



RAYSTAR

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RFC35CP-EIW-DBC

SPECIFICATION

CUSTOMER:

APPROVED BY	
PCB VERSION	
DATE	

FOR CUSTOMER USE ONLY

SALES BY	APPROVED BY	CHECKED BY	PREPARED BY

Release DATE:

TFT Display Inspection Specification: <https://www.raystar-optronics.com/download/products.htm>

Precaution in use of TFT module: <https://www.raystar-optronics.com/download/declaration.htm>

Revision History

VERSION	DATE	REVISED PAGE NO.	Note
0	2018/08/28		First issue

RAYSTAR OPTRONICS

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1.Module Classification Information

R	F	C	35	CP	-	E	I	W	-	D	B	C
1	2	3	4	5	-	6	7	8	-	9	10	11

Item	Description	
1	R : Raystar Optonics Inc.	
2	Display Type : F→TFT Type, J→ Custom TFT	
3	Solution: A: 128x160 B:320x234 C:320x240 D:480x234 E:480x272 F:800x480 G:640x480 H:1024x600 I:320x480 J:240x320 K:1280x800 L:240x400 M:1024x768 N:128x128 O:480x800 P:640x320 Q:800x600 S:480x128 T:800x320	
4	Display Size : 3.5" TFT	
5	Version Code.	
6	Model Type: A : TFT LCD E : TFT+FR+CONTROL BOARD J : TFT+FR+A/D BOARD N : TFT+FR+A/D BOARD+CONTROL BOARD S : TFT+FR+POWER BOARD (DC TO DC) 1 : TFT+CONTROL BOARD	6 : TFT+FR H : TFT+D/V BOARD I : TFT+FR+D/V BOARD B : TFT+POWER BD
7	Polarizer Type, Temperature range, View direction	I→Transmissive, W. T, 6:00 ; C→Transmissive, N. T, 6:00 L→Transmissive, W.T,12:00 ; F→Transmissive, N.T,12:00 Y→Transmissive,W.T, IPS TFT ; A→Transmissive, N.T, IPS TFT Z→Transmissive, W.T, O-TFT R→Transmissive, Super W.T, O-TFT N→Transmissive, Super W.T, 6:00; Q→Transmissive, Super W.T, 12:00 V→Transmissive, Super W.T, VA TFT
8	Backlight	W : LED, White H : LED, High Light White F : CCFL, White
9	Driver Method	D: Digital A: Analog L : LVDS M:MIPI
10	Interface	N : without control board A : 8Bit B : 16Bit S:SPI Interface R: RS232 U:USB I: I2C
11	TS	N : Without TS S : resistive touch panel C : capacitive touch panel capacitive touch panel (G-F-F) G : capacitive touch panel(G-G)

2.Summary

TFT 3.5" is a TN transmissive type color active matrix TFT liquid crystal display that uses amorphous silicon TFT as switching devices. This module is composed of a TFT_LCD module. It is usually designed for industrial application and this module follows RoHS,

RAYSTAR OPTRONICS

3.General Specifications

- Size: 3.5 inch
- Dot Matrix: 320 x RGB x 240 dots
- Module dimension: 93.5 x 66.44 x 9.85 mm
- Active area: 70.08 x 52.56 mm
- Dot pitch: 0.073 x 0.219 mm
- LCD type: TFT, Normally White, Transmissive
- View Direction: 12 o'clock
- Gray Scale Inversion Direction: 6 o'clock
- Aspect Ratio: 4:3
- Backlight Type: LED ,Normally White
- Controller IC: RA8875
- Interface: Digital 8080 family MPU
- CTP IC: FT5346DQQ Or Equal
- CTP Interface: I2C
- CTP FW Version: JSNTR045-5_5x46_Ref_V01_D01_20180428_all (1).bin
- With /Without TP: With CTP
- Surface: Glare

