Surenoo SRG0430C RGB Series Display User Manual

Contents

Surenoo SRG0430C RGB Series Display

Product Information

- Manufacturer: SHENZHEN SURENOO TECHNOLOGY CO.,LTD.
- Product Name: SRG0430C RGB Series Display
- Model Number: SRG0430C-480800-CTP
- LCD Display Size (Diagonal): 4.3 inch
- Module Structure: LCD Display + CTP Touch + PCB
- LCD Display Type: TFT
- Recommended Viewing Direction: 6 o’clock
- Number of Pixels (Resolution): 480(RGB)X800 pixels
- Color Pixel Arrangement: RGB Stripe
- Module Interface Type:
- LCD 16-bit RGB interface
- CTP I2C interface
- Module Input Voltage: 5.0V
- Color Numbers: 16.7M
- Backlight Type: White LED
- Operating Temperature: -20°C to 70°C
- Storage Temperature: -30°C to 80°C

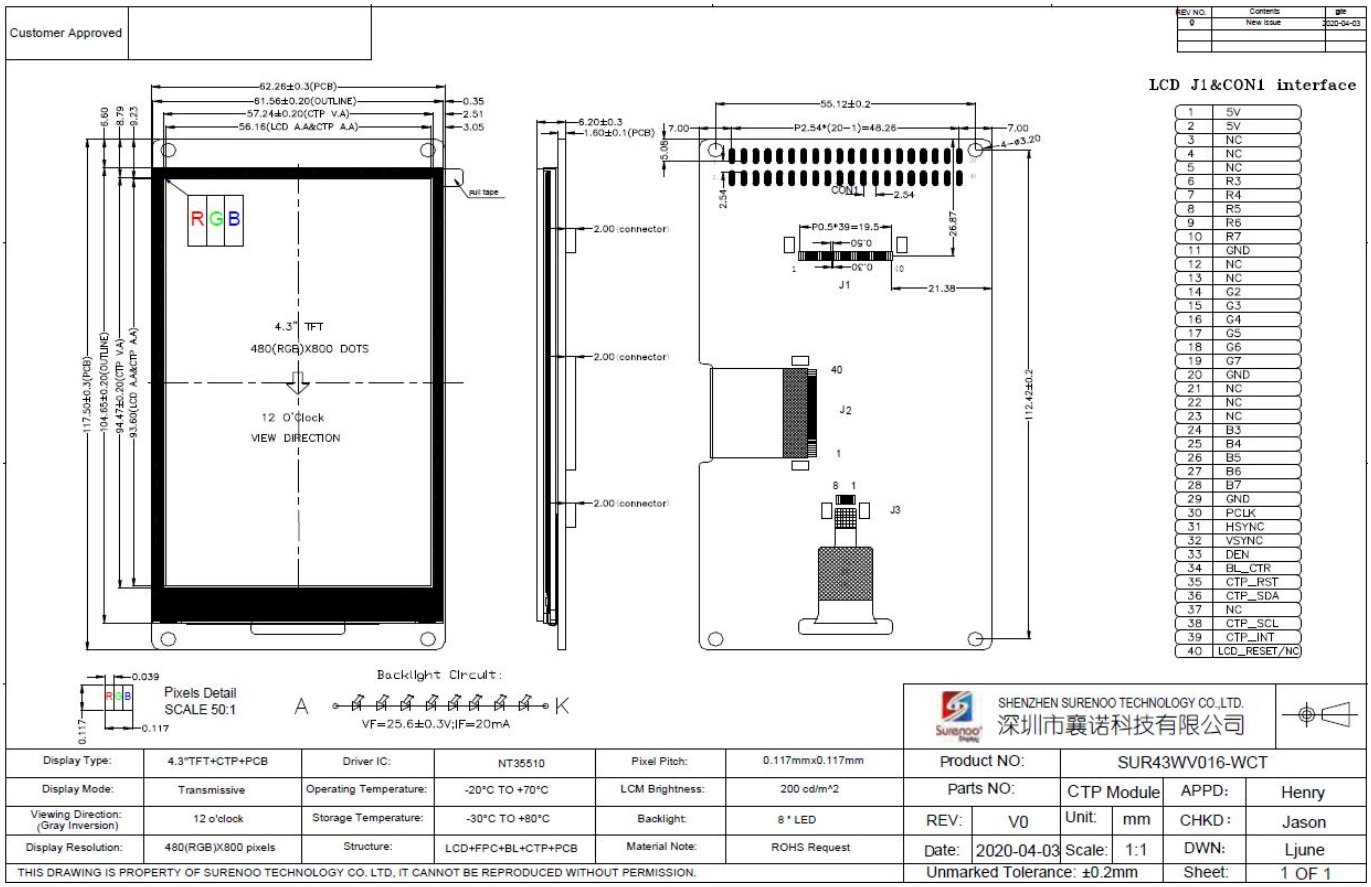
Product Usage Instructions

1. Ensure the operating voltage of the PCB is within the range of 5.0V.
2. Connect the LCD module to the PCB using the 16-bit RGB interface.
3. Connect the CTP touch to the PCB using the I2C interface.
4. Apply power to the module.
5. The display will show a resolution of 480(RGB)X800 pixels in RGB stripe format.
6. The recommended viewing direction is 6 o'clock.
7. The backlight is a white LED.
8. The operating temperature range is -20°C to 70°C.
9. The storage temperature range is -30°C to 80°C.

GENERAL INFORMATION

Item of general information	**Contents**		**Unit**
LCD Display Size (Diagonal)	4.3		inch
Module Structure	LCD Display + CTP Touch + PCB		–
LCD Display Type	TFT		–
LCD Display Mode	Normally White		–
Recommended Viewing Direction	6		o'clock
Gray inversion Direction	12		o'clock
Module size (W×H×T)	62.26×117.5×6.2		mm
Active area (W×H)	56.16×93.6		mm
Number of pixels (Resolution)	480RGB×800		pixel
