



SHENZHEN APTUS TECHNOLOGY CO., LIMITED

PRODUCT SPECIFICATION

1.44" TFT-LCD MODULE

MODEL NAME: DBT014CIN26C020A

DOC VERSION: 1.0

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FOR CUSTOMER	
CUSTOMER APPROVED	

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1. General Features

Item	Display Panel	Unit/note
Display Mode	Normally while	
LCM size	1.44"	
Viewing Direction	12 o'clock	
Input Signals	4-Line Serial MCU Interface	
Outline Dimensions	27.9 (W)*32.64(H)*2.25(T)	mm
Active Area	25.4976 (H) × 26.496(W)	mm
Number of Pixels	128 × RGB × 128	Pixels
Pixel Arrangement	RGB Vertical stripes	
Drive IC	ST7735	
Input voltage	2.8	V

2. Absolute Maximum Ratings

Item	Symbol	Min.	Max.	Unit	Note
LC Operating Voltage	VOP	--	5.1	V	*1,*2
Operating Temperature	T _{OP}	-20	70	°C	
Storage Temperature	T _{ST}	-30	80	°C	
Operating Ambient Humidity	H _{OP}	10	*4	RH	*3
Storage Humidity	H _{ST}	10	*4	RH	*3

Note:

*1. At 25±5°C

*2. Due to the characteristics of LC Material, the Liquid Crystal driving voltage varies with environmental temperature.

*3. Non-condensation.

*4. Temp. ≤ 60°C, 90%RH Max.

Temp. > 60°C, Absolute humidity shall be less than 90%RH.

3. Electrical Specification

(Unless specified, the ambient temperature $T_a=25^{\circ}\text{C}$)

Item	Symbol	Values			Unit
		Min	Type.	Max	
TFT Operation Frame rate	Hz	/	60	/	Hz
TFT common electrode voltage	VCOM	/	-0.874	/	V
TFT gate on voltage	VGH	/	14	/	V
TFT gate off voltage	VGL	/	-12.5	/	V
Vgh-Vgl	Vgh-Vgl	/	26.5	/	V

Note 1:

VCOM value should be adjusted by different condition to optimize Flicker Value.

Note 2:

VGH and VGL are the operating voltages of TFT gate.

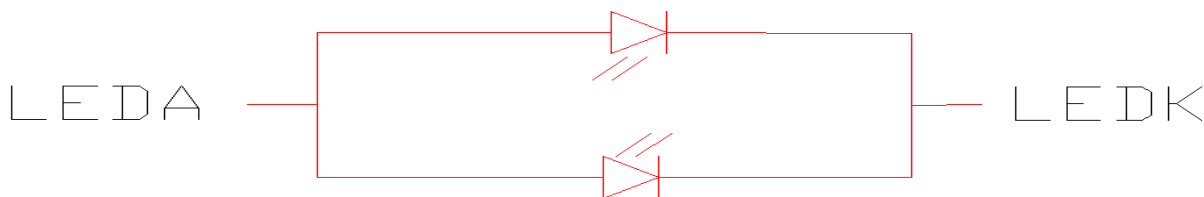
4. TIMING OF POWER SUPPLY

Please refer to the driver IC specification.

5. BACKLIGHT CHARACTERISTICS

Properties	Sym.	Min	Typ.	Max	Unit	Note
Forward voltage	Vf	--	3.2	--	V	
Luminance	Lv		200		cd/m ²	
Electric current	If	30	40	--	mA	
Number of LED	-	2			Piece	-

Circuit Diagram



6. Optical Specification

Optical characteristics are determined after the unit has been 'ON' and stable for approximately 30 minutes in a dark environment at 25 °C. The values specified are at an approximate distance 500mm from the LCD surface at a viewing angle of Φ and θ equal to 0°.