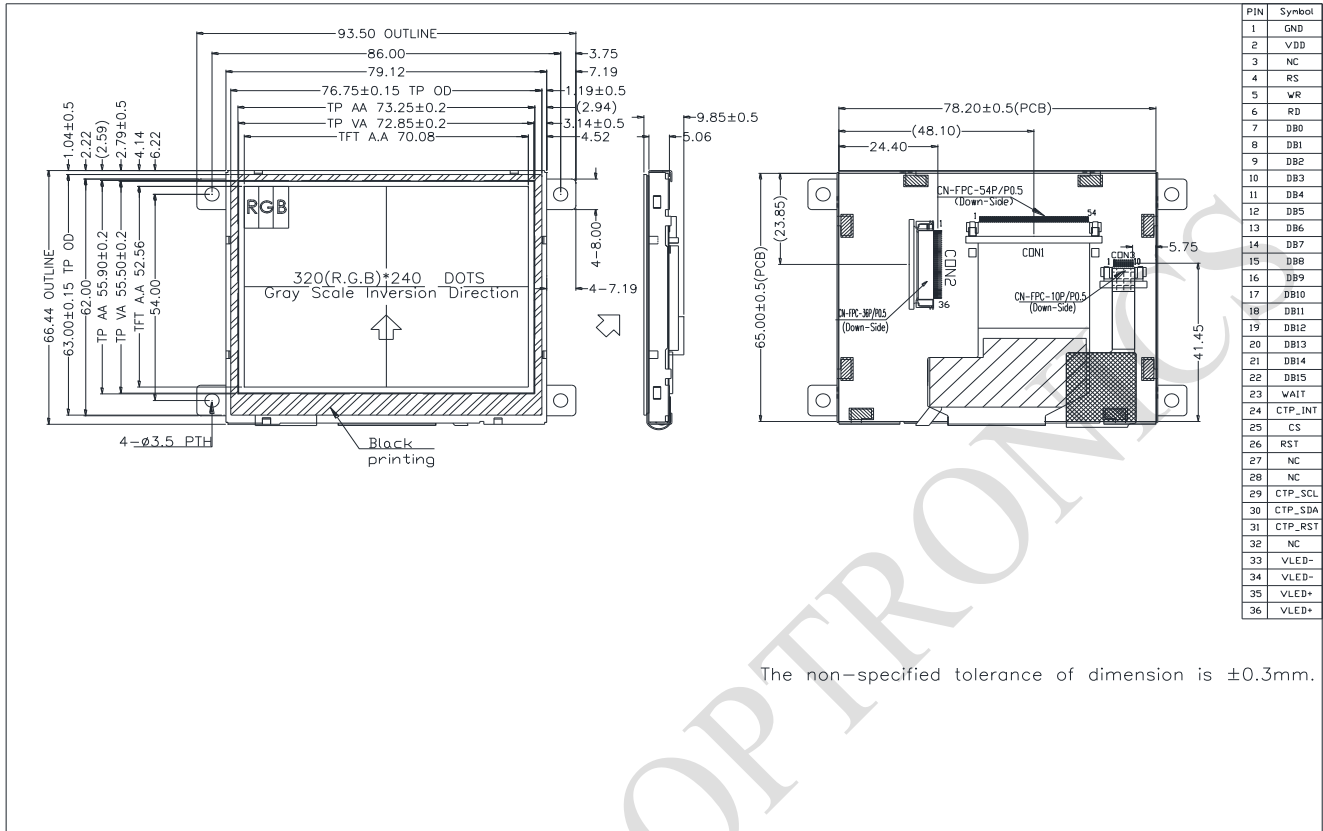
*Color tone slight changed by temperature and driving voltage.

