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Surenoo SMC0430A-800480 Series MCU Interface TFT LCD Module User Manual

Contents

Surenoo SMC0430A-800480 Series MCU Interface TFT LCD Module

Model No.

1. SMC0430A-480272-RTP/CTP
2. SMC0430A-800480-RTP/CTP (IPS)
3. SMC0500A-800480-RTP/CTP
4. SMC0700A-800480-RTP/CTP

Product Parameters

Model No.	Model Size	Resolution	Display Type	PCB Size	Active Area
SMC0430A-480272	**4.3"**	**480*272**	**TN**	**120.00*74.00**	**95.04*53.86**
SMC0430A-800480	**4.3"**	**800*480**	**IPS**	**120.00*74.00**	**95.04*53.86**
SMC0500A-800480	**5.0"**	**800*480**	**TN**	**133.50*84.00**	**108.00*64.80**
SMC0700A-800480	**7.0"**	**800*480**	**TN**	**181.00*108.00**	**154.08*85.92**
Display Color	RGB 65K color				
Controller	**SSD1963**				
Module Interface	16Bit Parallel Interface				
Operating Temperature	-10℃~60℃				
Storage Temperature	-20℃~70℃				
Operating Voltage	4.3": 2.8-3.3V	5.0": 2.8-3.3V		7.0": 5.0V	
IO Voltage	3.3V				

Interface Description

Interface for SMC0430A SSD1963 MCU Parallel TFT LCD Module

Interface for SMC0500A SSD1963 MCU Parallel TFT LCD Module

Interface for SMC0700A SSD1963 MCU Parallel TFT LCD Module

Notice:
A. "T_" are related pins of the resistive touch screen;
B. "SD_" are related pins of SD card;
C. "F_" are related pins of SPI FLASH;
D. "NC_" is the related pin of the capacitive touch screen;
E. The rest are related pins of the LCD screen;
F. SPI FLASH is not soldered, please solder it yourself if you need it.

No.	Pin ICON	Pin Description
1	GND	Module Power Ground Pin
2	3.3V/EX_3.3V	SMC0430A/SMC0500A: 3.3V; SMC0700A: NC / 3.3V.
3	NC	Undefined, reserved
4	RS	LCD register / data selection control pin (high level: register, low level: data)
5	WR	LCD write control pin
6	RD	LCD read control pin
7-14	DB8-DB15	LCD data bus high 8-bit pin
15	CS	LCD reset control pin (low level enable)
16	F_CS	SPI FLASH chip selection pin (low level enable
17	REST	LCD reset control pin (low level reset)
18	NC/5.0V	SMC0430A/SMC0500A: NC; SMC0700A: 5.0V.
19	LED_A	LED Backlight control Pin (If you need it, can connect it)
20	NC/INT	RTP: Undefined, reserved / CTP: Interrupt detection pin
21~28	DB0~DB7	LCD data bus low 8-bit pin
29	T_CLK	RTP: Touch Panel SPI bus clock control pin
30	T_CS	RTP: Touch screen IC chip select control pin (Low level enable)
31	T_DIN	RTP: Touch Panel SPI bus write data pin
32	NC/CRT	RTP: Undefined, reserved /CTP: Reset control pin (low level reset)
33	T_DO	RTP: Touch Panel SPI bus read data pin
34	T_IRQ	RTP: Interrupt detection pin (Low level enable)
35	SD_DO	SD: SDIO bus read data pin
36	SD_CLK	SD: SDIO bus clock control pin
37	SD_DIN	SD: SDIO bus write data pin
38	SD_CS	SD: SD chip select control pin (Low level enable)
39	NC/SDA	RTP: Undefined, reserved / CTP: IIC bus data control Pin
40	NC/SCL	RTP: Undefined, reserved / CTP: IIC bus clock control Pin

Program wiring instructions

LCD Pin (RTP)	SMC0430A/SMC0500A		SMC0700A	
	STM32F103RCT6	STM32F407VET6	STM32F103RCT6	STM32F407VET6
3.3V/5.0V	3.3V	3.3V	5.0V	5.0V
GND	GND	GND	GND	GND
DB0-DB1	PB0~PB15	PD14-PD15	PB0~PB15	PD14-PD15
DB2-DB3		PD0- PD1		PD0- PD1
DB4-DB12		PE7- PE15		PE7- PE15
DB13-DB15		PD8- PD10		PD8- PD10
WR	PC7	PD5	PC7	PD5
RD	PC6	PD4	PC6	PD4
RS	PC8	PD11	PC8	PD11
REST	PC4		PC4	
CS	PC9	PD7	PC9	PD7
LED_A	PC10	PB15	PC10	PB15
T_IRQ	PC1	PB1	PC1	PB1
T_DIN	PC3	PB2	PC3	PB2
T_DO	PC2	PC4	PC2	PC4
T_CS	PC13	PC13	PC13	PC13
T_CLK	PC0	PB0	PC0	PB0

Note:

Power Supply of Display
SMC0430A/SMC0500A: The 3.3V power supply must be connected to 2.8V~3.3V, and 5.0V cannot be connected;
SMC0700A: The power supply must be connected to 5.0V, otherwise the backlight will not light;

There are three ways to control the backlight: always on, SSD1963 PWM control brightness, and pin control. By default, pin control is used. Only need to input a high level on the LED_A pin to enable the backlight drive circuit, light the backlight, and input a low level to turn off the backlight. By inputting a PWM signal, the backlight brightness can be adjusted.

Since the power consumption of the product is 200-400mA when the backlight is the brightest, be sure to use a stable power supply and a qualified power supply line.

Outline Drawing

Diagram of LCD Module

Part B: SPEC for TFT LCD Panel

General Specifications

043JGI50 is a TFT-LCD module. It is composed of a TFT- LCD panel, driver IC, FPC, a back light unit. The 4.3 ″display area contains 800 x 480 pixels and can display up to 16.7M colors. This product accords with RoHS environmental criterion.

