

Product Specification For LCD Module

Model NO.: CNK128128-19020A1

CUSTOMER ITEM NO.:

REVISION : A

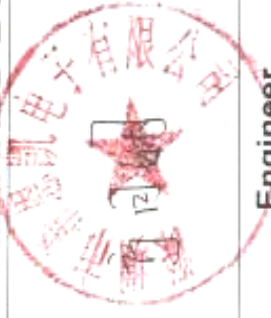
☐ APPROVAL FOR SPECIFICATIONS ONLY

☒ **APPROVAL FOR SPECIFICATIONS AND SAMPLE**

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[illegible]

4. GENERAL SPECIFICATION

ITEM	CONTENTS
Module Size	56.8(W) x57.1 (H) x8.2(T) mm
Display View Area	47.2(W) x47.2(H) mm
LCD Type	STN(BLUE)/Negative/Transmissive
View Angle	12 O'clock
Driver IC	UC1617s
Backlight Driver type	White
DC to DC circuit	Build-In
Weight	TBD

5. LCD ELECTRO-OPTICAL CHARACTERISTICS (Ta = 25°C)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
LCD Module Driving Voltage	VDD	Ta = 25°C	3.1	3.3	3.5	Volt
Operating Temperature	Top	--	-10°C	-	+60°C	°C
Storage Temperature	Tst	--	-20°C	-	+70°C	°C
Humidity	%	--	--	-	90%	

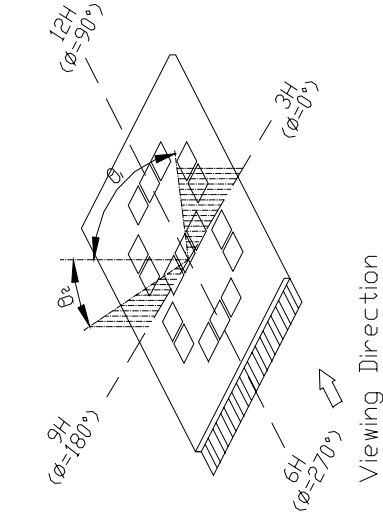
Note: See section 12 for backlight uniformity measurement

6. LCD OPTICAL CHARACTERISTICS

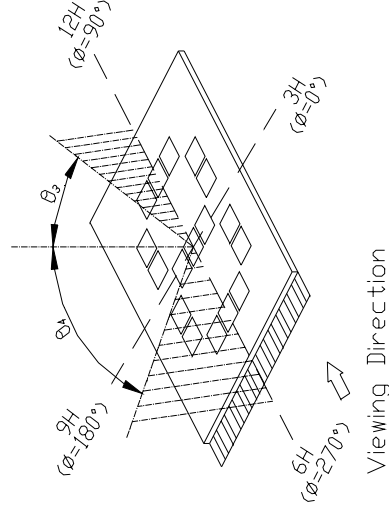
Item	Symbol	Temp(°C)	Rating			Unit	Reference
Recommended Driving Voltage	Vop	50				V	
		25	12.8	13.0	13.2		
		0					
Rise Time	Tr	25		180	230	ms	Note4
Fall Time	Tf	25		180	230		
Frame Frequency	FR	25	70	75	80	Hz	
Viewing angle Cr ≧ 2	∅=0°	25		40		Deg	Note1 Note2
	∅ =180°			40			
	∅ =90°			45			
	∅ =270°			30			
Viewing Direction		12 O'clock					
Contrast Ratio	Cr	25	6	8			Note3