4.Interface

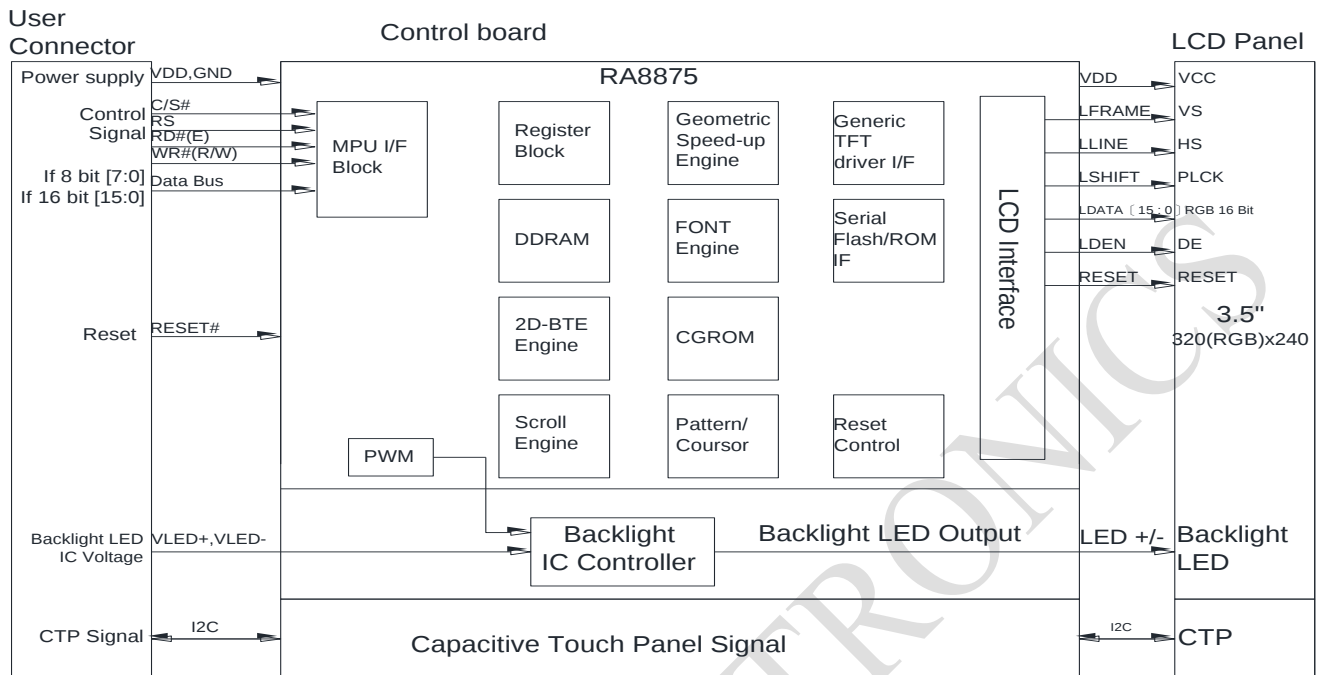
4.1. LCM PIN Definition (CON2)

Pin	Symbol	Function	Remark
1	GND	System ground	
2	VDD	Power Supply : +3.3V	
3	NC	No connect	
4	RS	Data/Command select	
5	WR	Write strobe signal	
6	RD	Read strobe signal	
7~22	DB0~DB15	Data bus	
23	WAIT	Wait Signal Output(H:active)	
24	CTP_INT	CTP Interrupt Signal From Touch Panel Module To Host	
25	CS	Chip select	
26	RST	Hardware reset	
27	NC	No connect	
28	NC	No connect	
29	CTP_SCL	CTP Serial IIC Clock	
30	CTP_SDA	CTP Serial IIC Data	
31	CTP_RST	CTP Reset Signal	
32	NC	No connect	
33~34	VLED-	Power for LED backlight cathode	
35~36	VLED+	Power for LED backlight anode	

5. Contour Drawing



6. Block Diagram



7. Absolute Maximum Ratings

Item	Symbol	Min	Typ	Max	Unit
Operating Temperature	TOP	-20	—	+70	°C
Storage Temperature	TST	-30	—	+80	°C

Note: Device is subject to be damaged permanently if stresses beyond those absolute maximum ratings listed above

1. Temp. $\leq 60^{\circ}\text{C}$, 90% RH MAX. Temp. $> 60^{\circ}\text{C}$, Absolute humidity shall be less than 90% RH at 60°C

8. Electrical Characteristics

8.1. Operating conditions: (CON2.Pin1=GND, Pin2=VDD)

Item	Symbol	Condition	Min	Typ	Max	Unit	Remark
Supply Voltage For LCM	VDD	-	3.0	3.3	3.6	V	-
Supply Current For LCM	IDD	-	-	50	75	mA	Note1
Power Consumption		-	-	165	270	mW	-

Note 1 : This value is test for VDD only Ta = 25 °C

8.2. LED driving conditions (CON2. Pin33,34=VLED-, Pin35,36=VLED+)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
Operation Current For LED Driver	I _{VLED}	-	-	75	mA	Note 1
Power Consumption	-	-	-	375	mW	VLED=5V
Supply Voltage For LED Driver	VLED+	3.3	-	5	V	Note 1
LED Life Time	-	-	50,000	-	Hr	Note 2,3,4

Note 1 : Power supply the back light IC specification

Note 2 : Ta = 25 °C

Note 3 : Brightness to be decreased to 50% of the initial value

Note 4 : The single LED lamp case

9.DC CHARATERISTICS

Parameter	Symbol	Rating			Unit	Condition
		Min	Typ	Max		
Low level input voltage	VIL	GND	-	0.2 VDD	V	
High level input voltage	VIH	0.8 VDD	-	VDD	V	