Pixel pitch (W×H)	0.117×0.117		mm
Color Pixel Arrangement	RGB Stripe		–
LCD Driver IC	–		–
Module Interface Type	LCD	16-bit RGB interface	–
	CTP	I2C interface	–
Module Input voltage	5.0V		V
Module Power Consumption	–		mW
Color Numbers	16.7M		–
Backlight Type	White LED		–

EXTERNAL DIMENSIONS



ABSOLUTE MAXIMUM RATINGS

Parameter of absolute maximum ratings	***Symbol***	***Min***	***Max***	***Unit***
Operating temperature	*Top*	*-20*	*70*	*℃*
Storage temperature	*Tst*	*-30*	*80*	*℃*
Humidity	*RH*	*–*	*90%(Max 60℃)*	*RH*

Note: Absolute maximum ratings means the product can withstand short-term, not more than 120 hours. If the product is a long time to withstand these conditions, the life time would be shorter.

ELECTRICAL CHARACTERISTICS(DC CHARACTERISTICS)

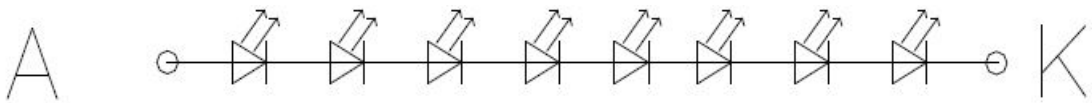
Parameter of DC characteristics	***Symbol***	***Min.***	***Typ.***	***Max.***	***Unit***
PCB operating voltage	*VCC5V*	*–*	*5.0*	*–*	*V*
LCD I/O operating voltage	*VDD*	*2.7*	*3.3*	*3.6*	*V*
Input voltage 'H' level	*VIH*	*0.7*VDD*	*–*	*VDD*	*V*
Input voltage 'L' level	*VIL*	*VSS*	*–*	*0.3*VDD*	*V*
Output voltage 'H' level	*VOH*	*VDD-0.4*	*–*	*VDD*	*V*
Output voltage 'L' level	*VOL*	*VSS*	*–*	*VSS+0.4*	*V*

BACKLIGHT CHARACTERISTICS

Item of backlight characteristics	***Symbol***	***Min.***	***Typ.***	***Max.***	***Unit***	***Remark***
Forward Voltage	*Vf*	*22.4*	*25.6*	*26.4*	*V*	*Note1*
Forward Current	*If*	*–*	*20*	*–*	*mA*	*–*
Number of LED	*–*	*–*	*8*	*–*	*Piece*	*–*
LED Connection mode	*S/P*	*–*	*Serial*	*–*	*–*	*–*

Note:

- Note1: The LED Supply Voltage is defined by the number of LED at Ta=25℃ and If=20mA.
- Backlight control via the BL_CTR pin or PWM signal.
- Backlight circuit:



CTP CHARACTERISTICS

Item of CTP characteristics	***Specification***	***Unit***	***Remark***
Panel Type	*Glass Cover + Glass Sensor*	*–*	*–*
Resolution	*480× 800*	*pixel*	*–*
Surface Hardness	*6H*	*–*	*–*
Transparency	*≥82%*	*–*	*–*
Driver IC	*–*	*–*	*–*
Interface Type	*I2C*	*–*	*–*
Support Points	*5*	*–*	*–*
Sampling Rate	*20~100*	*Hz*	*–*
Supply voltage	*3.3*	*V*	*–*

ELECTRO-OPTICAL CHARACTERISTICS

Item of electro-optical characteristics		*Symbol*	*Condition*	*Min.*	*Typ.*	*Max.*	*Unit*	*Remark*	*Note*
Response time		*Tr+Tf*	*θ=0 =0 Ta=25℃*	*–*	*30*	*40*	*ms*	*FIG 1.*	*4*
Contrast Ratio		*CR*		*–*	*500*	*–*	*–*	*FIG 2.*	*1*
Luminance uniformity		*WHITE*		*–*	*80*	*–*	*%*	*FIG 2.*	*3*
Surface Luminance		*Lv*		*–*	*250*	*–*	*cd/m2*	*FIG 2.*	*2*
CIE (x, y) chromaticity	*White*	*White x*	*θ=0 =0 Ta=25℃*	*0.266*	*0.296*	*0.326*	*–*	*FIG 2.*	*5*
		White y		*0.295*	*0.325*	*0.355*			
	Red	*Red x*		*0.617*	*0.647*	*0.677*			
		Red y		*0.299*	*0.329*	*0.359*			
	Green	*Green x*		*0.247*	*0.277*	*0.307*			
		Green y		*0.519*	*0.549*	*0.579*			
	Blue	*Blue x*		*0.104*	*0.134*	*0.164*			
		Blue y		*0.093*	*0.123*	*0.152*			
Viewing angle range	*=90(12 o'clock)*		*CR 10*	*60*	*70*	*–*	*deg*	*FIG 3.*	*6*
	=270(6 o'clock)			*60*	*70*	*–*	*deg*		
	=0(3 o'clock)			*60*	*70*	*–*	*deg*		
	=180(9 o'clock)			*40*	*60*	*–*	*deg*		
NTSC ratio	*–*		*–*	*–*	*50*	*–*	*%*	*–*	*–*

Note

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

$$\text{Contrast Ratio(CR)} = \frac{\text{Average Surface Luminance with all white pixels(P1,P2,P3,P4,P5,P6,P7,P8,P9)}}{\text{Average Surface Luminance with all black pixels(P1,P2,P3,P4,P5,P6,P7,P8,P9)}}$$

2. Surface luminance is the LCD surface from the surface with all pixels displaying white. For more information see FIG 2.
   Lv=Average Surface Luminance with all white pixels (P1,P2,P3,P4,P5,P6,P7,P8,P9)
3. The uniformity in surface luminance WHITE is determined by measuring luminance at each test position 1 through 9, and then dividing the maximum luminance of 9points luminance by minimum luminance of 9 points luminance. For more information see FIG 2.

FIG 2.

$$\delta\text{WHITE} = \frac{Minimum\ Surface\ Luminance\ with\ all\ white\ pixels\ (P1,P2,P3,P4,P5,P6,P7,P8,P9)}{Maximum\ Surface\ Luminance\ with\ all\ white\ pixels\ (P1,P2,P3,P4,P5,P6,P7,P8,P9)}$$

4. 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.
5. CIE (x, y) chromaticity ,The x,y value is determined by screen active area position 5.
   For more information see FIG 2.
6. Viewing angle is the angle at which the contrast ratio is greater than a specific value.
   For TFT module, the specific value of contrast ratio is 10.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.
7. 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 BM-7 photo detector.
8. For TN type TFT transmissive module, Gray scale reverse occurs in the direction of panel viewing angle.

FIG.1. The definition of Response Time

FIG.2. Measuring method for Contrast ratio, surface luminance, Luminance uniformity,CIE (x , y) chromaticity
A : H/6 ;
B : V/6 ;
H,V : Active Area(AA) size
Measurement instrument: BM-7; Light spot size=5mm, 350mm distance from the LCD surface to detector lens.