7. OPTICAL CHARACTERISTICS DEFINITION

Note 1. Definition of angle θ 1& θ 2

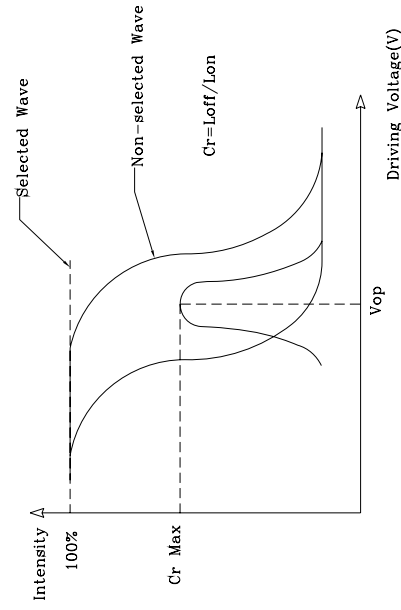


Note 2. Definition of angle θ 3& θ 4

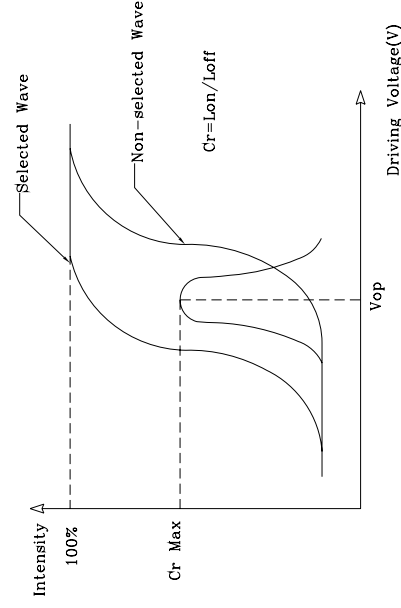


LCD Panel

Note 3. Definition of contrast ratio (Cr2)

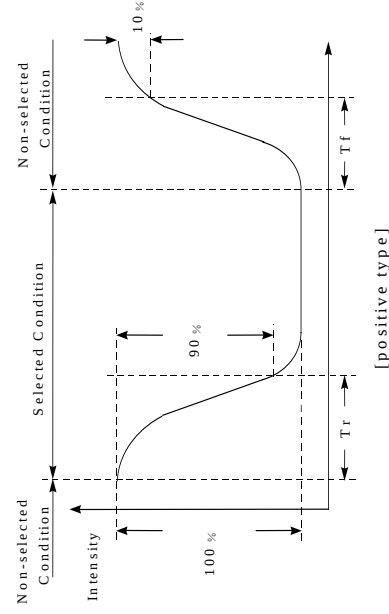


[Positive type]

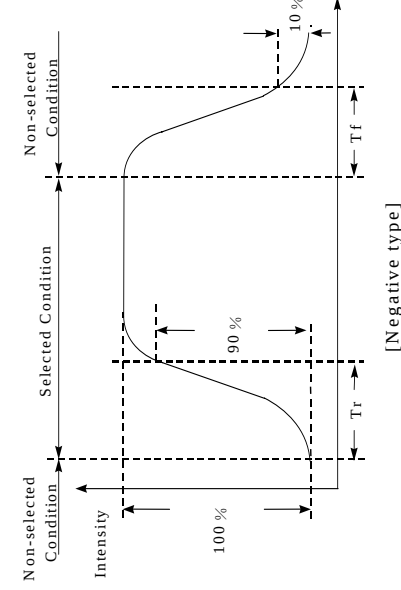


[Negative type]

Note 4. Definition of response time



[positive type]



[Negative type]

