GOD	Time to drive LP-00 after turnaround request-MPU	$4xT_{LPXD}$		ns	Output

Table 8 Mipi Interface Low Power Mode Timing Characteristics

7.5.5 Reset Timing:

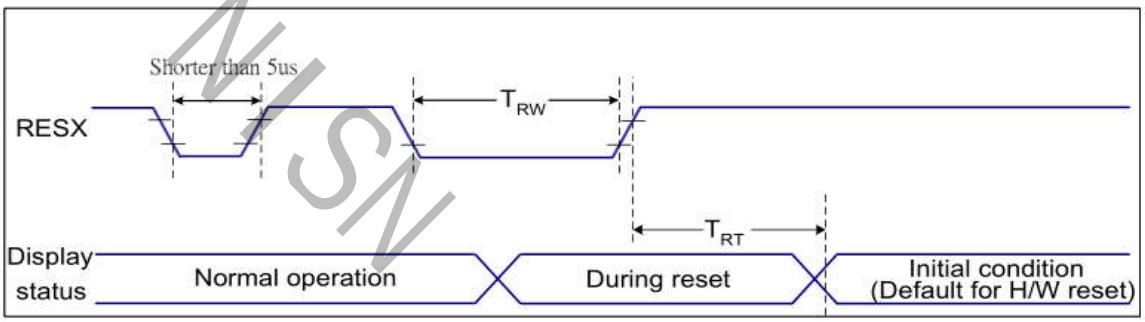


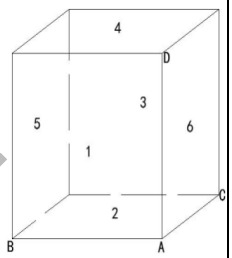
Figure 9 Reset Timing

VDDI=1.8,VDD=2.8, AGND=DGND=0V, Ta=25 ℃

Related Pins	Symbol	Parameter	MIN	MAX	Unit
RESX	TRW	Reset pulse duration	10	-	us
	TRT	Reset cancel	-	5 (Note 1, 5)	ms
				120(Note 1, 6, 7)	ms

Table 9 Reset Timing

5.可靠性实验测试(Reliability Test Conditions And Methods)

<table>
<tr><th>序号</th><th>试验项目</th><th>试验条件及方法</th><th>试验设备</th><th>检验项目</th><th>检验工具</th></tr>
<tr><td>1</td><td>高温高湿(静、动态)试验</td><td>温度 60℃±3℃,湿度 90%±3%,要求选择时间分别为 96 小时,静、动态（产品点亮）在室温下恢复 2 小时后进行外观,显示功能检查。</td><td>恒温恒湿试验机</td><td>检验外观、功能、抗腐蚀性</td><td rowspan="2">目视/测试架/客户样机/显微镜</td></tr>
<tr><td>2</td><td>高、低温冲击试验</td><td>静态-30℃（30 分钟）∽ 80℃（30 分钟）∽ -30℃（30 分钟），24 个循环，在室温下恢复 2 小时后进行外观,显示功能检查。</td><td>冷热冲击试验机</td><td>检验外观、功能</td></tr>
<tr><td>3</td><td>高温存贮试验</td><td>常温70℃+-3℃、宽温80℃+/-3℃、96小时后在室温状态下恢复1 小时在2 小时内完成外观、显示功能检查。</td><td>烤箱</td><td>检验外观、功能</td><td rowspan="2">目视/测试架/客户样机</td></tr>
<tr><td>4</td><td>低温存贮试验</td><td>常温-20℃+/-3℃、宽温-30℃+/-3℃、条件的试验箱内保存96小时后在室温状态下恢复1 小时,在2 小时完成外观、显示功能检查，特别注意检查是否有漏液、断线、腐蚀、偏光片不良现象。</td><td>低温冰箱</td><td>检验外观、功能</td></tr>
<tr><td>5</td><td>低温存贮试验（动态）</td><td>常温-20℃+/-3℃、宽温-30℃+/-3℃条件的试验箱内点亮刷屏，过程中每1小时观察一次，检查显示功能，如：异常，卡机，花屏等。特别注意检查是否有漏液、断线、腐蚀、偏光片不良现象。</td><td>低温冰箱</td><td>检验外观、功能</td><td>目视/测试架/客户样机</td></tr>
<tr><td>6</td><td>包装模组跌落试验</td><td>1、跌落重量及自由落体高度:
(图二)
 