Item	Symbol	Condition	Specification			Unit	Remark
			Min.	Typ.	Max.		
Response Time	Tr + Tf	$\theta = 0^\circ, \Phi = 0^\circ$	-	16	32	ms	Note 1,2,3
Contrast Ratio	CR	$\theta = 0^\circ, \Phi = 0^\circ$	400	500	-		Note 1,2,4
Viewing Angle Direction (Gray Inversion)	-		-	12 O'clock	-		Note 1,2,5,8
Viewing Angle	Left (9 o'clock)	$CR \geq 10$	60	70	-	deg.	Note 1,2,5,8
	Right (3 o'clock)		60	70	-		
	Top (12 o'clock)		55	65	-		
	Bottom (6 o'clock)		50	60	-		
Color Chromaticity (CF only with C light, CIE 1931)	Rx	$\theta = 0^\circ, \Phi = 0^\circ$	-0.015	0.612	+0.015		Note 1,6 CF Glass
	Ry		-0.015	0.328	+0.015		
	Gx		-0.015	0.295	+0.015		
	Gy		-0.015	0.571	+0.015		
	Bx		-0.015	0.141	+0.015		
	By		-0.015	0.159	+0.015		
	Wx		-0.015	0.301	+0.015		
	Wy		-0.015	0.338	+0.015		
Color Gamut (CF only with C light, CIE 1931)	NTSC	$\theta = 0^\circ, \Phi = 0^\circ$ CIE1931	50	53	-	%	Note 1,6 CF Glass
Transmittance (without Polarizer)	Tr	$\theta = 0^\circ, \Phi = 0^\circ$	(15.0)	(17.5)	-	%	Note 1,7 without Pol

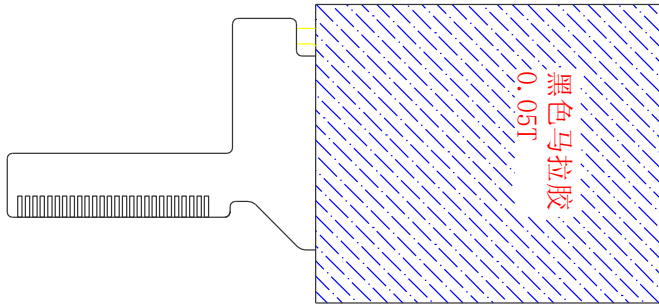
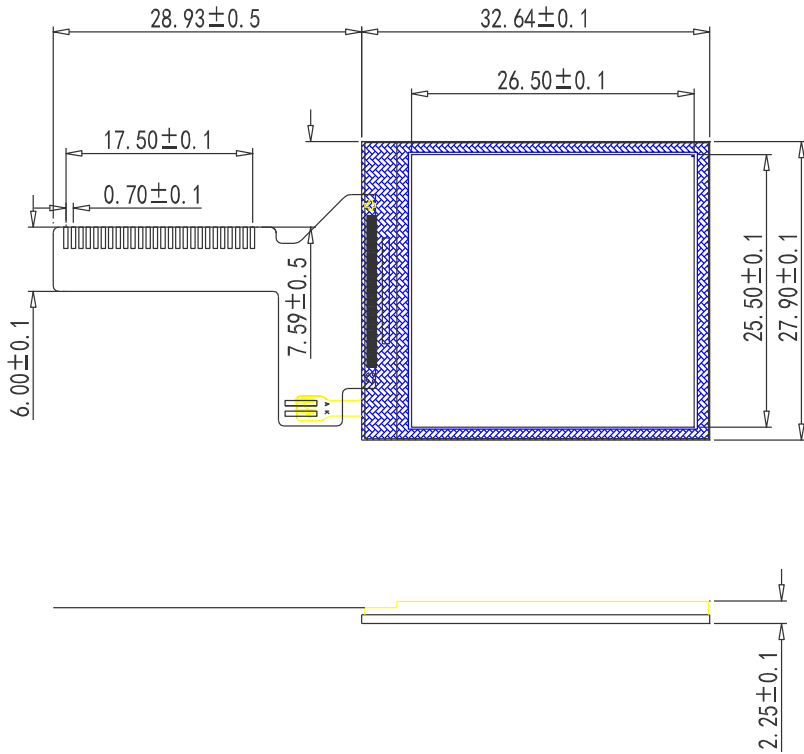
7. Interface Description



1	GND	GND	Power ground
IOVCC	PWOER	I	1.8V/2.8V
3	NC	NC	NC
4	NC	NC	Connect 2.8V
5	NC	NC	NC
6	CS	I	Chip select signal
7	RESET	I/O	LCD Reset Terminal active "L"
8	A0	I/O	Display data/command Selection Pin in MCU Interface.
9	NC	NC	NC
10	NC	NC	NC
11	SCL	I/O	A synchronous clock signal in SPI
12	SDA	I/O	Serial input signal in SP
13	NC	GND	NC
14	GND	I/O	Power ground
15	GND	I/O	Power ground
16-23	NC	I/O	NC
24	VDD	I/O	Connect 2.8V
25	LEDK	I/O	Cathode for back light driver voltage
26	LEDA	I/O	Anode for back light driver voltage