Item	Contents	Unit	Note
LCD Type	Normally Black,Transmissive	–	
Display color	16.7M		1
Viewing Direction	ALL	O'Clock	
Operating temperature	-20~+70	°C	
Storage temperature	-30~+80	**°C**	
Modulesize	105.50(W)×67.20(H)×3.00(T)	mm	
ActiveArea	95.04(W)×53.858(H)	mm	
Number of Dots	800×RGB×480	dots	
Backlight	10-LED		
Data Transfer	RGB interface	–	

1. Color tune is slightly changed by temperature and driving voltage.

2. Without FPC and Solder.

Outline Drawing
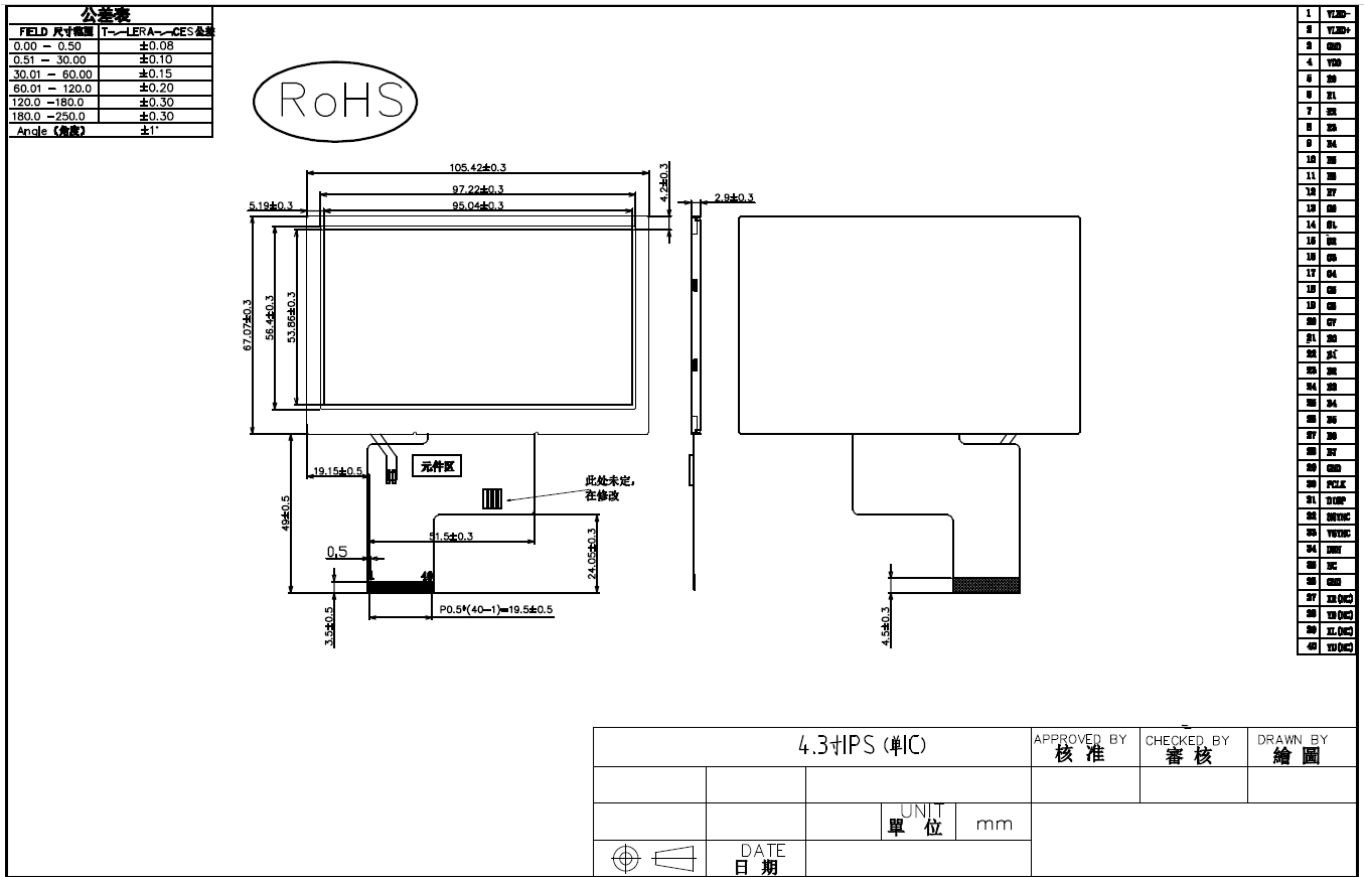
Absolute Maximum Ratings(Ta=25°C)

Electrical Absolute Maximum Ratings.(Vss=0V ,Ta=25°C)

Parameter	Symbol	Min	Typ	Max	Unit	Note
Power supply	VDD	-0.3	–	3.96	V	
	AVDD	-0.5	–	14.85	V	
	VGL	–	-10.5	–	V	
	VGH	–	13	–	V	
Operating Temperature	TOP	-20	–	70	°C	
Storage Temperature	TST	-30	–	80	°C	

1. If the module is above these absolute maximum ratings. It may become permanently damaged. Using the module within the following electrical characteristic conditions are also exceeded, the module will malfunction and cause poor reliability.
2. VDD>VSS must be maintained.

3. Please be sure users are grounded when handing LCD Module.

Environmental Absolute Maximum Ratings.

Item	Storage		Operating		Note
	MIN.	MAX.	MIN.	MAX.	
Ambient Temperature	-30℃	80℃	-20℃	70℃	1,2
Humidity	–	–	–	–	3

1. The response time will become lower when operated at low temperature.
2. Background color changes slightly depending on ambient temperature.

   The phenomenon is reversible.
3. Ta<=40℃:85%RH MAX.

   Ta>=40℃:Absolute humidity must be lower than the humidity of 85%RH at 40℃.