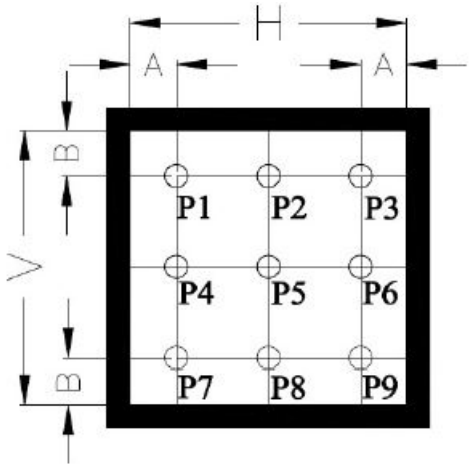
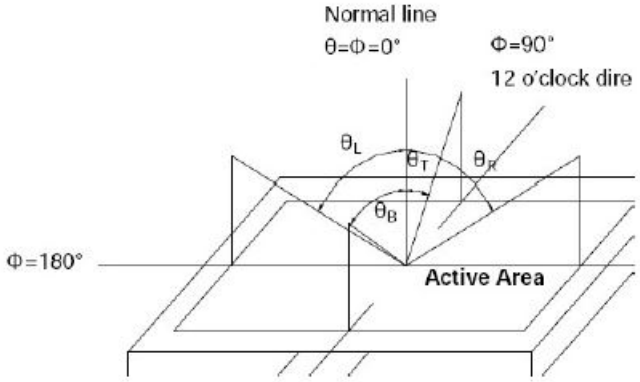


FIG.3. The definition of viewing angle

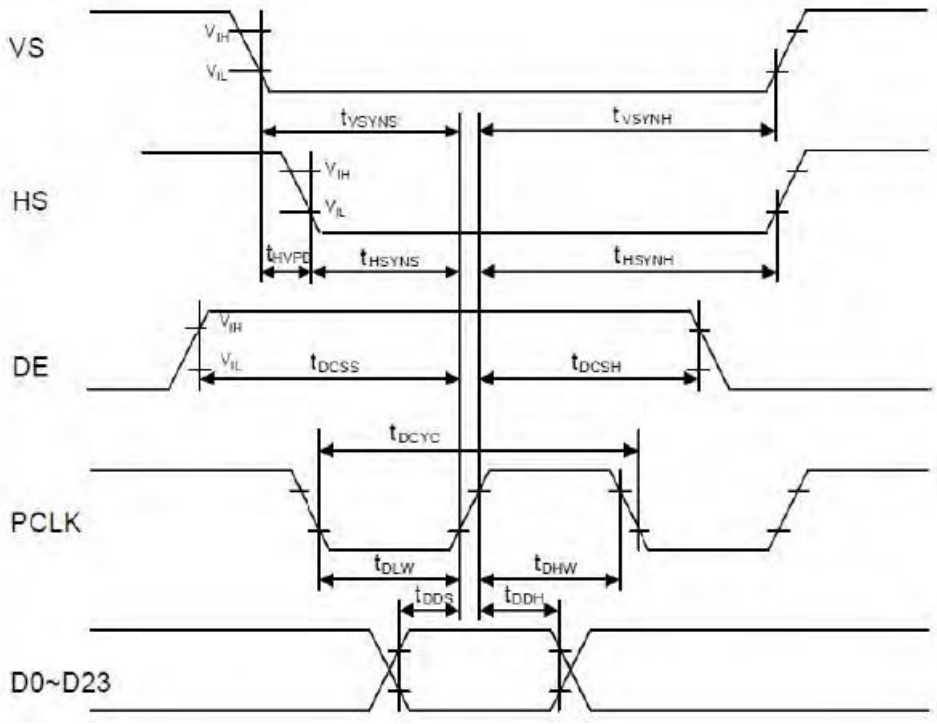


INTERFACE DESCRIPTION

This RGB Display Support 16-Bit or 18-Bit RGB Interface only.
8.1: 16-Bit RGB Interface: R0, R1, R2, G0, G1, B0, B1, B2 Signal connect to GND or VDD.
8.2: 18-Bit RGB Interface: R0, R1, G0, G1, B0, B1 Signal connect to GND or VDD.