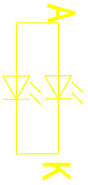
8. Outline Dimension

Customer No.: CUSTOMER_NO.:



PIN	DESCRIPTION
1	GND
2	IDVCC
3	NC
4	NC
5	NC
6	CS
7	RESET
8	AD
9	NC
10	NC
11	SCL
12	SDA
13	NC
14	GND
15	GND
16	NC
17	NC
18	NC
19	NC
20	NC
21	NC
22	NC
23	NC
24	VDD
25	LEDK
26	LEDA

Display Mode	normally white TN
Display Resolution	DOTS:128(R,G,B)*128
Viewing Angle	12 0'CLOCK
LCD Controller/Driver	ST7735
BACKLIGHT	1CHIP-WHITE_LED
Operation Temperature	-20°C ~ 70°C
Storage Temperature	-30°C ~ 80°C



深圳市爱普拓思科技有限公司

DBT1440Q046S

NDI	FIRST ISSUE	DATE	TOLERANCE:	DWN	DSN
NDI	FIRST ISSUE	DATE	DECIMAL: .x ± .80 .xx ± .20 ← ±1/4°	CHKD	APPD
NDI	CONTENT	DATE		100% IN SCALE	UNIT mm

SHEET: 外形图

9. initialization Setup

Please consult our technical department for detail information.

10. Reliability and Inspection Standard

No.	Test Item		Test Conditions	Remark
1	High Temperature	Storage	70°C, 48Hr	Note
		Operation	60°C, 48Hr	Note
2	Low Temperature	Storage	-30°C, 48Hr	Note
		Operation	-20°C, 48Hr	
3	High Temperature and High Humidity		60°C, 90%RH, 24Hr	Note
4	Temperature Cycle	Storage	-10°C(1Hr)→25°C(5min)→60°C(1Hr) 32 Cycles	Note
		Operation	-20°C(1Hr)→25°C(5min)→60°C(1Hr) 25 Cycles	
5	Drop Test		60cm/ 3Corner/ 8Face, 1Cycle	Note

Note:

- 1) The test samples should be applied to only one test item.
- 2) Sample size for each test item is 5~10pcs.
- 3) For Damp Proof Test, pure water(Resistance>1MΩ) should be used.
- 4) In case of malfunction defect caused by ESD damage, if it would be recovered to normal state after resetting, it would be judged as a good part.
- 5) EL evaluation should be excepted from reliability test with humidity and temperature: Some defects such as black spot/blemish can happen by natural chemical reaction with humidity and fluorescence EL has.
- 6) After the reliability test, the test samples should be inspected after 2 hours at least.
- 7) Functional test is OK. Missing segment, shorts, unclear segment, non display, display abnormally, liquid crystal leak are not allowed.
- 8) After testing, the current Idd should be within initial value $\pm 20\%$.
- 9) No low temperature bubbles, end seal loose and fall, frame rainbow, ACF bubble growing are allowable in the appearance test.

11. Inspection Criterion

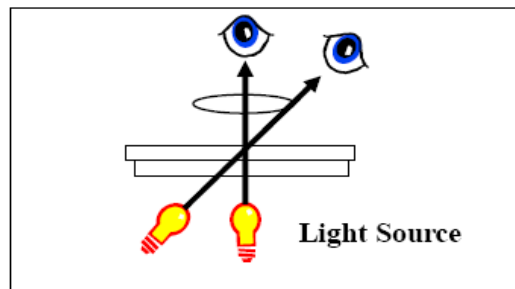
11.1. Sampling Method

Unless otherwise agreed upon in writing, the sampling inspection shall be applied to the Customer's incoming inspection.

- 1) Lot size: Quantity per shipment lot
- 2) Sampling type: Normal inspection , single sampling
- 3) Inspection level: II
- 4) Sampling table: MIL-STD-105D
- 5) Acceptable Quality Level(AQL): Major=0.65 Minor=1.5

11.2. Inspection Method

- 1) Ambient Condition:
 - a. Temperature: Room temperature $25\pm 5^{\circ}\text{C}$
 - b. Illumination: Single fluorescent lamp non-directive(300 to 700 Lux)
- 2) Viewing distance
The distance between the LCD and the inspector' s eyes shall be at least 30-50cm.
- 3) Viewing Angle
The inspection shall be conducted within normal viewing angle range.