10.AC Characteristics

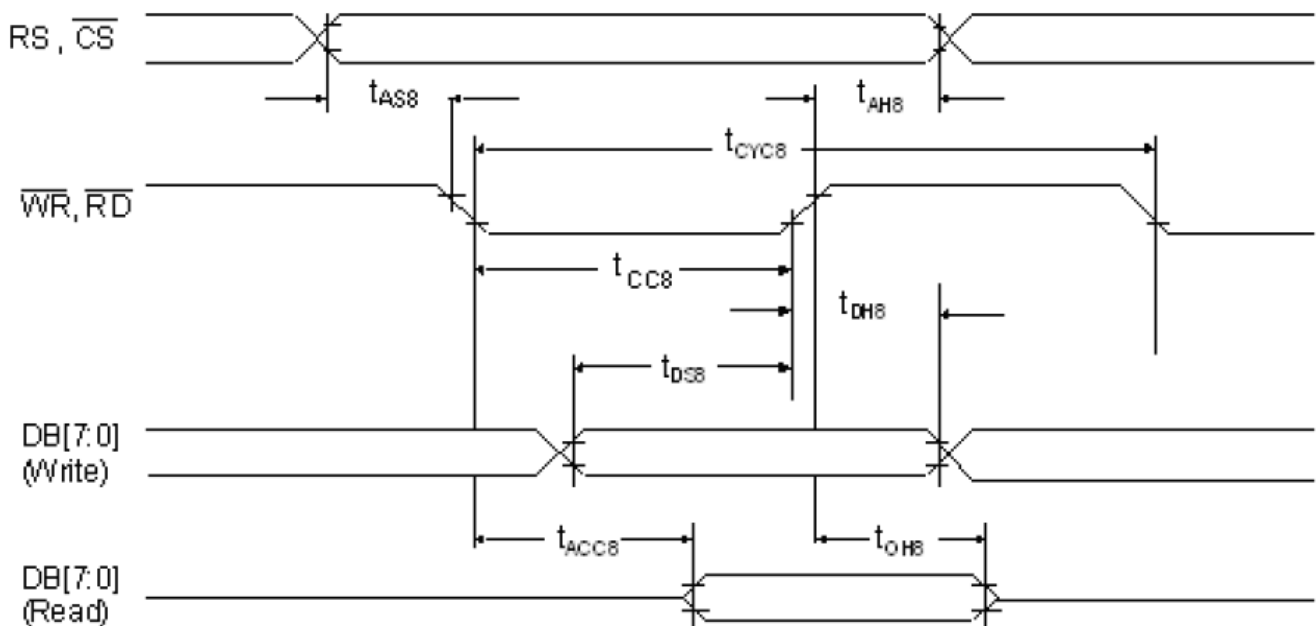
10.1. 8080 Mode

The following timing charts are used to describe the timing specification of the standard 8080 interfaces.

10.2. 8080 Mode Write Cycle

Symbol	Parameter	Rating		Unit	Symbol
		Min.	Max.		
tCYC8	Cycle time	50	-	ns	tc is one system clock period: tc = 1/SYS_CLK
tCC8	Strobe Pulse width	20	-	ns	
tAS8	Address setup time	0	-	ns	
tAH8	Address hold time	10	-	ns	
tDS8	Data setup time	20	-	ns	
tDH8	Data hold time	10	-	ns	
tACC8	Data output access time	0	20	ns	
tOH8	Data output hold time	0	20	ns	

8080 – 8/16-bit interface



The data bus width of RA8875 can be selected to 8-bit/16-bit by setting the Bit [1:0] of SYSR. When Bit [1:0] of SYSR is cleared to "00", then the data bus is 8-bit. If Bit [1:0] of SYSR is set to "11", then the data transition is set as 16-bit.