Electrical Specifications and Timing Characteristics

Electrical characteristics(Vss=0V ,Ta=25℃)

Parameter		Symbol	Condition	Min	Typ	Max	Unit	Note
Power supply		VDD	Ta=25℃	2.8	3.3	3.6	V	
Input voltage	'H'	VIH	VDD=3.3V	0.7VDD	–	VDD	V	
	'L'	VIL	VDD=3.3V	0	–	0.3VDD	V	
Current Consumption		ICC1	Normal mode	–	–	–	mA	2
		ICC2	Sleep mode	–	0.03	0.09	mA	2

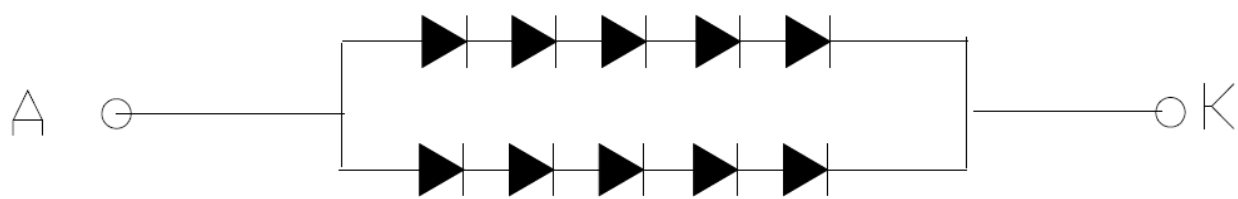**Note:**

1. When an optimum contrast is obtained in transmissive mode.
2. Tested in 1✕1chessboardpattern.

LED backlight specification(VSS=0V ,Ta=25℃)

Item	Symbol	Condition	Min	Typ	Max	Unit	Note
Supplyvoltage			–	15	–	V	
Supply current	If	–	–	40	–	MA	

Note:

1. VLED=VLED(+)-VLED(-).
2. The current of LED is 20mA.

   A LED drive in constant current mode is recommended.

Interface signals

Pin	Symbol	Description.
1	LED_K	Backlight LED Ground
2	LED_A	Backlight LED Power
3	GND	GND

4	VDD	Power supply
5~12	R0-R7	Red data bus
13~20	G0-G7	Green data bus
21~28	B0-B7	Blue data bus
29	GND	GND
30	PCLK	Data clock
31	DISP	Standby mode select pin
32	HSYNC	Line SYNC signal
33	VSYNC	Frame SYNC signal

34	DE	Data Enable Input
35	NC	NC
36	GND	GND
37	X1	Touch Panel Control Pin
38	Y1	Touch Panel Control Pin
39	X2	Touch Panel Control Pin
40	Y2	Touch Panel Control Pin

Optical Characteristics

Item	Symbol		**Condition**	Min.	Typ.	Max.	Unit	Note
Brightness	Bp		$\theta=0°$	–	500	–	Cd/m2	1
Uniformity	⊿Bp		F=0°	75	80	–	%	1,2
Viewing Angle	3:00			70	80	–	Deg	3
	6:00			70	80	–		
	9:00		Cr≥10	70	80	–		
	12:00			70	80	–		
Contrast Ratio	Cr		$\theta=0°$ F=0°		1200			
Response Time	Tr+Tf				30	40	ms	5
Color of CIE Coordinate	W	x	$\theta=0°$ F=0°	–	0.311	–	–	1,6
		y		–	0.338	–	–	
		Y		–	–	–	–	
	R	x		–	–	–	–	
		y		–	–	–	–	
		Y		–	–	–	–	
	G	x		–	–	–	–	
		y		–	–	–	–	
		Y		–	–	–	–	
	B	x		–	–	–	–	
		y		–	–	–	–	
		Y		–	–	–	–	
NTSC Ratio					50		%	

Note The parameter is slightly changed by temperature, driving voltage and materiel
Note 1: The data are measured after LEDs are turned on for 5 minutes. LCM displays full white.
The brightness is the average value of 9 measured spots. Measurement equipment PR-705 (Φ8mm)

Measuring condition:

- Measuring surroundings: Dark room.
- Measuring temperature: Ta=25℃.
- Adjust operating voltage to get optimum contrast at the center of the display.

Measured value at the center point of LCD panel after more than 5 minutes while backlight turning on.
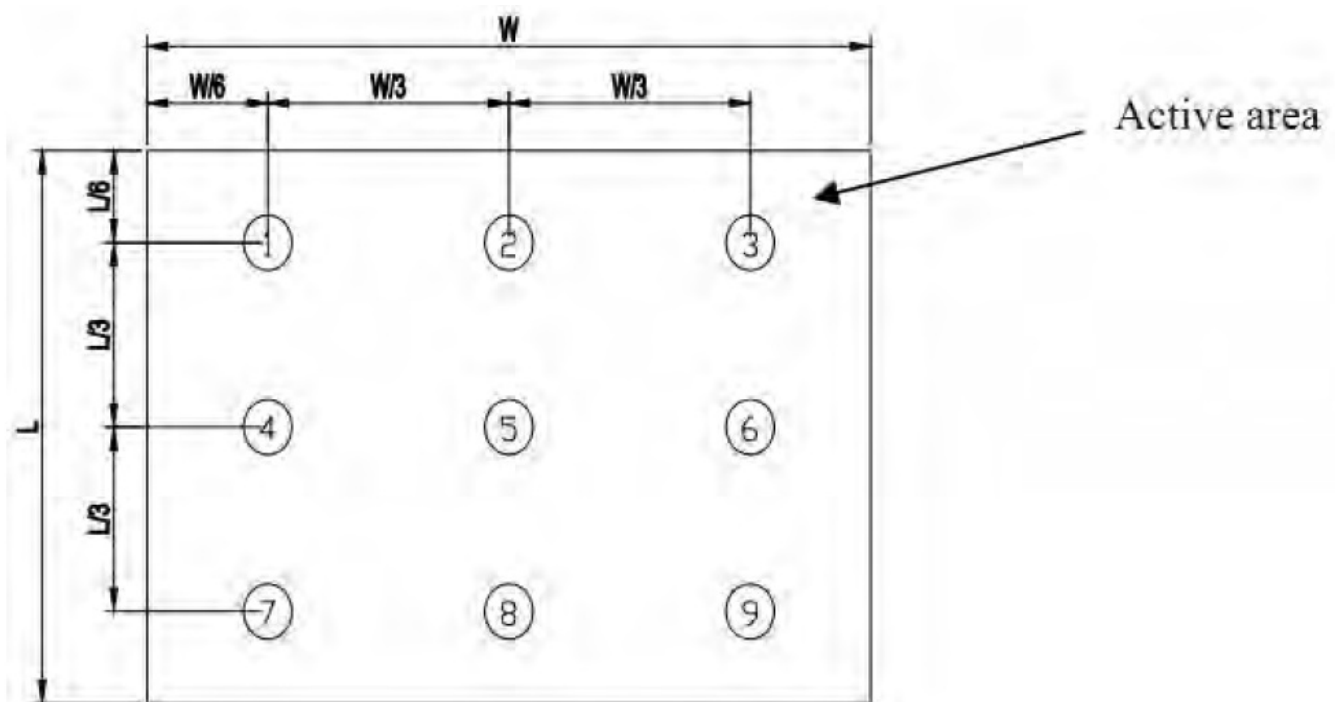