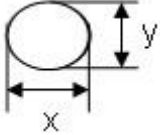



11.3. Inspection Criteria

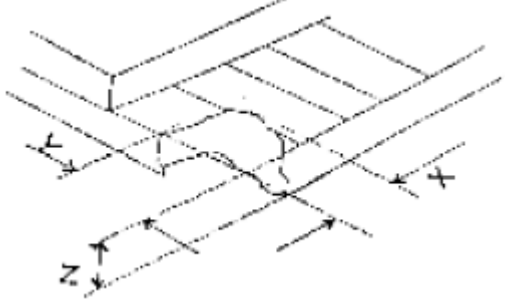
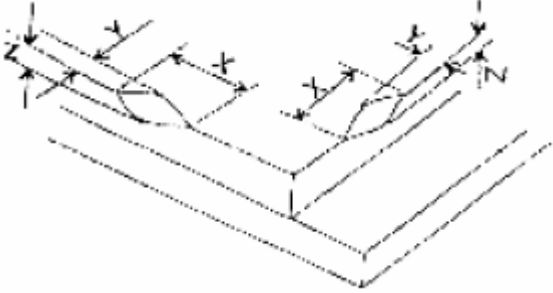
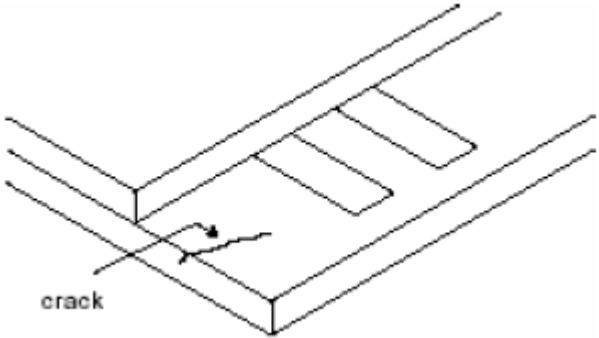
11.3.1. Major defect

No.	Item	Inspection Standard	Classification of defects
1	All functional defects	1) No display 2) Display abnormally 3) Open or missing segment 4) Short circuit 5) Excess power consumption 6) Backlight no lighting, flickering and abnormal lighting	Major
2	Missing	Missing component	Major
3	Outline dimension	Overall outline dimension beyond the drawing is not allowed	Major

11.3.2. Cosmetic Defect

No.	Item	Inspection Standard		Classification of defects											
1	(spot defect) Black and White spot pinhole	For dark/white spot, size Φ is defined as $\Phi=(x+y)/2$			Minor										
		<table border="1"> <thead> <tr> <th>Size Φ (mm)</th> <th>Acceptable Quantity</th> </tr> </thead> <tbody> <tr> <td>$\Phi \leq 0.1$</td> <td>Ignore</td> </tr> <tr> <td>$0.10 \leq \Phi \leq 0.15$</td> <td>2</td> </tr> <tr> <td>$0.15 \leq \Phi \leq 0.2$</td> <td>1</td> </tr> <tr> <td>$0.2 < \Phi$</td> <td>0</td> </tr> </tbody> </table>				Size Φ (mm)	Acceptable Quantity	$\Phi \leq 0.1$	Ignore	$0.10 \leq \Phi \leq 0.15$	2	$0.15 \leq \Phi \leq 0.2$	1	$0.2 < \Phi$	0
		Size Φ (mm)	Acceptable Quantity												
		$\Phi \leq 0.1$	Ignore												
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2	(line defect) Black and White line Polarizer scratch	Define: 		Minor											
		<table border="1"> <thead> <tr> <th>Width(mm)</th> <th>Length(mm); Acceptable Qty</th> </tr> </thead> <tbody> <tr> <td>$\Phi \leq 0.03$</td> <td>Ignore</td> </tr> <tr> <td>$0.03 < W \leq 0.05$</td> <td>$L \leq 3.0$; $N \leq 2$</td> </tr> <tr> <td>$0.05 < W \leq 0.1$</td> <td>$L \leq 2.0$; $N \leq 2$</td> </tr> <tr> <td>$0.1 < W$</td> <td>Define as spot defect</td> </tr> </tbody> </table>			Width(mm)	Length(mm); Acceptable Qty	$\Phi \leq 0.03$	Ignore	$0.03 < W \leq 0.05$	$L \leq 3.0$; $N \leq 2$	$0.05 < W \leq 0.1$	$L \leq 2.0$; $N \leq 2$	$0.1 < W$	Define as spot defect	
		Width(mm)	Length(mm); Acceptable Qty												
		$\Phi \leq 0.03$	Ignore												
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3	Polarizer defect	Dent or bubble(between the polarizer and glass)		Minor											
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11.3.3. Cosmetic Defect