2、自由落体角度如下：
<table><tr><th>总重量</th><th>自由落体高度</th></tr><tr><td>0-9kg</td><td>92cm</td></tr><tr><td>9-25kg</td><td>76cm</td></tr><tr><td>25-45kg</td><td>53cm</td></tr><tr><td>45-68kg</td><td>46cm</td></tr><tr><td>大于 68kg</td><td>41cm</td></tr><tr><td></td><td></td></tr></table>1） 一角：A角
2） 三菱：A-B, A-D, A-C
3） 六面：面 1，面 2，面 3，面 4，面 5，面 6;</td><td>包装模组跌落架</td><td>测试电性能无异常、外观检验无破损，无脱离现象</td><td>目视/测试架/客户样机</td></tr>
</table>

7	盐雾试验	标准条件:中性盐雾试验（NSS 试验）：5%的氯化钠盐水溶液,溶液 PH 值中性（6.5～7.2），试验温度 35±2℃,盐雾的沉降率在 1～2ml/80cm².h 之间,时间 24h。2.其它特殊要求条件:醋酸盐雾试验(ASS 试验)：5%氯化钠溶液中配入冰醋酸,溶液 PH 值为 3 左右，试验温度 35±2℃,盐雾的沉降率在 1～2ml/80cm².h 之间，时间 24h。	盐雾试验设备	检验外观、功能，盐雾试验结果的判定方法，腐蚀物出现判定法：定性判定，试验后功能测试应 OK，外观观察产品无腐蚀现象产生。	目视/测试架/客户样机/显微镜
8	ESD 抗静电试验	测试架测试状态下试验：接触 4KV,非接触(空气) 8KV 放电测试	抗静电枪（尖头接触放电，圆头空气放电）	检验外观、功能	目视/测试架

6. 光电参数（Optical Characteristics）

3.2 Optical Specifications

Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Threshold Voltage		Vsat		4.1	4.3	4.5	V	Fig.1
		Vth		1.6	1.8	2.0	V	
Viewing Angle	Horizontal	Θ3	CR>10	70	80			Note 1
		Θ9		70	80			
	Vertical	Θ12		70	80			
		Θ6		70	80			
Contrast Ratio		CR	Θ= 0°	800	1000			Note 2
Transmittance		T(%)	Θ= 0°	3.2	3.6			Note 3
NTSC		%	Θ= 0°	58	63			Only CF
Reproduction Of color	Red	Rx	Θ= 0°	0.625	0.640	0.655		Note 4 *Color filter Glass (with OC)
		Ry		0.311	0.326	0.341		
	Green	Gx		0.279	0.294	0.309		
		Gy		0.565	0.580	0.595		
	Blue	Bx		0.134	0.149	0.164		
		By		0.090	0.105	0.120		
White		Wx	Θ= 0°	0.287	0.302	0.317		
		Wy		0.314	0.329	0.344		
Response Time		Tr+Tf	Θ= 0°		35	40	ms	Note 5

Note:

1. Viewing angle is the angle at which the contrast ratio is greater than 10. The viewing are determined for the horizontal or 3, 9 o'clock direction and the vertical or 6, 12 o'clock direction with respect to the optical axis which is normal to the LCD surface (see FIG.2).
2. Contrast measurements shall be made at viewing angle of Θ= 0° and at the center of the LCD surface. Luminance shall be measured with all pixels in the view field set first to white, then to the dark (black) state. (See FIG. 2) Luminance Contrast Ratio (CR) is defined mathematically.