NO.	Symbol	I/O	DESCRIPTION
1~2	VCC5V	Power supply	Module Power supply (5V Typ.)
3~10	R0~R7	I	8bit digital Red data input(R0:LSB; R7:MSB)
11	GND	Power supply	Power ground
12~19	G0~G7	I	8bit digital Green data input(G0:LSB; G7:MSB)
20	GND	Power supply	Power ground
21~28	B0~B7	I	8bit digital Blue data input(B0:LSB; B7:MSB)
29	GND	Power supply	Power ground
30	DCLK	I	Clock signal.
31	HSYNC	I	Horizontal Sync input.
32	VSYNC	I	Vertical Sync input.
33	DEN	I	Data input Enable.
34	BL_CTR	I	Backlight control pin
35	CTP_RST	I	CTP external reset signal, Low is active
36	CTP_SDA	I/O	CTP I2C data input and output
37	NC	–	No connection
38	CTP_SCL	I	CTP I2C clock input
39	CTP_INT	I	CTP External interrupt to the host
40	NC	–	No connection

INPUT TIMING



Parallel RGB input Timing table

Signal	Symbol	Parameter	MIN	TYP	MAX	Unit	Description
VS	t_{VSYNS}	VSYNC setup time	10	-	-	ns	
	t_{VSYNH}	VSYNC hold time	10	-	-	ns	
HS	t_{HSYNS}	HSYNC setup time	10	-	-	ns	
	t_{SCYCR}	HSYNC hold time	10	-	-	ns	
	t_{HVPD}	HSYNC to VSYNC falling edge	400	-	-	ns	
PCLK	t_{DCYC}	PCLK cycle time	33	-	125	ns	
	t_{DLW}	PCLK "L" pulse width	11	-	-	ns	
	t_{DHW}	PCLK "H" pulse width	11	-	-	ns	
	f_{DFREQ}	PCLK frequency	8	-	30	MHz	
DE	t_{DCSS}	DE setup time	10	-	-	ns	
	t_{DCSH}	DE hold Time	10	-	-	ns	
D0~D23	t_{DDS}	RGB Data setup time	10	-	-	ns	
	t_{DDH}	RGB Data hold time	10	-	-	ns	

RELIABILITY TEST CONDITIONS

No.	***Test Item***	***Test Condition***
1	*High Temperature Storage*	*80°C/120 hours*
2	*Low Temperature Storage*	*-30°C/120 hours*
3	*High Temperature Operating*	*70°C/120 hours*
4	*Low Temperature Operating*	*-20°C/120 hours*
5	*Temperature Cycle Storage*	*-20°C(30min.)~25(5min.)~70°C(30min.)×10cycles*

A Inspection after test:

Inspection after 2~4 hours storage at room temperature, the sample shall be free from defects:

Ø Air bubble in the LCD;

Ø Sealleak;

Ø Non-display;

Ø Missing segments;

Ø Glass crack;

Ø Current is twice higher than initial value.

B Remark:

Ø The test samples should be applied to only one test item.

Ø Sample size for each test item is 5~10pcs.

Ø Failure Judgment Criterion: Basic Specification, Electrical Characteristic, Mechanical Characteristic, Optical Characteristic.

A Inspection after test:
Inspection after 2~4 hours storage at room temperature, the sample shall be free from defects:

- Air bubble in the LCD;
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- Non-display;
- Missing segments;
- Glass crack;
- Current is twice higher than initial value.

B Remark:

- The test samples should be applied to only one test item.
- Sample size for each test item is 5~10pcs.
- Failure Judgment Criterion: Basic Specification, Electrical Characteristic, Mechanical Characteristic, Optical

Characteristic.

INSPECTION CRITERION

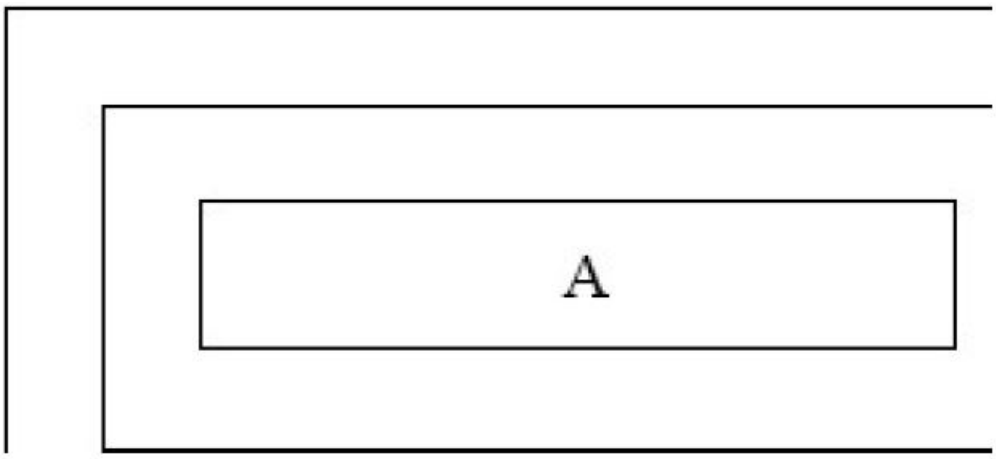
This specification is made to be used as the standard of acceptance/rejection criteria for TFT-LCD/IPS TFT-LCD module product, and this specification is applicable only in the case that the size of module equal to or exceed than 3.5 inch.