50cm

Detecter
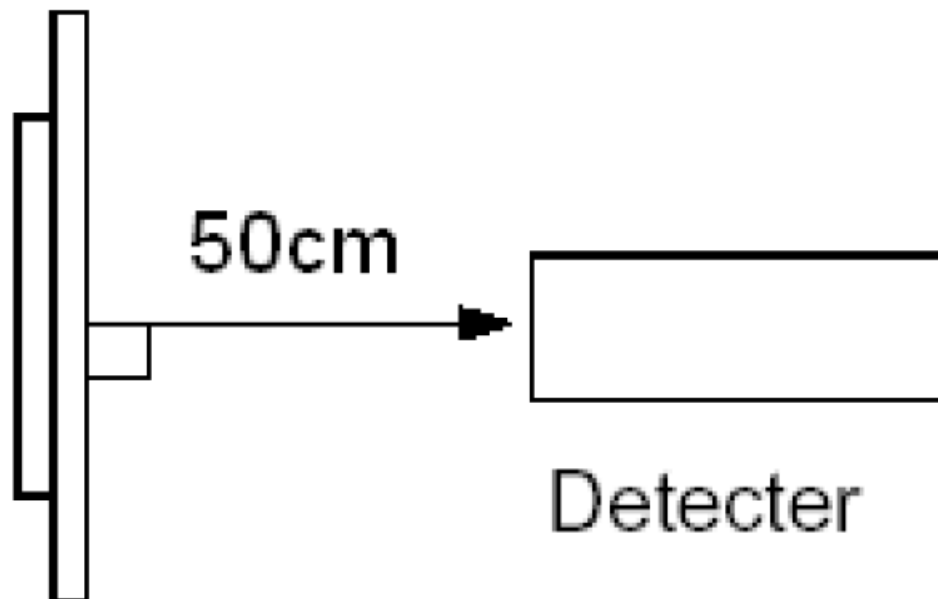
Note 2: The luminance uniformity is calculated by using following formula.