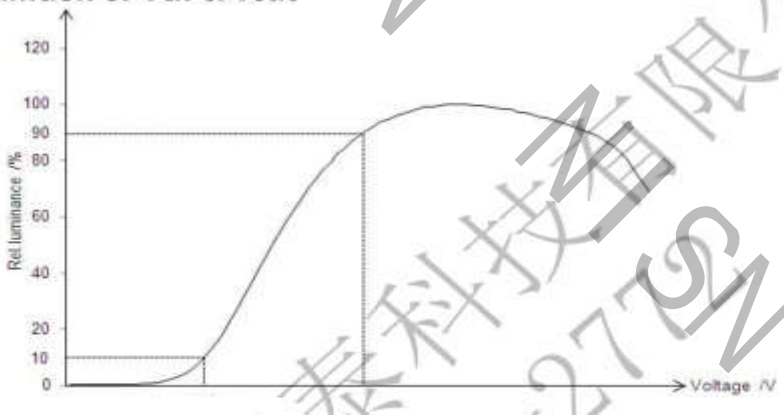
$$CR = \frac{\text{Luminance when displaying a white raster}}{\text{Luminance when displaying a black raster}}$$

3. Transmittance is the value with APF Polarizer.

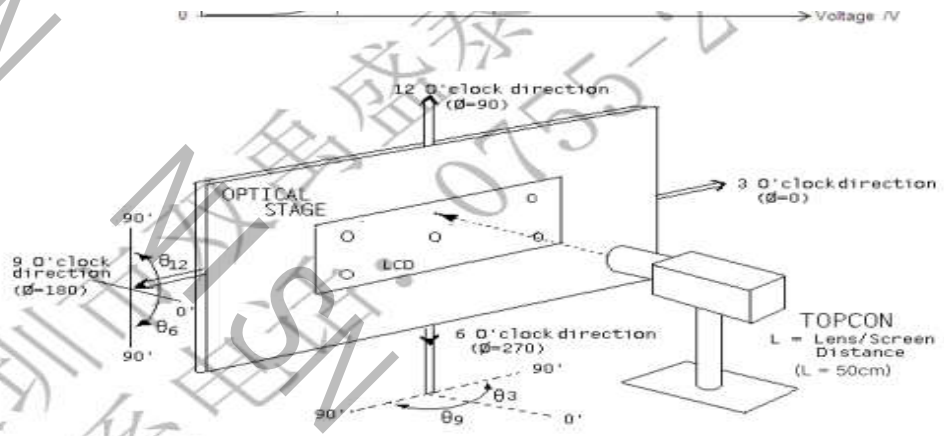
4. The color chromaticity coordinates specified in Table1 shall be calculated from
The spectral data measured with all pixels first in red, green, blue and white.
Measurements shall be made at the center of the C/F.
Measurement condition is C - light source & Halogen Lamp

5. The electro-optical response time measurements shall be made as FIG.3 by switching the "data" input signal ON and OFF.
The times needed for the luminance to change from 10% to 90% is Tr, and 90% to 10% is Tf.

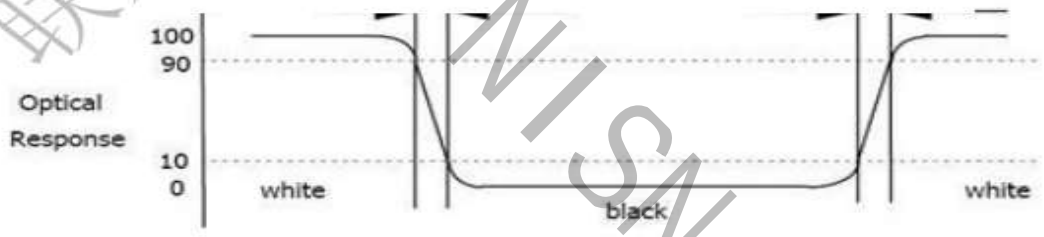
Figure 1. The definition of Vth & Vsat



Figur



Figur



7.检验标准（Inspection standard）

8.1 Inspection conditions is as follows

1) Viewing angle is within +-30° from vertical direction, as fig 1

2) Viewing angle is the angle defined in the drawing

3) Ambient temperature is approximately 25+-5° C

4) Ambient luminance is about 300~500 Lux.