10.3. Pixel Data Format

16-bit mode color



65K colors 16-bit



256 colors 16-bit

8-bit mode color



1st cycle



2nd cycle

65K colors 8-bit



256 colors 8-bit

11. Optical Characteristics

Item		Symbol	Condition.	Min	Typ.	Max.	Unit	Remark
Response time		Tr	$\theta=0^{\circ}$ 、 $\Phi=0^{\circ}$	-	10	-	ms	Note
		Tf		-	15	-	ms	3,5
Contrast ratio		CR	At optimized viewing angle	300	350	-	-	Note 4,5
Color Chromaticity	White	Wx	$\theta=0^{\circ}$ 、 $\Phi=0$	0.26	0.31	0.36	-	Note
		Wy		0.28	0.33	0.38	-	2,6,7
Viewing angle (Gray Scale Inversion Direction)	Hor.	ΘR	$CR \geq 10$	-	55	-	Deg.	Note 1
		ΘL		-	55	-		
	Ver.	ΦT		-	45	-		
		ΦB		-	50	-		
Brightness		-	-	280	340	-	cd/ m ²	Center of display
Uniformity		(U)	-	75	-	-	%	Note5

Ta=25±2℃, VLED=3.3V

Note 1: Definition of viewing angle range

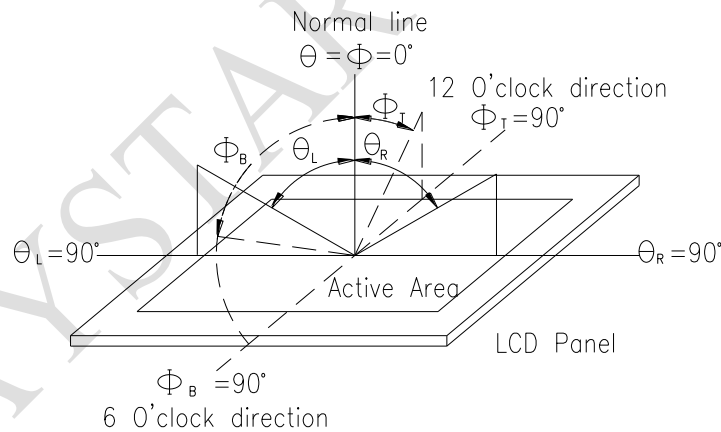


Fig. 11.1. Definition of viewing angle

Note 2: Test equipment setup:

After stabilizing and leaving the panel alone at a driven temperature for 10 minutes, the measurement should be executed. Measurement should be executed in a stable, windless, and dark room. Optical specifications are measured by Topcon BM-7orBM-5 luminance meter 1.0° field of view at a distance of 50cm and normal direction.

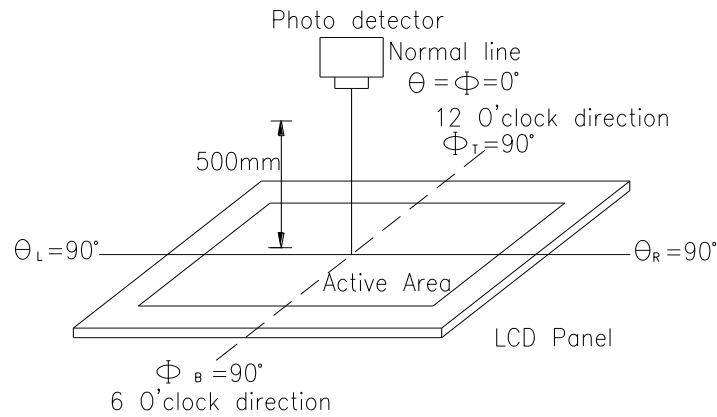
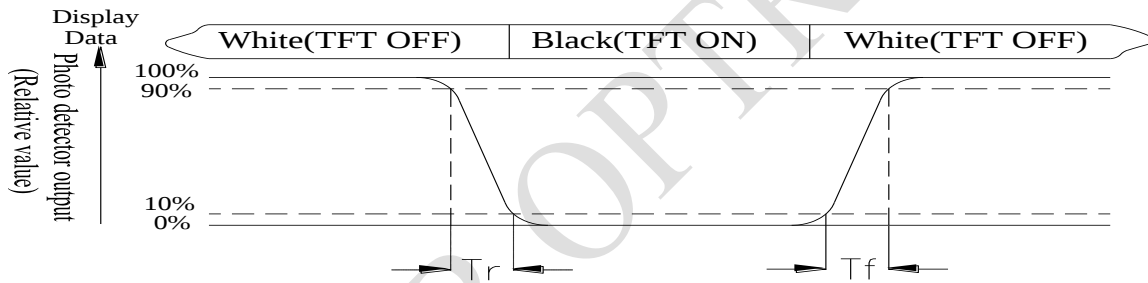


Fig. 11.2. Optical measurement system setup

Note 3: Definition of Response time:

The response time is defined as the LCD optical switching time interval between “White” state and “Black” state. Rise time, T_r , is the time between photo detector output intensity changed from 90% to 10%. And fall time, T_f , is the time between photo detector output intensity changed from 10% to 90%



Note 4: Definition of contrast ratio:

The contrast ratio is defined as the following expression.

$$\text{Contrast ratio (CR)} = \frac{\text{Luminance measured when LCD on the "White" state}}{\text{Luminance measured when LCD on the "Black" state}}$$

Note 5: Definition of Luminance Uniformity

Active area is divided into 9 measuring areas (reference the picture in below). Every measuring point is placed at the center of each measuring area.