Sample plan
Sampling plan according to GB/T2828.1-2003/ISO 2859-1 1999 and ANSI/ASQC Z1.4-1993,normal level 2 and based on:

Major defect: AQL 0.65
Minor defect: AQL 1.5

Inspection condition
Viewing distance for cosmetic inspection is about 30cm with bare eyes, and under an environment of 20~40W light intensity, all directions for inspecting the sample should be within 45°against perpendicular line. (Normal temperature 20~25℃and normal humidity 60 ±15%RH)

Definition of Inspection Item
A Definition of inspection zone in LCD.



- **Zone A:** character/Digit area
- **Zone B:** viewing area except Zone A (Zone A + Zone B=minimum Viewing area)
- **Zone C:** Outside viewing area (invisible area after assembly in customer's product)

Fig.1 Inspection zones in an LCD

Note: As a general rule, visual defects in Zone C are permissible, when it is no trouble for quality and assembly of customer's product.

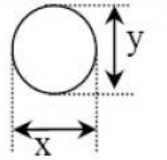
B Definition of some visual defect

Bright dot	*Because of losing all or part function, bad pixel dots appear bright and the size is more than 5 0% of one dot in which LCD panel is displaying under* *black pattern.*
Dark dot	*Dots appear dark and unchanged in size in which LCD panel is displaying* *under pure red, green, blue picture, or pure whiter picture.*

Major Defect

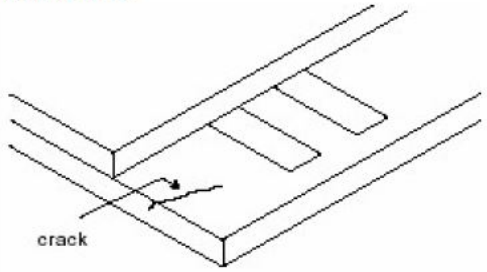
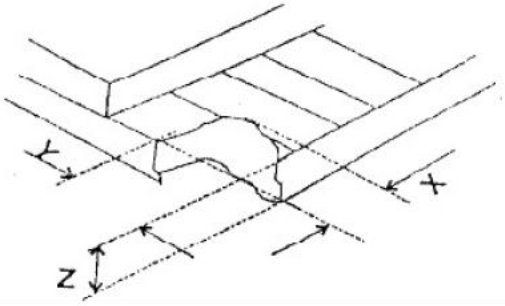
Item No.	***Items to be inspected***	***Inspection standard***	***Classification of defects***
1	*Functional defects*	*1) No display* *2) Display abnormally* *3) Missing vertical, horizontal segment* *4) Short circuit* *5) Excess power consumption* *6)Backlight no lighting, flickering and abnormal lighting*	*major*
2	*Missing*	*Missing component*	
3	*Outline dimension*	*Overall outline dimension beyond the drawing is not allo wed*	