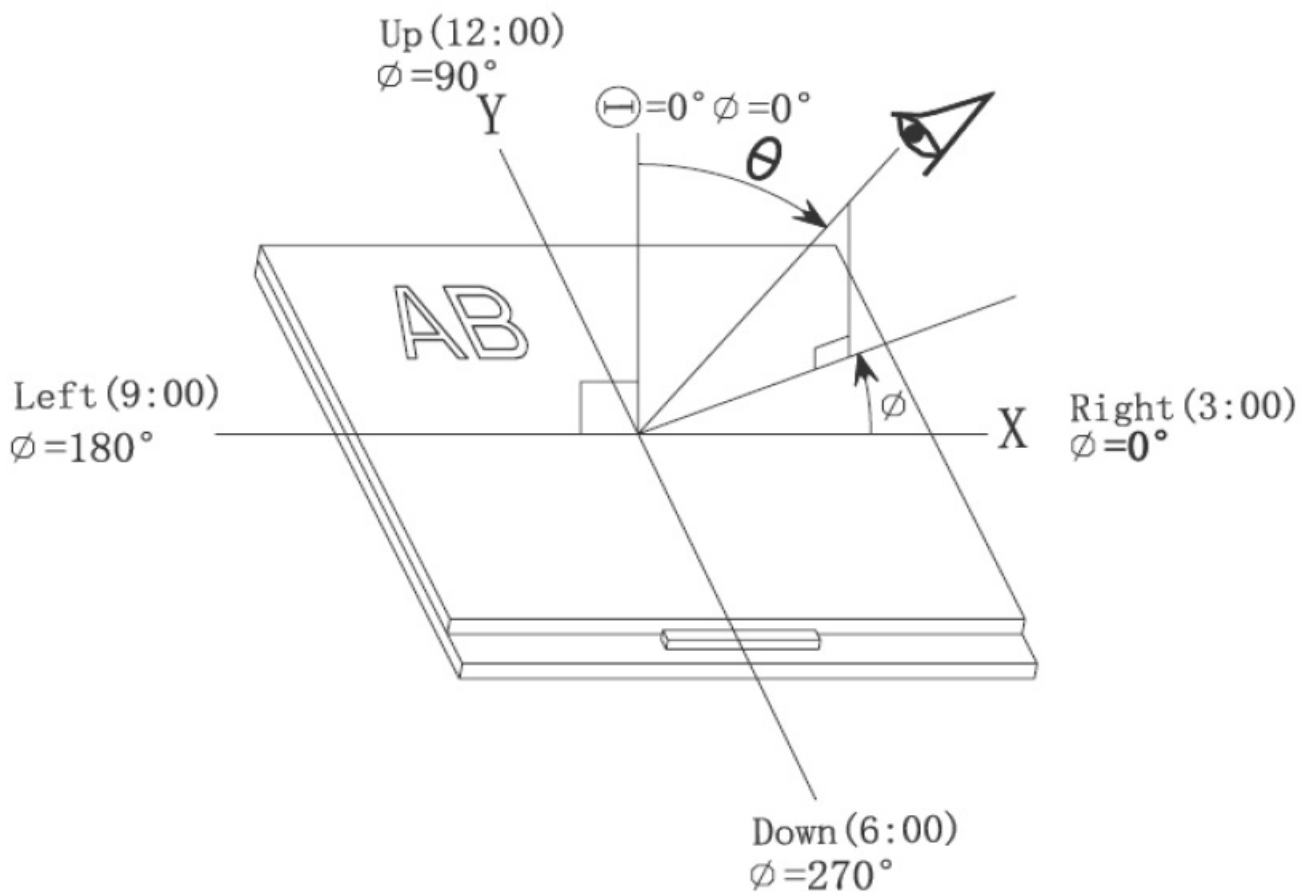$\varDelta$Bp = Bp (Min.) / Bp (Max.)×100 (%)
Bp (Max.) = Maximum brightness in 9 measured spots
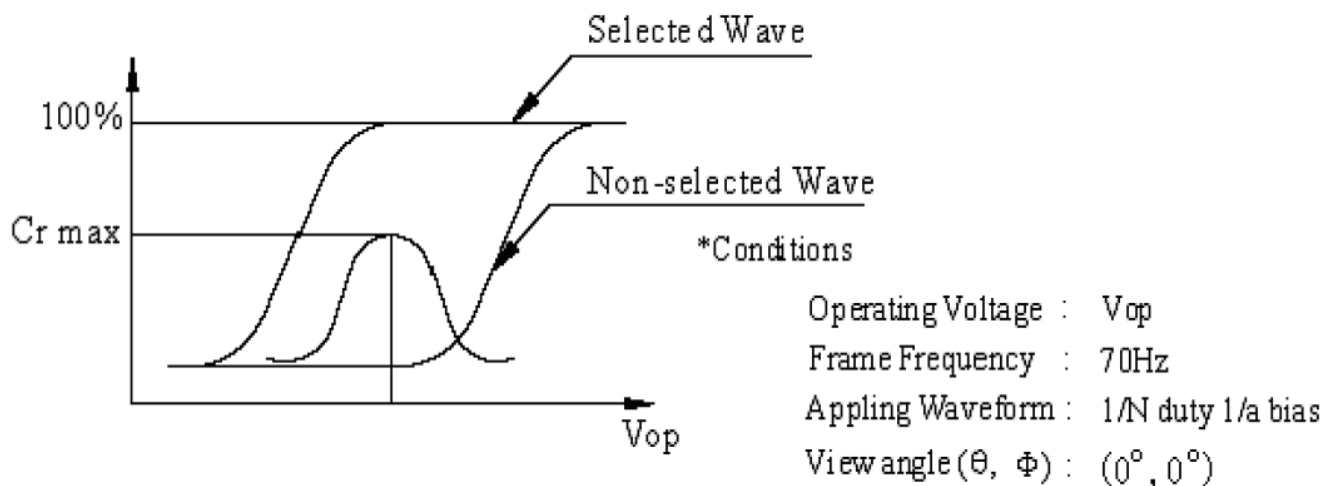Bp (Min.) = Minimum brightness in 9 measured spots.

Active area

Note 3: The definition of viewing angle:
Refer to the graph below marked by θ and Φ

Note 4: Definition of contrast ratio.(Test LCD using DMS501)

*Conditions

Operating Voltage : Vop
Frame Frequency : 70Hz
Appling Waveform : 1/N duty 1/a bias
View angle (θ, Φ) : (0°, 0°)

$$Contrast \ ratio(Cr) = \frac{Brightness \ of \ selected \ dots}{Brightness \ of \ non-selected \ dots}$$

Note 5: Definition of Response time. (Test LCD using DMS501):
The output signals of photo detector are measured when the input signals are changed from "black" to "white"(falling time) and from "white" to "black"(rising time), respectively. The response time is defined as the time interval between the 10% and 90% of amplitudes.Refer to figure as below.
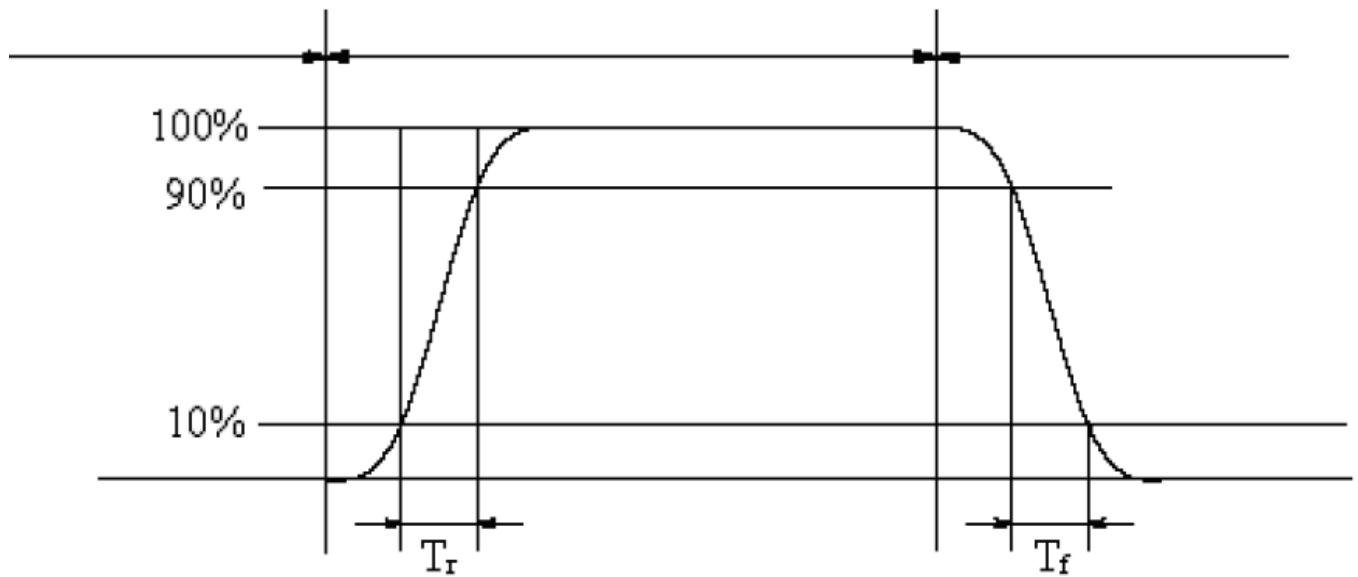
The definition of response time