Luminance Uniformity (U) = $L_{min}/L_{max} \times 100\%$

L = Active area length

W = Active area width

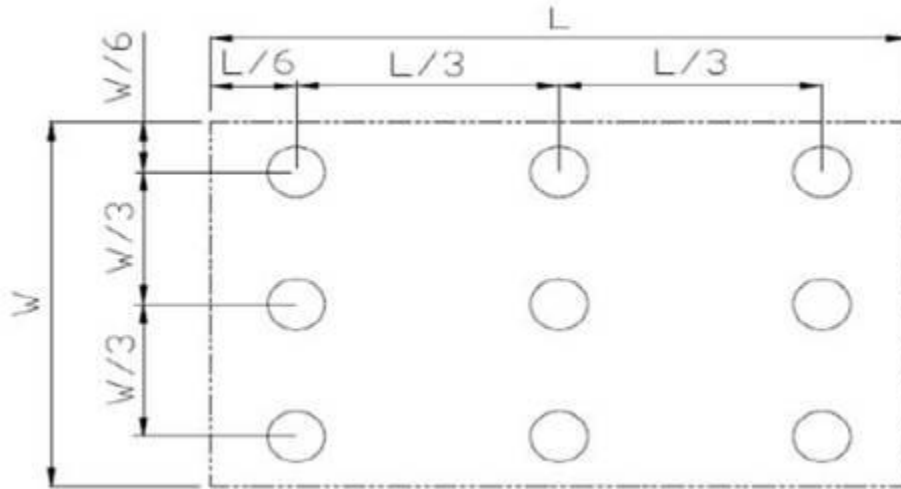


Fig11.3. . Definition of uniformity

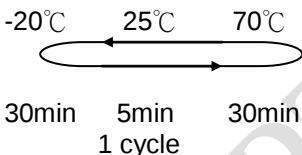
Note 6: Definition of color chromaticity (CIE 1931)

Color coordinates measured at the center point of LCD

Note 7: Measured at the center area of the panel when all the input terminals of LCD panel are electrically opened.

12. Reliability

Content of Reliability Test (Wide temperature, -20°C~70°C)