8. INTERFACE PIN ASSIGNMENT

PIN	DESC	FUNCTION
1	ESD	
2	VLCD	MAIN LCD Power Supply. When VLCD is used, connect these pins together
3	VB0-	LCD Bias Voltages. These are the voltage sources to provide SEG driving currents. These voltages are generated internally. Connect capacitors of CBX value between VBX+ and VBX-. In COG application, the resistance of these ITO traces directly affects the S
4	VB1-	
5	VB1+	
6	VB0+	
7	VDD	Power for reference voltage circuit
8	VSS	Ground. Connect VSS and VSS2 to the shared GND pin. In COG applications, minimize the ITO resistance for both VSS and VSS2
9	BM1	Bus mode: The interface bus mode is determined by BM[1:0] and
10	BM0	Bus mode: The interface bus mode is determined by BM[1:0] and
11	WR1	WR [1:0] controls the read/write operation of the host interface. See Host Interface section for details.
12	WR0	
13	CD	Select Control data or Display data for read/write operation.
14	CS1	Chip Select. Chip is selected when CS1="H" and CS0 = "L". When the chip is not selected, D[7:0] will be high impedance.
15	CS0	In I2C mode, these two pins indicate the I2C bus address' bit 2 and bit 3.
16	RST	It's necessary to set pin-reset in 3 mS after VDD/2/3 stable. When RST="L", all control registers are re-initialized by their default states. An RC Filter has been included on-chip. There is no need for external RC noise filter.
17	D7	Bi-directional bus for both serial and parallel host interfaces
18	D6	Bi-directional bus for both serial and parallel host interfaces
19	D5	Bi-directional bus for both serial and parallel host interfaces
20	D4	Bi-directional bus for both serial and parallel host interfaces
21	D3	Bi-directional bus for both serial and parallel host interfaces
22	D2	Bi-directional bus for both serial and parallel host interfaces
23	D1	Bi-directional bus for both serial and parallel host interfaces
24	D0	Bi-directional bus for both serial and parallel host interfaces
25	ESD	
26	NC	

9. BACKLIGHT

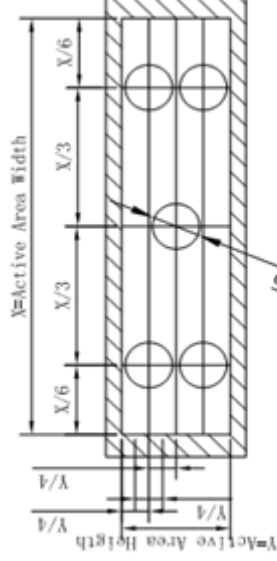
BACKLIGHT ELECTRICAL-OPTICAL CHARACTERISTICS

(Unless specified, Ambient temperature Ta=25°C)

PARAMETER	Sym.	Min.	Typ.	Max.	Unit	Test Condition	Reference
Supply Current	I	--	45	--	mA	45mA	
LED WHITE	V	2.8	3.0	3.2	V	45mA	--
LED Blue	V				V	45mA	
LED Red	V				V	45mA	
Backlight Luminous Intensity	Lv	--	--	--	Cd/m ²	45mA	Note1
Uniformity	--	70	--	--	%	45mA	Note1 Note2

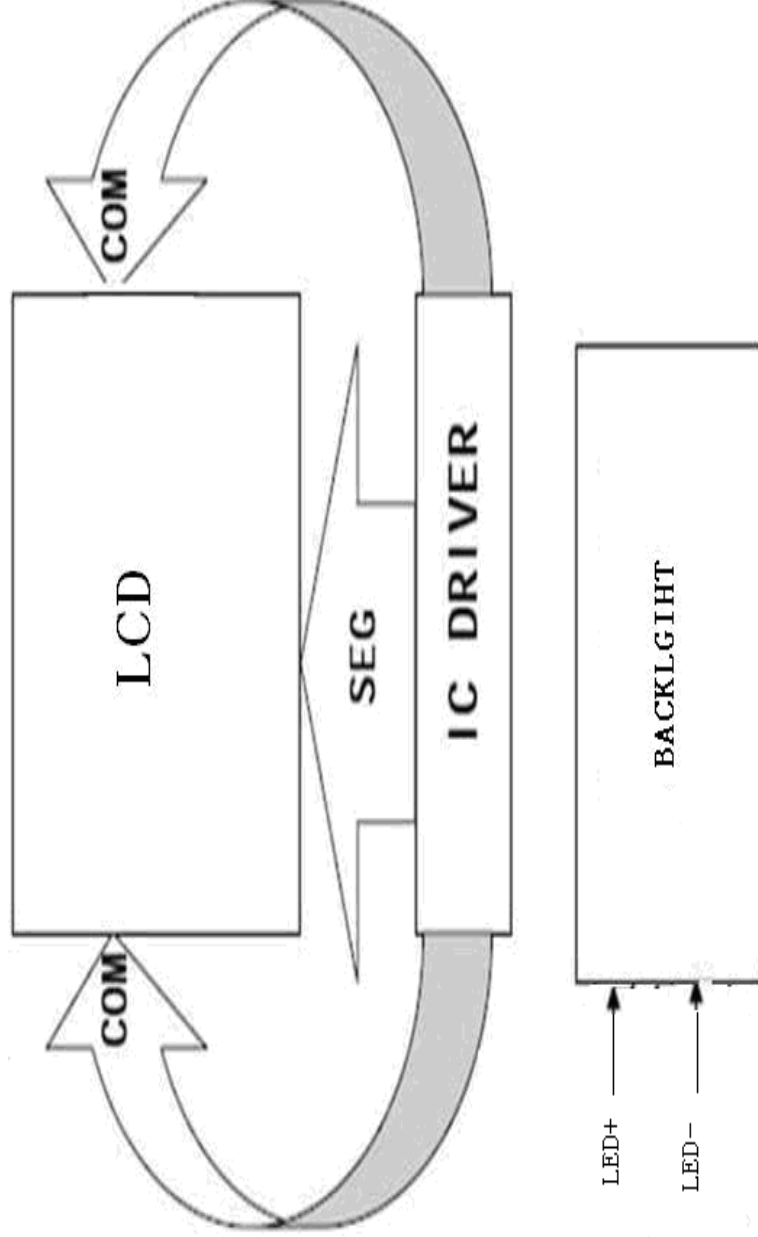
NOTE:

1. Backlight luminance: The measurement instrument is BM-7 luminance colorimeter. The aperture of colorimeter is $\varnothing 5\text{mm}$ and the distance between lens and backlight is 50cm. 5 points will be measured and the luminance of backlight is the average value of 5 points.



2. Backlight Uniformity = (The Luminance min / The Luminance max) x 100%

10.BLOCK DIAGRAM



11.AC Characteristics

Serial 4-Line Interface

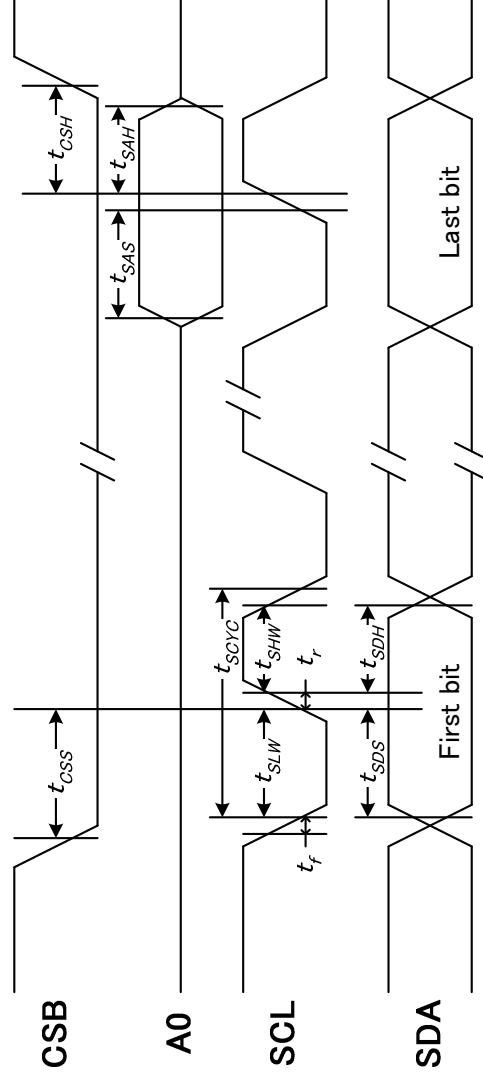


Fig. 32

(VDD1 = 3.0V, Ta = 25°C)

Item	Signal	Symbol	Condition	Rating		Units
				Min.	Max.	
Serial Clock Period	SCL	tSCYC		200	—	ns
SCL "H" pulse width		tSHW		80	—	
SCL "L" pulse width		tSLW		80	—	
Address setup time	A0	tSAS		60	—	
Address hold time		tSAH		30	—	
Data setup time	SDA	tSDS		60	—	
Data hold time		tSDH		30	—	
CS-SCL time	CSB	tCSS		40	—	
CS-SCL time		tCSH		100	—	

- The input signal rise and fall time (tr, tf) are specified at 15 ns or less.
- All timing is specified using 20% and 80% of VDD1 as the standard.