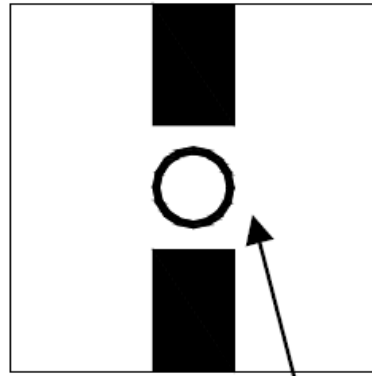**Note 6**: Definition of Color of CIE Coordinate and NTSC Ratio.

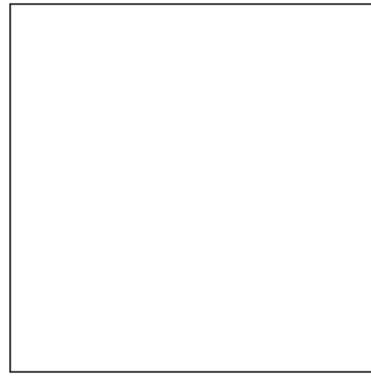1931 CIE Chromaticity Diagram
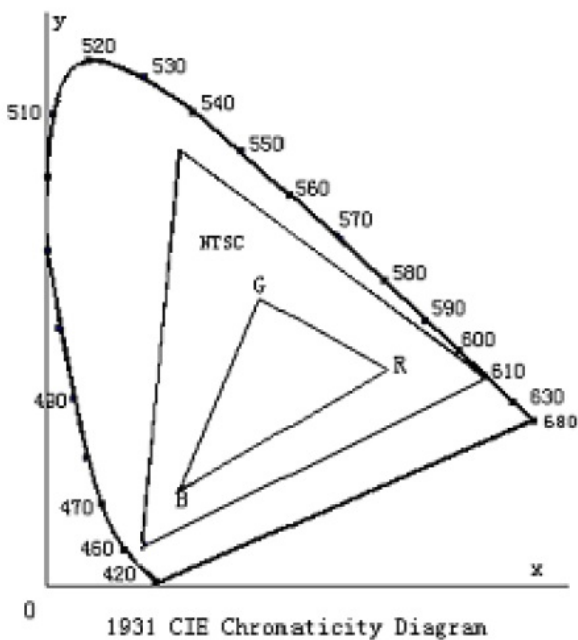
Color gamut:

$$S = \frac{\text{area of RGB triangle}}{\text{area of NTSC triangle}} \times 100\%$$

Note 7: Definition of cross talk.
Cross talk ratio(%)=|pattern A Brightness-pattern B Brightness|/pattern A Brightness*100

Pattern A   Pattern B

Measurement point(center)

Electric volume value=3F+/-3Hex

Reliability Test Items and Criteria

No	Test Item	Test condition	Criterion
1	High Temperature Storage	80℃±2℃ 96H Restore 2H at 25℃ Power off	1. After testing, cosmetic and electrical defects should not happen. 2. Total current consumption should not be more than twice of initial value.
2	Low Temperature Storage	-30℃±2℃ 96H Restore 2H at 25℃ Power off	
3	High Temperature Operation	70℃±2℃ 96H Restore 2H at 25℃ Power on	
4	Low Temperature Operation	-20℃±2℃ 96H Restore 4H at 25℃ Power on	
5	High Temperature/Humidity Operation	60℃±2℃ 90%RH 96H Power on	
6	Temperature Cycle	−30℃←——————→80℃ 30min 5min 30min after 5 cycle, Restore 2H at 25℃ Power off	
7	Vibration Test	10Hz~150Hz, 100m/s2, 120min	Not allowed cosmetic and electrical defects.
8	Shock Test	Half- sine wave,300m/s2,11ms	
9	ESD Test	Air discharge:±8KV, Contact discharge:±4KV	

Note: Operation: Supply 3.3V for logic system.

The inspection terms after reliability test, as below

ITEM	Inspection
Contrast	CR>50%
IDD	IDD<200%
Brightness	Brightness>60%
Color Tone	Color Tone+/-0,05

Quality level

Classification of defects

Major defects (MA): A major defect refers to a defect that may substantially degrade usability for product applications, including all functional defects(such as no display, abnormal display, open or missing segment, short circuit, missing component), outline dimension beyond the drawing, progressive defects and those affecting reliability.

Minor defects (MI): A minor defect refers to a defect which is not considered to be able to substantially degrade the product application or a defect that deviates from existing standards almost unrelated to the effective use of the product or its operation, such as black spot, white spot, bright spot, pinhole, black line, white line, contrast variation, glass defect, polarizer defect, etc.

Definition of inspection range

For dot defect of TFT LCD which is not smaller than 3 inches, dividing three areas to make a judgment (according to figure 1).
A area : center of viewing area
B area : periphery of viewing area
C area : Outside viewing area
For other defects, dividing two areas to make a judgment (according figure 2).