No.	Item	Inspection Standard	Classification of defects						
1	Glass defect	<p>1) Chip on the corner</p>  <table border="1" data-bbox="400 712 1104 819"> <tr> <td>X</td> <td>Y</td> <td>Z</td> </tr> <tr> <td>≤3.0</td> <td>≤S</td> <td>≤T</td> </tr> </table> <p>Remark: S=contact pad length; T=the thickness of glass Chips on the corner of terminal shall not be allowed to extend into the ITO pad or expose perimeter seal. Acceptable Quantity N≤2.</p>	X	Y	Z	≤3.0	≤S	≤T	Minor
		X	Y	Z					
		≤3.0	≤S	≤T					
<p>2) Chip on the edge of glass</p>  <table border="1" data-bbox="400 1393 1104 1512"> <tr> <td>X</td> <td>Y</td> <td>Z</td> </tr> <tr> <td>Ignore</td> <td>≤0.5</td> <td>≤T</td> </tr> </table> <p>Acceptable Quantity: N≤2</p>	X	Y	Z	Ignore	≤0.5	≤T	Minor		
X	Y	Z							
Ignore	≤0.5	≤T							
<p>3) Creak Creaks tend to break are not allowed.</p> 	Minor								

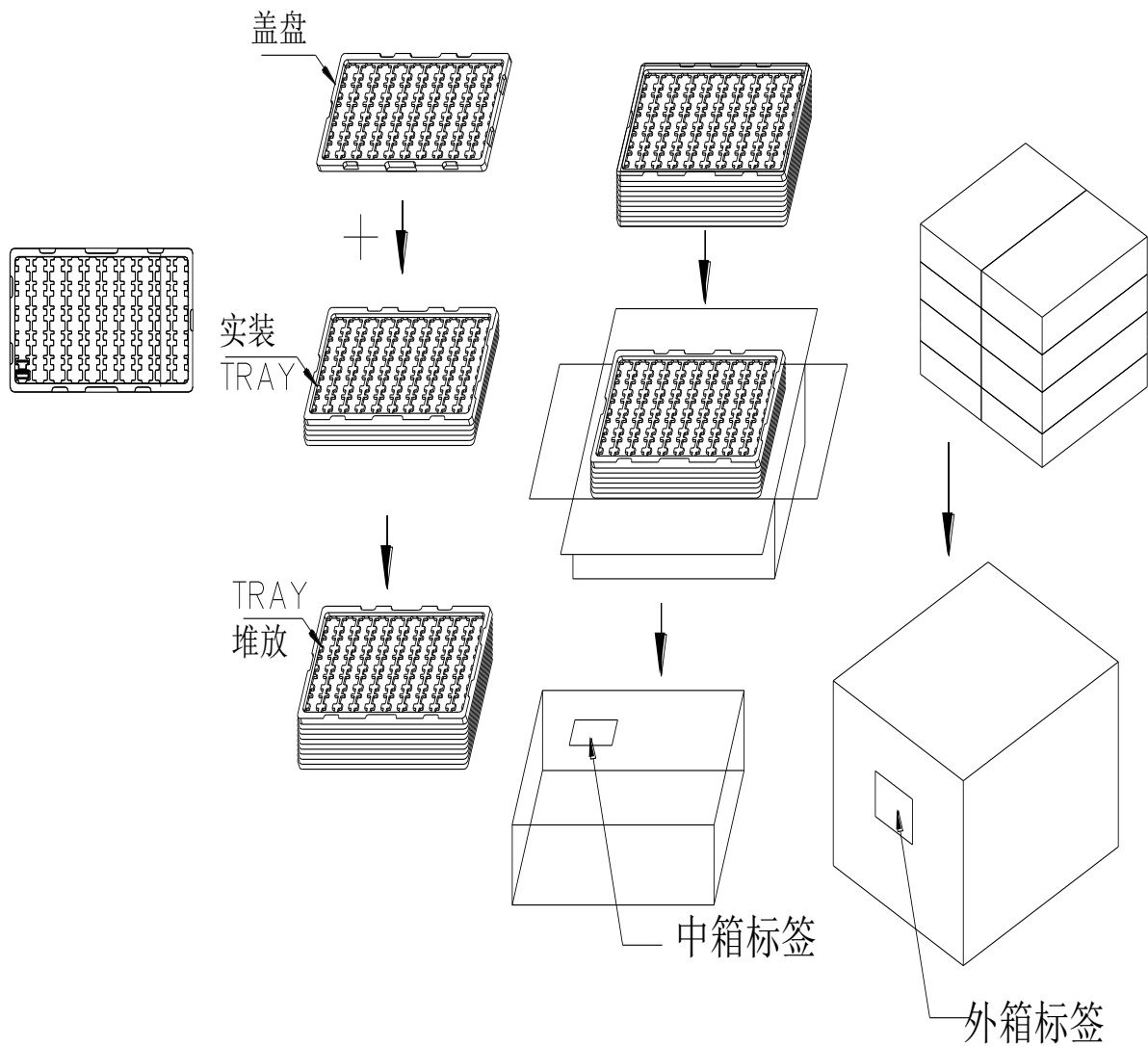
12. Packing Dimension

Packaging Quantity:

One tray Include: **TBD** pcs module;

One B-F Box Include: **TBD** pcs tray; **TBD** pcs Module;

One Carton Include: **TBD**-set B-F Box; **TBD** pcs tray; **TBD** pcs Module



■ PRECAUTIONS FOR USING LCD MODULES

Handing Precautions

- (1) The display panel is made of glass and polarizer. As glass is fragile, it tends to become or chipped during handling especially on the edges. Please avoid dropping or jarring. Do not subject it to a mechanical shock by dropping it or impact.
- (2) If the display panel is damaged and the liquid crystal substance leaks out, be sure not to get any in your mouth. If the substance contacts your skin or clothes, wash it off using soap and water.
- (3) Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary. Do not touch the display with bare hands. This will stain the display area and degraded insulation between terminals (some cosmetics are determined to the polarizer).
- (4) The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully. Do not touch, push or rub the exposed polarizers with anything harder than an HB pencil lead (glass, tweezers, etc.). Do not put or attach anything on the display area to avoid leaving marks on. Condensation on the surface and contact with terminals due to cold will damage, stain or dirty the polarizer. After products are tested at low temperature they must be warmed up in a container before coming is contacting with room temperature air.
- (5) If the display surface becomes contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If it is heavily contaminated, moisten cloth with one of the following solvents
 - Isopropyl alcohol