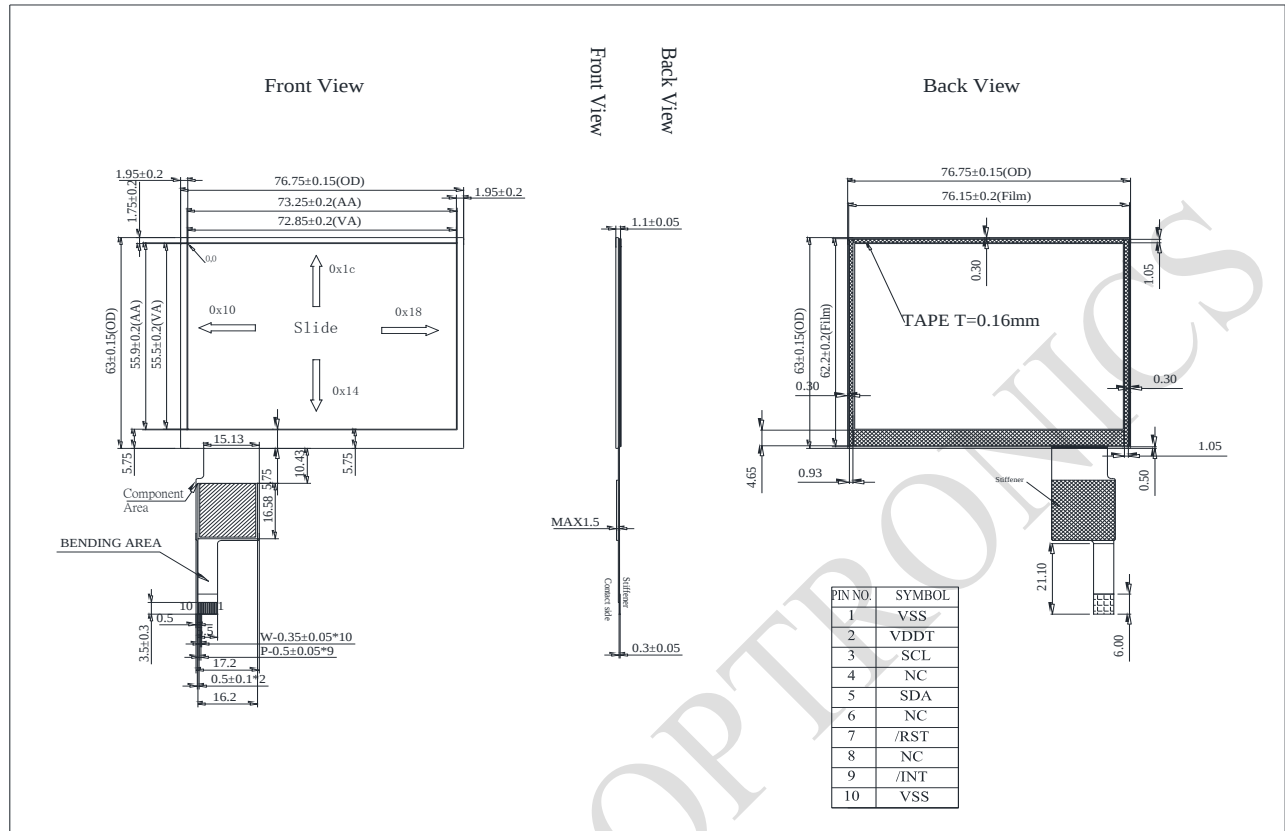
Environmental Test			
Test Item	Content of Test	Test Condition	Note
High Temperature storage	Endurance test applying the high storage temperature for a long time.	80°C 200hrs	2
Low Temperature storage	Endurance test applying the low storage temperature for a long time.	-30°C 200hrs	1,2
High Temperature Operation	Endurance test applying the electric stress (Voltage & Current) and the thermal stress to the element for a long time.	70°C 200hrs	—
Low Temperature Operation	Endurance test applying the electric stress under low temperature for a long time.	-20°C 200hrs	1
High Temperature/ Humidity Operation	The module should be allowed to stand at 60°C,90%RH max	60°C,90%RH 96hrs	1,2
Thermal shock resistance	The sample should be allowed stand the following 10 cycles of operation 	-20°C/70°C 10 cycles	—
Vibration test	Endurance test applying the vibration during transportation and using.	Total fixed amplitude : 3 1.5mm Vibration Frequency : 10~55Hz One cycle 60 seconds to 3 directions of X,Y,Z for Each 15 minutes	3
Static electricity test	Endurance test applying the electric stress to the terminal.	VS=±600V(contact) ,±800v(air), RS=330Ω CS=150pF 10 times	—

Note1: No dew condensation to be observed.

Note2: The function test shall be conducted after 4 hours storage at the normal Temperature and humidity after remove from the test chamber.

Note3: The packing have to including into the vibration testing.