A zone : Inside Viewing area
B zone : Outside Viewing area
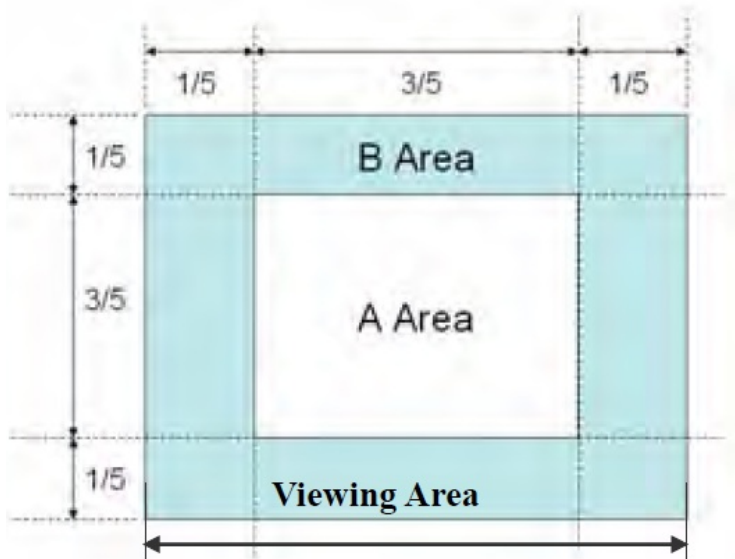X1(A.A~V.A): 2mm X2(A.A~V.A): 2mm Y1(A.A~V.A): 2mm Y2(A.A~V.A): 2mm
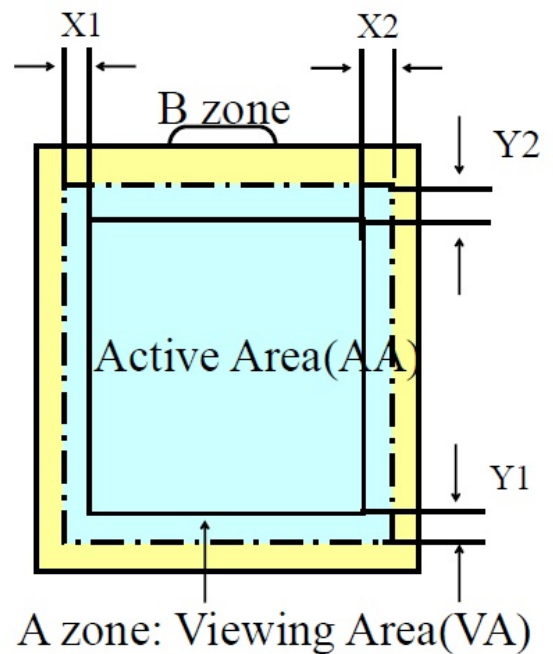
Figure 1

Figure 2

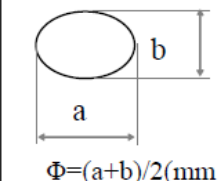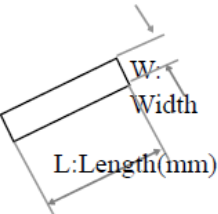**Inspection items and general notes**

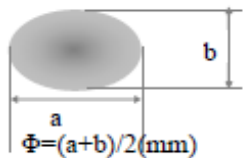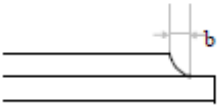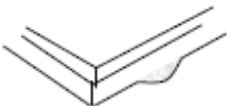|		
General notes	1. Should any defects which are not specified in this standard happen, additional standard shall be determined by mutual agreement between customer and SH. 2. Viewing area should be the area which SH guarantees. 3.Limit sample should be prior to this Inspection standard. 4.Viewing judgment should be under static pattern. 5.Inspection conditions Inspection distance: 250 mm (from the sample)　　Temperature　　　　　　: 25±5 ºC Inspection angle　　: 45 degrees in 6 o'clock direction (all defects in viewing area should be inspected from this direction)	
Inspection items	Pinhole, Bright spot, Black spot, White spot, Black line, White Line, Foreign particle, Bubble	The color of a small area is different from the remainder. The phenomenon doesn't change with voltage
	Contrast variation	The color of a small area is different from the remainder. The phenomenon changes with voltage
	Polarizer defect	Scratch, Dirt, Particle, Bubble on polarizer or between polarizer and glass
	Dot defect (TFT LCD)	The pixel appears bright or dark abnormally when display
	Functional defect	No display, Abnormal display, Open or missing segment, Short circuit, False viewing direction

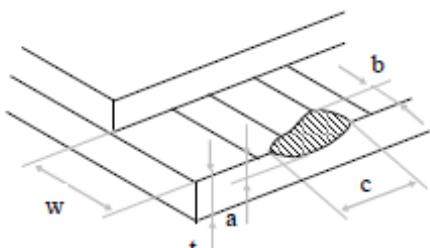|	Glass defect	Glass crack, Shaved corner of glass, Surplus glass
	PCB defect	Components assembly defect
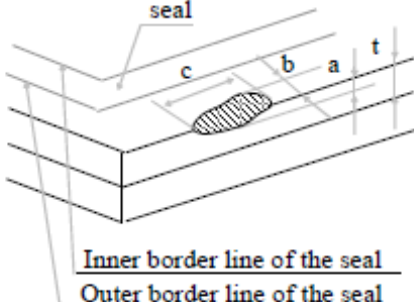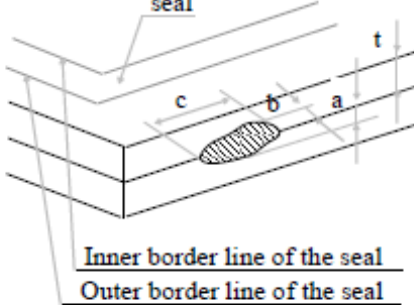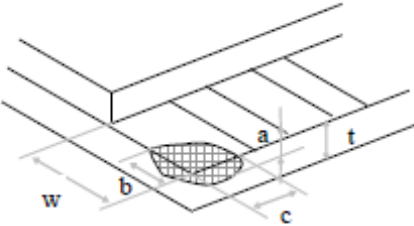
Outgoing Inspection level

Outgoing Inspection standard	Inspection conditions	Inspection				
		Min.	Max.	Unit	IL	AQL
Major Defects	See 8.3 general notes	See 8.5			II	0.065
Minor Defects	See 8.3 general notes	See 8.5			II	0.065
Note Sampling standard conforms to GB2828						