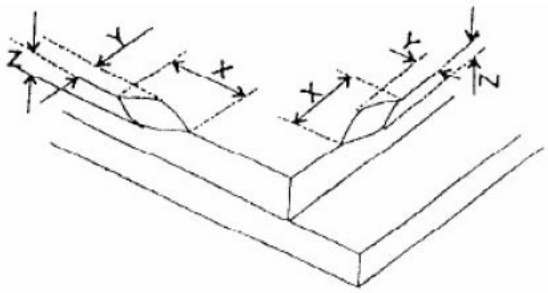
Minor Defect

<table>
<tr><th>Item No.</th><th>Items to be inspected</th><th>Inspection standard</th><th>Classification of defects</th></tr>
<tr><td>1</td><td>Bright dot /dark dot defect</td><td>
<table>
<tr><td rowspan="2">Zone</td><td colspan="3">Acceptable Qty</td></tr>
<tr><td colspan="3">A+B</td><td rowspan="2">C</td></tr>
<tr><td>3.5” ~ 7”</td><td>7~10.1”</td><td>>10.1”</td></tr>
<tr><td>Bright pixel dot</td><td>1</td><td>2</td><td>3</td><td rowspan="5">Acceptable</td></tr>
<tr><td>Dark pixel dot</td><td>4</td><td>4</td><td>4</td></tr>
<tr><td>2bright dots adjacent</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td>2dark dots adjacent</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td>Total bright and dark dots</td><td>5</td><td>6</td><td>7</td></tr>
</table>
Note: Minimum distance between defective dots is more than 5mm; Pixel dots' function is normal, but bright dots caused by foreign material and other reasons are judged by the dot defect of 5.2.
</td><td>Minor</td></tr>
<tr><td>2</td><td>Dot defect
 

Φ=(x+y) /2</td><td>
<table>
<tr><td rowspan="2">Zone
Size(mm)</td><td colspan="3">Acceptable Qty</td></tr>
<tr><td colspan="3">A+B</td><td rowspan="2">C</td></tr>
<tr><td>3.5”~7”</td><td>7~10.1”</td><td>>10.1”</td></tr>
<tr><td>Φ≤0.2</td><td>Acceptable</td><td>Acceptable</td><td>Acceptable</td><td rowspan="3">Acceptable</td></tr>
<tr><td>0.2<Φ≤0.5</td><td>4</td><td>5</td><td>6</td></tr>
<tr><td>Φ>0.5</td><td>0</td><td>0</td><td>0</td></tr>
</table>
Note:
1. Minimum distance between defective dots is more than 5 mm;
2. The quantity of defect is zero in operating condition.
</td><td>Minor</td></tr>
<tr><td>3</td><td>Linear defect</td><td>
<table>
<tr><td colspan="2" rowspan="2">Zone
Size (mm)</td><td colspan="3">Acceptable Qty</td></tr>
<tr><td colspan="3">A+B</td><td rowspan="2">C</td></tr>
<tr><td>Length</td><td>Width</td><td>3.5”~7”</td><td>7~10.1”</td><td>>10.1”</td></tr>
<tr><td>Ignore</td><td>W≤0.05</td><td>Acceptable</td><td>Acceptable</td><td>Acceptable</td><td rowspan="3">Acceptable</td></tr>
<tr><td>L≤5.0</td><td>0.05< W≤0.1</td><td>4</td><td>5</td><td>6</td></tr>
<tr><td>L>5.0</td><td>W>0.1</td><td>0</td><td>0</td><td>0</td></tr>
</table>
</td><td>Minor</td></tr>
</table>

<table>
<tr>
<td>4</td>
<td>Polarizer defect</td>
<td>
5.4.1 Polarizer Position
(i) Shifting in position should not exceed the glass outline dimension.
(ii) Incomplete covering of the viewing area due to shifting is not allowed.
5.4.2 Dirt on polarizer
Dirt which can be wiped easily should be acceptable.
5.4.3 Polarizer Dent & Air bubble
<table>
<tr><td rowspan="2">Zone
Size(mm)</td><td colspan="3">Acceptable Qty</td></tr>
<tr><td colspan="3">A+B</td><td>C</td></tr>
<tr><td>3.5”~7”</td><td>7~10.1”</td><td>>10.1”</td><td rowspan="4">Acceptable</td></tr>
<tr><td>Φ≤0.2</td><td>Acceptable</td><td>Acceptable</td><td>Acceptable</td></tr>
<tr><td>0.2＜Φ≤0.5</td><td>4</td><td>5</td><td>6</td></tr>
<tr><td>Φ＞0.5</td><td>0</td><td>0</td><td>0</td></tr>
</table>
5.4.4 Polarizer scratch
(i) If the polarizer scratch can be seen after cover assembling or in the operating condition, judge by the linear defect of 5.3.
(ii)If the polarizer scratch can be seen only in non-operating condition or some special angle, judge by the following:
<table>
<tr><td colspan="2" rowspan="2">Zone
Size (mm)</td><td colspan="3">Acceptable Qty</td></tr>
<tr><td colspan="3">A+B</td><td>C</td></tr>
<tr><td>Length</td><td>Width</td><td>3.5”~7”</td><td>7~10.1”</td><td>>10.1”</td><td rowspan="4">Acceptable</td></tr>
<tr><td>Ignore</td><td>W≤0.05</td><td>Acceptable</td><td>Acceptable</td><td>Acceptable</td></tr>
<tr><td>1.0＜L≤5.0</td><td>0.05＜W≤0.20</td><td>4</td><td>5</td><td>6</td></tr>
<tr><td>L＞5.0</td><td>W＞0.2</td><td>0</td><td>0</td><td>0</td></tr>
</table>
</td>
<td>Minor</td>
</tr>
<tr>
<td>5</td>
<td>MURA</td>
<td>Using 3% ND filter, it’s NG if it can be seen in R,G,B picture.</td>
<td>Minor</td>
</tr>
<tr>
<td></td>
<td>White/Black dot（MURA）</td>
<td>Visible under：ND3%：D≦0.15mm, Acceptable；
0.15mm＜D≦0.5mm, N≦4；D＞0.5mm, Not allowable.</td>
<td></td>
</tr>
</table>