13.Touch Panel Information



14.Initial Code For Reference

```
void Initial_RA8875()
```

```
{  
    RES = 1;  
    Delay1ms (10);  
    RES = 0;  
    Delay1ms (50);  
    RES = 1;  
    Delay1ms (100);  
  
    LCD_CmdWrite(0x88);  
    LCD_DataWrite(0x0a);  
    Delay1ms(1);  
    LCD_CmdWrite(0x89);  
    LCD_DataWrite(0x02);  
    Delay1ms(1);  
  
    LCD_CmdWrite(0x10);  
    LCD_DataWrite(0x0c);  
  
    LCD_CmdWrite(0x04);  
    LCD_DataWrite(0x03);  
    Delay1ms(1);  
  
    //Horizontal set  
    LCD_CmdWrite(0x14);  
    LCD_DataWrite(0x27);  
    LCD_CmdWrite(0x15);  
    LCD_DataWrite(0x80);  
    LCD_CmdWrite(0x16);  
    LCD_DataWrite(0x03);  
    LCD_CmdWrite(0x17);  
    LCD_DataWrite(0x02);  
    LCD_CmdWrite(0x18);  
    LCD_DataWrite(0x03);  
  
    LCD_CmdWrite(0x19);  
    LCD_DataWrite(0xef);  
    LCD_CmdWrite(0x1A);  
    LCD_DataWrite(0x00);  
    LCD_CmdWrite(0x1B);  
    LCD_DataWrite(0x0f);  
    LCD_CmdWrite(0x1C);  
    LCD_DataWrite(0x00);  
    LCD_CmdWrite(0x1D);  
    LCD_DataWrite(0x0e);  
    LCD_CmdWrite(0x1E);  
    LCD_DataWrite(0x06);  
}
```

```
LCD_CmdWrite(0x1F);  
LCD_DataWrite(0x01);
```

```
LCD_CmdWrite(0x30);  
LCD_DataWrite(0x00);  
LCD_CmdWrite(0x31);  
LCD_DataWrite(0x00);  
LCD_CmdWrite(0x34);  
LCD_DataWrite(0x3F);  
LCD_CmdWrite(0x35);  
LCD_DataWrite(0x01);
```

```
LCD_CmdWrite(0x32);  
LCD_DataWrite(0x00);  
LCD_CmdWrite(0x33);  
LCD_DataWrite(0x00);  
LCD_CmdWrite(0x36);  
LCD_DataWrite(0xef);  
LCD_CmdWrite(0x37);  
LCD_DataWrite(0x00);
```

```
}
```

LCM Sample Estimate Feedback Sheet		
Module Number : _____		
1 、 Panel Specification :		
1. Panel Type :	☐ Pass	☐ NG , _____
2. View Direction :	☐ Pass	☐ NG , _____
3. Numbers of Dots :	☐ Pass	☐ NG , _____
4. View Area :	☐ Pass	☐ NG , _____
5. Active Area :	☐ Pass	☐ NG , _____
6. Operating Temperature :	☐ Pass	☐ NG , _____
7. Storage Temperature :	☐ Pass	☐ NG , _____
8. Others : _____		
2 、 Mechanical Specification :		
1. PCB Size :	☐ Pass	☐ NG , _____
2. Frame Size :	☐ Pass	☐ NG , _____
3. Material of Frame :	☐ Pass	☐ NG , _____
4. Connector Position :	☐ Pass	☐ NG , _____
5. Fix Hole Position :	☐ Pass	☐ NG , _____
6. Backlight Position :	☐ Pass	☐ NG , _____
7. Thickness of PCB :	☐ Pass	☐ NG , _____
8. Height of Frame to PCB :	☐ Pass	☐ NG , _____
9. Height of Module :	☐ Pass	☐ NG , _____
10. Others :	☐ Pass	☐ NG , _____
3 、 Relative Hole Size :		
1. Pitch of Connector :	☐ Pass	☐ NG , _____
2. Hole size of Connector :	☐ Pass	☐ NG , _____
3. Mounting Hole size :	☐ Pass	☐ NG , _____
4. Mounting Hole Type :	☐ Pass	☐ NG , _____
5. Others :	☐ Pass	☐ NG , _____
4 、 Backlight Specification :		
1. B/L Type :	☐ Pass	☐ NG , _____
2. B/L Color :	☐ Pass	☐ NG , _____
3. B/L Driving Voltage (Reference for LED Type) : ☐ Pass ☐ NG , _____		
4. B/L Driving Current :	☐ Pass	☐ NG , _____
5. Brightness of B/L :	☐ Pass	☐ NG , _____
6. B/L Solder Method :	☐ Pass	☐ NG , _____
7. Others :	☐ Pass	☐ NG , _____

>> Go to page 2 <<

Module Number : _____

5 、 Electronic Characteristics of Module :

1.Input Voltage :	☐ Pass	☐ NG , _____
2.Supply Current :	☐ Pass	☐ NG , _____
3.Driving Voltage for LCD :	☐ Pass	☐ NG , _____
4.Contrast for LCD :	☐ Pass	☐ NG , _____
5.B/L Driving Method :	☐ Pass	☐ NG , _____
6.Negative Voltage Output :	☐ Pass	☐ NG , _____
7.Interface Function :	☐ Pass	☐ NG , _____
8.LCD Uniformity :	☐ Pass	☐ NG , _____
9.ESD test :	☐ Pass	☐ NG , _____
10.Others :	☐ Pass	☐ NG , _____

6 、 Summary :
Sales signature : _____

Customer Signature : _____

Date : / /