12. RELIABILITY

No	Test Item	Content of Test	Test Condition
1	High Temperature Storage	Endurance test of high temperature for a long time.	70℃ 96H
2	Low Temperature Storage	Endurance test of low temperature for a long time.	-20℃ 96H
3	High Temperature Operation	Endurance test of electrical stress (Voltage & Current) and the thermal stress to the element.	60℃ 96H
4	Low Temperature Operation	Endurance test of electrical stress (Voltage & Current) and the thermal stress to the element.	-10℃ 96H
5	High Temperature /Humidity Storage	Endurance Test of high temperature and high humidity for a long time.	40℃ 90%RH 96H
6	Thermal shock	Endurance test of low and high temperature cycles.(air to air) $-20\pm 2^{\circ}\text{C} \longleftrightarrow 70\pm 2^{\circ}\text{C}$ (60min) $\longleftrightarrow$ (60min) 1 cycle	-10℃/70℃ 10 cycle
7	vibration	Maximum vibration is 2.45m/s ² (0.25 G) during operation and 11.75 m/s ² (1.2 G) during storage. Tested 10-100KHz XYZ directions 1 hour each.	Ambient temperature Ta=25℃
8	shock	Maximum shock is 29.4 m/s ² (3 G) during operation and 490.0 m/s ² (50 G) during storage. Tested 10 milliseconds in XYZ directions 1 time each.	Ambient temperature Ta=25℃

Note:

1) Condensation is not allowed during low temperature testing.

2) Driving condition for operation test:

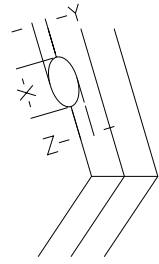
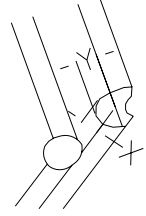
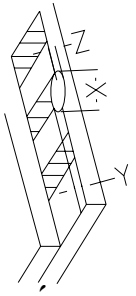
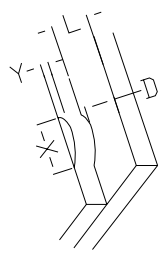
Power Supply Current for BackLight(I_{mA})=15mA

Failure Judgment Criterion

After the above mentioned test (For Environmental Test, after 2 hours in room temperature):

- 1) There should not be conspicuous failure of display quality and appearance.
- 2) Contrast ratio should be greater than or equal to 50% of the initial contrast ratio.
- 3) Abnormal function is a failure.

13. INSPECTION CRITERIA

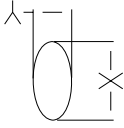
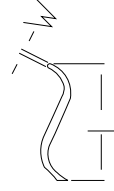
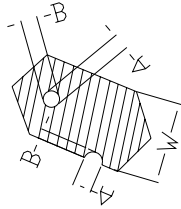
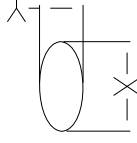
NO	Item	Criteria	AQL
1	Electrical Testing	(1) non-display (2) segment missing (3) segment short	0.65
2	Dimension state	Dimension out of the specification	1.00
3	Glass crack	Substrate check symbol Definition: X: Length direction Y: Short side direction Z: Thickness direction T: Glass thickness K:LCD length L: Single connector width (1) General crack 	2.50
		(2) Corner 	
		(3) Contact pad crack 	
		(4) Substrate protuberance and internal crack 	
		(5) No progressive glass cracks allowed	

X	Y	Z
$1/8K \geq$	$1/3L \geq$	No check

- Cracks on the contact area cannot exceed 1/2 of the glass thickness.
- Y not to exceed 1/3 seal width