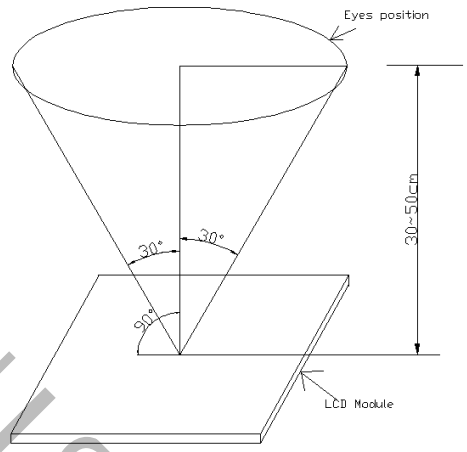
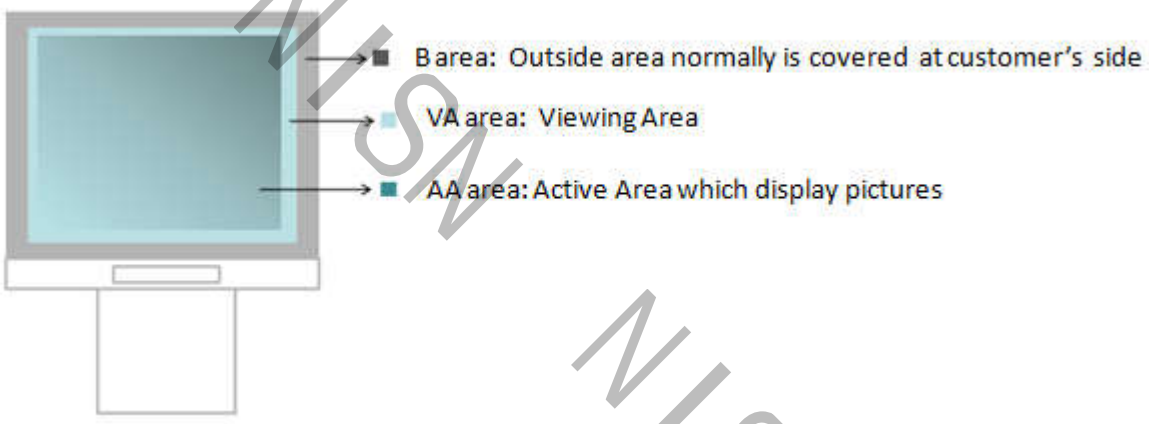
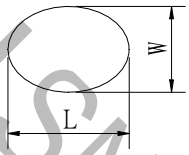


fig1

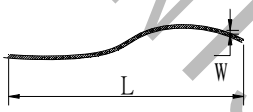
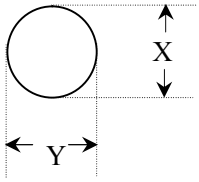
8.2 Panel area definition



8.3 Routine inspection standards

<table>
<tr><td>项目</td><td>不良定义</td><td>不良现象</td><td colspan="3">判定标准</td><td>检验方法</td><td></td></tr>
<tr><td>11.3.1</td><td>外观尺寸</td><td>与图纸尺寸不相符</td><td colspan="3">NG</td><td>卡尺</td><td></td></tr>
<tr><td rowspan="4">11.3.2</td><td rowspan="4">功能</td><td>显示少线</td><td colspan="3">NG</td><td>目视</td><td></td></tr>
<tr><td>无显示</td><td colspan="3">NG</td><td>目视</td><td></td></tr>
<tr><td>显示异常</td><td colspan="3">NG</td><td>目视</td><td>主</td></tr>
<tr><td>TP 功能不良，无触摸</td><td colspan="3">NG</td><td>目视/用手触摸</td><td>主</td></tr>
<tr><td rowspan="7">11.3.3</td><td rowspan="7">点亮产品可见及在LCD或T/P上有擦拭不掉的点状物</td><td rowspan="7">偏光片刺伤、脏点、圆形物、黑点
 