 - Ethyl alcoholDo not scrub hard to avoid damaging the display surface.
- (6) Solvents other than those above-mentioned may damage the polarizer. Especially, do not use the following.
 - Water
 - Ketone
 - Aromatic solventsWipe off saliva or water drops immediately, contact with water over a long period of time may cause deformation or color fading. Avoid contacting oil and fats.
- (7) Exercise care to minimize corrosion of the electrode. Corrosion of the electrodes is accelerated by water droplets, moisture condensation or a current flow in a high-humidity environment.
- (8) Install the LCD Module by using the mounting holes. When mounting the LCD module make sure it is free of twisting, warping and distortion. In particular, do not forcibly pull or bend the I/O cable or the backlight cable.
- (9) Do not attempt to disassemble or process the LCD module.
- (10) NC terminal should be open. Do not connect anything.
- (11) If the logic circuit power is off, do not apply the input signals.
- (12) Since LCM has been assembled and adjusted with a high degree of precision, avoid applying excessive shocks to the module or making any alterations or modifications to it.
 - Do not alter, modify or change the shape of the tab on the metal frame.
 - Do not make extra holes on the printed circuit board, modify its shape or change the positions of components to be attached.
 - Do not damage or modify the pattern writing on the printed circuit board.
 - Absolutely do not modify the zebra rubber strip (conductive rubber) or heat seal connector.
 - Except for soldering the interface, do not make any alterations or modifications with a soldering iron.

- Do not drop, bend or twist LCM.

Storage Precautions

When storing the LCD modules, the following precaution is necessary.

- (1) Store them in a sealed polyethylene bag. If properly sealed, there is no need for the dessicant.
- (2) Store them in a dark place. Do not expose to sunlight or fluorescent light, keep the temperature between 0°C and 35°C.
- (3) The polarizer surface should not come in contact with any other objects. (We advise you to store them in the container in which they were shipped).

Others

Liquid crystals solidify 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 module is subject to a low temperature.

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.

To minimize the performance degradation of the LCD modules resulting from destruction caused by static electricity etc., exercise care to avoid holding the following sections when handling the modules.

- Exposed area of the printed circuit board.
- Terminal electrode sections.