(4) Substrate protuberance and internal crack

$D < 2/3L$, Reject

NO	Item	Criterion	AQL											
4.	Black spot , white spot (including polarizer) $\varnothing=(X+Y)/2$ unit:mm	(1) Round type  <table><tr><th>Size</th><th>Acceptable QTY</th></tr><tr><td>$\varnothing\leqslant0.10$</td><td>Accept</td></tr><tr><td>$0.10<\varnothing\leqslant0.20$</td><td>2</td></tr><tr><td>$0.20<\varnothing\leqslant0.25$</td><td>1</td></tr><tr><td>$0.25<\varnothing$</td><td>0</td></tr></table>	Size	Acceptable QTY	$\varnothing\leqslant0.10$	Accept	$0.10<\varnothing\leqslant0.20$	2	$0.20<\varnothing\leqslant0.25$	1	$0.25<\varnothing$	0	1.50	
		Size	Acceptable QTY											
		$\varnothing\leqslant0.10$	Accept											
		$0.10<\varnothing\leqslant0.20$	2											
$0.20<\varnothing\leqslant0.25$	1													
$0.25<\varnothing$	0													
(2) Line type  <table><tr><th>Length L</th><th>Width W</th><th>Acceptable QTY</th></tr><tr><td>accept</td><td>$0.015\geqslant W$</td><td>No check</td></tr><tr><td>$3.0\geqslant L$</td><td>$0.050\geqslant W$</td><td rowspan="2">2</td></tr><tr><td>$2.5\geqslant L$</td><td>$0.080\geqslant W$</td></tr><tr><td></td><td>$0.100<W$</td><td>As round type</td></tr></table>	Length L	Width W	Acceptable QTY	accept	$0.015\geqslant W$	No check	$3.0\geqslant L$	$0.050\geqslant W$	2	$2.5\geqslant L$	$0.080\geqslant W$		$0.100<W$	As round type
Length L	Width W	Acceptable QTY												
accept	$0.015\geqslant W$	No check												
$3.0\geqslant L$	$0.050\geqslant W$	2												
$2.5\geqslant L$	$0.080\geqslant W$													
	$0.100<W$	As round type												
(3) No more than 2 spots and lines within 3 mm. Maximum combined total of round and line defects is 4.														
(4) Scratches criterion is same as that of Round type.														
5.	Pixel deformation	Symbols: W: segment width $\varnothing$: average of diameter $=(A+B)/2$ (1)Pin hole and deformation  <table><tr><th>Width</th><th>Acceptable</th><th>Defect</th></tr><tr><td>$W<0.4$</td><td>$\varnothing\leqslant0.20$</td><td>and $\varnothing\leqslant1/2W$</td></tr><tr><td>$W\geqslant0.4$</td><td>$\varnothing\leqslant0.25$</td><td>and $\varnothing\leqslant1/3W$</td></tr></table> $\varnothing$ under 0.10mm ,acceptable (2) Pixel size should be in the range of 95% to 100% of the normal dimension and the gap between pixels should be less than 150% of normal dimension.	Width	Acceptable	Defect	$W<0.4$	$\varnothing\leqslant0.20$	and $\varnothing\leqslant1/2W$	$W\geqslant0.4$	$\varnothing\leqslant0.25$	and $\varnothing\leqslant1/3W$	2.5		
		Width	Acceptable	Defect										
		$W<0.4$	$\varnothing\leqslant0.20$	and $\varnothing\leqslant1/2W$										
		$W\geqslant0.4$	$\varnothing\leqslant0.25$	and $\varnothing\leqslant1/3W$										
6.	Polarizer bubble $\varnothing=(X+Y)/2$  <table><tr><th>size $\varnothing$</th><th>Acceptable QTY</th></tr><tr><td>$\varnothing\leqslant0.20$</td><td>No check</td></tr><tr><td>$0.20<\varnothing\leqslant0.50$</td><td>3</td></tr><tr><td>$0.50<\varnothing\leqslant1.00$</td><td>2</td></tr><tr><td>$1.00<\varnothing$</td><td>0</td></tr><tr><td>Total QTY</td><td>3</td></tr></table>	size $\varnothing$	Acceptable QTY	$\varnothing\leqslant0.20$	No check	$0.20<\varnothing\leqslant0.50$	3	$0.50<\varnothing\leqslant1.00$	2	$1.00<\varnothing$	0	Total QTY	3	1.5
		size $\varnothing$	Acceptable QTY											
		$\varnothing\leqslant0.20$	No check											
$0.20<\varnothing\leqslant0.50$	3													
$0.50<\varnothing\leqslant1.00$	2													
$1.00<\varnothing$	0													
Total QTY	3													
7.	Contrast	Under normal power supply, uneven contrast is unacceptable.	2.5											
8.	Rainbow	Obvious uneven color in LCD viewing area is not allowed.	2.5											