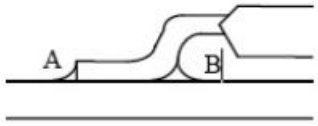
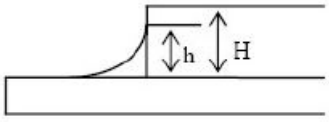
<table>
<tr><td rowspan="3">6</td><td rowspan="3">Glass defect</td><td>(i) Crack
Cracks are not allowed.
 
</td><td>Minor</td></tr>
<tr><td>(ii) TFT chips on corner
 

<table><tr><td>X</td><td>Y</td><td>Z</td><td>Acceptable</td></tr><tr><td>≤3.0</td><td>≤3.0</td><td>Not more than the thickness of glass</td><td>N≤3</td></tr></table>Chips on the corner of terminal shall not be allowed to extend into the ITO pad or expose perimeter seal.</td><td>Minor</td></tr>
<tr><td>(iii) Usual surface crack
 

<table><tr><td>X</td><td>Y</td><td>Z</td><td>Acceptable</td></tr><tr><td>≤1.5</td><td>≤1.5</td><td>Not more than the thickness of glass</td><td>N≤4</td></tr></table>It is only applicable to the upper glass of LCD.</td><td>Minor</td></tr>
</table>

Module Cosmetic Criteria

Item No.	***Items to be inspected***	***Inspection Standard***	***Classification of defects***
1	*Difference in Spec.*	*Not allowable*	*Major*
2	*Pattern peeling*	*No substrate pattern peeling and floating*	*Major*
3	*Soldering defects*	*No soldering missing*	*Major*
		No soldering bridge	*Major*

		No cold soldering	*Minor*
4	*Resist flaw on PCB*	*Visible copper foil (Φ0.5 mm or more) on substrate pattern is not allowed*	*Minor*
5	*FPC gold finger*	*No dirt, breaking, oxidation lead to black*	*Major*
6	*Backlight plastic frame*	*No deformation, crack, breaking, backlight positioning column breaking, obvious nick.*	*Minor*
7	*Marking printing effect*	*No dark marking, incomplete, deformation lead to unable to judge*	*Minor*
8	*Accretion of metallic Foreign matter*	*No accretion of metallic foreign matter (Not exceed Φ0.2 mm)*	*Minor*
9	*Stain*	*No stain to spoil cosmetic badly*	*Minor*
10	*Plate discoloring*	*No plate fading, rusting and discoloring*	*Minor*
11	*1. Lead parts*	*a. Soldering side of PCB Solder to form a 'Filet' all around the lead. Solder should not hide the lead form perfectly.*	*Minor*
		b. Components side(In case of 'Through Hole PCB') Solder to reach the Components side of PCB.	*Minor*
	2. Flat packages	*Either 'Toe'(A) or 'Seal'(B)of the lead to be covered by "Filet". Lead form to be assume over Solder.* 	*Minor*
	3. Chips	*(3/2) H ≥h ≥(1/2) H* 	*Minor*
	4. Solder ball/Solder splash	*a. The spacing between solder ball and the conductor or solder pad h ≥0.13 mm. The diameter of solder ball d≤0.15 mm.*	*Minor*
		b. The quantity of solder balls or solder splashes isn't beyond 5 in 600 mm2.	*Minor*

		c. Solder balls/Solder splashes do not violate minimum el ectrical clearance.	*Major*

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Documents / Resources

	Surenoo SRG0430C RGB Series Display [pdf] User Manual SRG0430C RGB Series Display, SRG0430C, RGB Series Display, Series Display, Display

References

- Surenoo Tech: Professional LCD Module Supplier Since 2005