Inspection Items and Criteria

Inspection items			Judgment standard			
				Category	Acceptable number	
					A zone	B zone
1	Black spot, White spot, Pinhole, Foreign Particle, Particle in or on glass, Scratch on glass	$\Phi=(a+b)/2$(mm) (a/b<2.5)	A	$\Phi<=0.20$	Neglected	Neglected
			B	$0.20<\Phi<=0.25$	3	Neglected
			C	$0.25<\Phi<=0.3$	2	Neglected
			D	$0.3<\Phi<=0.4$	1	3
			E	$0.4<\Phi<=0.5$	0	2
			Total defective point(B,C)		1	-
2	Black line, White line, and Particle Between Polarizer and glass, Scratch on glass	W: Width L:Length(mm) L/W>=2.5	A	$W<=0.03$	Neglected	Neglected
			B	$0.03<W<=0.05$ $L<=3.0$	3	Neglected
			C	$0.05<W<=0.1$ $L<=3.0$	2	Neglected
			D	$0.05<W<=0.1$ $L<=4.0$	1	3
			E	$W>0.1$ $L>4.0$	0	2
			Total defective point(B,C)		1	-
3	Bright spot			any size	none	none
4	Contrast		A	$\Phi<0.2$	Neglected	Neglected

#							
	variation			B	$0.2<\Phi<=0.3$	2	
				C	$0.3<\Phi<=0.4$	1	
				D	$0.4<\Phi$	0	
		$\Phi=(a+b)/2$(mm)		Total defective point(B,C)		3	
5	Bubble inside cell			any size		none	none
6	Polarizer defect (if Polarizer is used)	Scratch ,damage on polarizer, Particle on polarizer or between polarizer and glass.		Refer to item 1 and item 2.			
		Bubble, dent and convex		A	$\Phi<=0.1$	Neglected	Neglected
				B	$0.1<\Phi<=0.2$	2	Neglected
				C	$0.2<\Phi<=0.3$	1	2
7	Surplus glass	Stage surplus glass		B<=0.3mm			
		Surrounding surplus glass		Should not influence outline dimension and assembling.			
8	Open segment or open common			Not permitted			
9	Short circuit			Not permitted			
10	False viewing direction			Not permitted			
11	Contrast ratio uneven			According to the limit specimen			
12	Crosstalk			According to the limit specimen			
13	Black /White spot(display)			Refer to item 1			
14	Black /White line(display)			Refer to item 2			

	Inspection items		Judgment standard		Acceptable number
			Category(application: B zone)		
15	Glass defect crack	ⅰ) The front of lead terminals	A	a≤ t, b≤1/5W, c≤3mm	Max.3 defects allowed
			B	Crack at two sides of lead terminals should not cover patterns and alignment mark	
		ⅱ) Surrounding crack-non-contact side Inner border line of the seal Outer border line of the seal		b < Inner borderline of the seal	
		ⅲ) Surrounding crack- contact side Inner border line of the seal Outer border line of the seal		b < Outer borderline of the seal	
		ⅳ) Corner	A	a <= t, b <= 3.0, c <= 3.0	
			B	Glass crack should not cover patterns u and alignment mark and patterns.	

Inspection items			Judgment standard
			Category(application: B zone)
16	PCB defect	Component soldering: No cold soldering、short、open circuit、burr、tin ball The flat encapsulation component position deviation must be less than 1/3 width of the pin (Pic.1); the sheet component deviation: Pin deviates from the pad and contact with the near components is not permitted（Pic.2）	
		lead defect: The lead lack must be less than 1/3 of its width; The lead burr must be less than 1/3 of the seam; Impurities connect with the near leads is not permitted	
		Connector soldering: Soldering tin is at contact position of the plug and socket is not permitted No foundation is scald Serious cave distortion on plug and socket contact pin is not permitted	
		Glue on root of the speaker receiver and motor lead: The insulative coat of the lead must join into the PCB; the protected glue must envelop to the insulative coat.	

Precautions for Use of LCD Modules

Handling Precautions

1. The display panel is made of glass. Do not subject it to a mechanical shock by dropping it from a high place, etc.
2. If the display panel is damaged and the liquid crystal substance inside it leaks out, be sure not to get any in your mouth, if the substance comes into contact with your skin or clothes, promptly wash it off using soap and

water.

3. Do not apply excessive force to the di splay surface or the adjoining areas since this may cause the color tone to vary.

4. The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully.

5. If the display surface is contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If still not completely clear, moisten cloth with one of the following solvents:

   - Isopropyl alcohol
   - Ethyl alcohol

     Solvents other than those mentioned above may damage the polarizer. Especially, do not use the following:

   - Water
   - Ketone
   - Aromatic solvents

6. Do not attempt to disassemble the LCD Module.

7. If the logic circuit power is off, do not apply the input signals.

8. To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.

   1. Be sure to ground the body when handling the LCD Modules.
   2. Tools required for assembly, such as soldering irons, must be properly ground.
   3. To reduce the amount of static electricity generated, do not conduct assembly and other work under dry conditions.
   4. The LCD Module is coated with a film to protect the display surface. Be care when peeling off this protective film since static electricity may be generated.

Storage precautions

1. When storing the LCD modules, avoid exposure to direct sunlight or to the light of fluorescent lamps.
2. The LCD modules should be stored under the storage temperature range.
3. The LCD modules should be stored in the room without acid, alkali and harmful gas.

The LCD modules should be no falling and violent shocking during transportation, and also should avoid excessive press, water, damp and sunshine.

Documents / Resources

[Surenoo SMC0430A-800480 Series MCU Interface TFT LCD Module](#) [pdf] User Manual
SMC0430AA3-800480, SMC0430A-480272, SMC0430A-800480, SMC0500A-800480, SMC0700A-800480, SMC0430A-800480 Series, SMC0430A-800480 Series MCU Interface TFT LCD, MCU Interface TFT LCD Module, TFT LCD Module, LCD Module, Module

References

- **Surenoo Tech: Professional LCD Module Supplier Since 2005**

- **Surenoo Tech: Professional LCD Module Supplier Since 2005**