14. PRECAUTION FOR USE OF LCD MODULE

1. 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, the liquid crystal substance leaks out, do not ingest. If the substance contacts skin or clothes, promptly wash off using soap and water.
- 3) Do not apply excessive force to the display surface or adjoining areas since this may affect the LCD color
- 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 or process the LCD module.

2. Assembling Precautions

- 1) When mounting the LCD module make sure that it is free of twisting, warping, and distortion. Distortion has great influence upon display quality. Also, use an adequately stiff outer case.
- 2) Please handle the LCD module by its side.
- 3) NC terminal should be open. Do not connect anything.
- 4) If the logic circuit power is OFF, do not apply the input signals.
- 5) To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.
 - Be sure to ground the body when handling the LCD module.
 - Tools required for assembly, such as soldering irons, must be properly grounded.
 - To reduce the amount of static electricity generated, do not conduct assembly and other work under dry conditions.
 - The LCD module is coated with a film to protect the display surface. Exercise care when peeling off this protective film since static electricity may be generated.
- 6) Be careful handling the glass panel because it has a very sharp edge.

3. Storage Precautions

- 1) When storing the LCD module, avoid exposure to direct sunlight, to the light of fluorescent lamps, to high temperature or to high humidity. Whenever possible, LCD modules should be stored in the same packaging they were shipped in.
- 2) Exercise care to minimize corrosion of the electrodes. Corrosion of the electrodes is accelerated by water droplets or by current flow in a high-humidity environment.

4. Design Precautions

- 1) The absolute maximum ratings represent the rated value beyond which LCD module can not exceed. When the LCD modules are used in excess of this rated value, their operation characteristics may be adversely affected.
- 2) To prevent the occurrence of erroneous operation caused by noise, attention must be paid to satisfy V_{IL} , V_{IH} specification values including taking the precaution of using signal cables that are short.
- 3) The LCD exhibits temperature dependency characteristics. Since recognition of the display becomes difficult when the LCD is used outside its designated operating temperature range, be sure to use the LCD within this range. Also keep in mind that the LCD driving voltage levels necessary for clear displays will vary according to temperature.
- 4) We recommended that power supply lines (VDD) have over-current protection line. (Fuse etc. Recommend Value:0.5A)
- 5) Sufficiently reduce electrical noise from peripheral devices.
- 6) To cope with EMI, take measures basically on outputting side.
- 7) Assemble LCD module tightly with the application case or PCB.

5. Other considerations

- 1) Liquid crystal solidifies under low temperature (below the storage temperature range) leading to defective orientation or the generation of air bubbles (black or white). Air bubbles may also be generated if the LCD module is subjected to a strong shock at a low temperature.
- 2) If the LCD modules have been operating for a long time showing the same display patterns, the display patterns may remain on the screen as ghost images and a slight contrast irregularity may also appear. A normal operating status can be regained by suspending use for some time. It should be noted that this phenomenon does not adversely affect performance reliability.
- 3) To minimize the performance degradation of the LCD module's resulting from destruction caused by static electricity, etc., exercise care to avoid touching the LCD's electrical connections.
- 4) LCD voltage adjustment may be necessary to obtain the best contrast on each LCD.
- 5) Precaution for disposal of LCD module. When disposal of LCD module, ask specialization company of industrial waste which is permitted by the government. When burn up LCD module, obey the law of environmental hygienic.