Φ=(L+W)/2</td><td colspan="3">LCM/总成 0.95 寸—2.4 寸</td><td rowspan="7">目 视
(用菲淋卡比对)</td><td rowspan="7">次</td></tr>
<tr><td>Φ≦0.10mm</td><td></td><td>1、距产品30mm 目视不见忽略。
2、5mm 间距内只允许 3 个点。
3、显示区只允许 10 个点，超过以上第 2 第 3 项则 NG 。</td></tr>
<tr><td>0.10mm＜Φ≦0.15mm</td><td></td><td>1</td></tr>
<tr><td>Φ＞0.15mm</td><td></td><td>NG</td></tr>
<tr><td colspan="3">0.15mm＜Φ≦0.2mm 按照 A-品入库</td></tr>
<tr><td colspan="3">LCM/总成＞2.4 寸——6.0 寸</td></tr>
<tr><td>Φ≦0.10mm</td><td></td><td>1、10mm 间距内只允许 3 个
2、显示区只允许 10 个点，超过以上任意一项则 NG</td></tr>
<tr><td>0.1mm＜Φ≦0.15mm</td><td></td><td>4（TP、屏各允许 2 个）</td></tr>
<tr><td>0.15mm＜Φ≦0.2mm</td><td></td><td>2（TP、屏各允许 1 个）</td></tr>
</table>

<table>
<tr><td></td><td></td><td></td><td>Φ>0.2mm</td><td></td><td>NG</td><td></td><td></td></tr>
<tr><td>11.3.4</td><td>点亮产品可见及在LCD或T/P上有擦拭不掉的线状物/刮伤</td><td> 
</td><td colspan="3">LCM/总成0.95寸——6.0寸
<table><tr><td colspan="2"></td><td rowspan="2">允许个数</td></tr><tr><td>长(L)</td><td>宽(W)</td></tr><tr><td>≦1mm</td><td>≦0.03mm</td><td>2</td></tr><tr><td>≦2mm</td><td>0.03<W≦0.05mm</td><td>1</td></tr><tr><td>>2mm</td><td>>0.05mm</td><td>NG</td></tr></table>两条线毛之间必须距离5mm以上（0.95寸—3.0寸）.
两条线毛之间必须距离10mm以上（3.1寸—6.0寸）.</td><td>目视(用菲淋卡比对)</td><td>次</td></tr>
<tr><td>11.3.5</td><td>偏光片气泡</td><td>Φ=（X+Y）/2
 
</td><td colspan="3"><table><tr><td>尺寸</td><td>允许个数</td></tr><tr><td>1、Φ≦0.1mm
2、不超过边框1/3</td><td>不计（密集不可）</td></tr><tr><td>0.10<Φ≦0.2mm</td><td>1</td></tr><tr><td>Φ>0.2mm</td><td>NG</td></tr><tr><td>0.2<Φ≦1.5mm,（边框以外）</td><td>3</td></tr></table>0.95寸-2.4寸气泡间距大于5mm以上
>2.4寸-6.0寸气泡间距大于10mm以上</td><td>在日光台灯下撕起保护膜,距待测物30cm目视</td><td>次</td></tr>
<tr><td>11.3.6</td><td>T/P及偏光片凹凸点</td><td>T/P：LCD偏光片上有凹凸点</td><td colspan="3">可视区有水纹（擦拭不掉）拒收
未进入可视区允收,客户装机后不见允收</td><td>在同一视角下用样品比对</td><td>次</td></tr>
<tr><td>11.3.7</td><td><u>Mura</u></td><td>边框四周或任一侧的色差、较画面深、区域云状不均、固定位置之图形凹陷状、封口部分较画面深的半圆形、一圈圈均匀的色差、线状mura、黑画面可见因spacer聚集产生的mura、均匀的实斜线、区域性斜线、Driver IC与TFT匹配问题等原因的mura</td><td colspan="3">1.判定示画面为128灰阶画面，用ND filter盖住mura位置进行判定。
2、ND1.3（ND5%可遮盖不见）
3、双方若有签 限度样品，优先限度样品。</td><td>ND filter,128灰阶画面</td><td>次</td></tr>
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