

LCM Specification

PRODUCT TYPE:	TFT MODULE
PRODUCT P/N:	ET128A06
VERSION:	V0

Customer（客户）		
INSPECTION RESULT 检测结果	TESTED BY 检测人	APPROVED BY 确认人

Supplier(屏厂)		
DESIGNED BY	CHECKED BY	APPROVED BY

Revision History

Date	Rev.	Reason
2023.06.06	V0	NEW ISSUE

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■ GENERAL DESCRIPTION

ET128A06 is a color active matrix LCD module incorporating amorphous silicon **TFT** (Thin Film Transistor). It is composed of a color TFT-LCD panel, driver IC, FPC and a backlight unit. The module display area contains **240(RGB)x240**pixels and can display up to **16.7M** colors. This product accords with RoHS environmental criterion.

■ GENERAL FEATURES

Item	Contents	Unit
LCD Type	IPS	/
Viewing direction	ALL	O' Clock
Outside Dimensions	46.6mm(W)*47.4mm(H)*3.25mm(T)	mm
Active area (WxH)	32.4mm(W)×32.4mm(H)	mm
Number of Dots	240(RGB) x240	/
Driver IC	GC9A01	/
Colors	16.7M	/
Backlight Type	2LEDS / White	/
Interface Type	8 bit MCU	/
Input voltage	3.3	V

■ ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Min	Max	Unit
Power for Circuit Driving	VDD	-0.3	4.6	V
Power for Circuit Logic	VDD	-0.3	4.6	V
Input voltage	Vin	-0.3	VDD + 0.5	V
Operating temperature	Top	-10	60	℃
Storage temperature	Tst	-20	70	℃
Humidity	RH	/	90%(Max60℃)	RH

■ ELECTRICAL SPECIFICATIONS

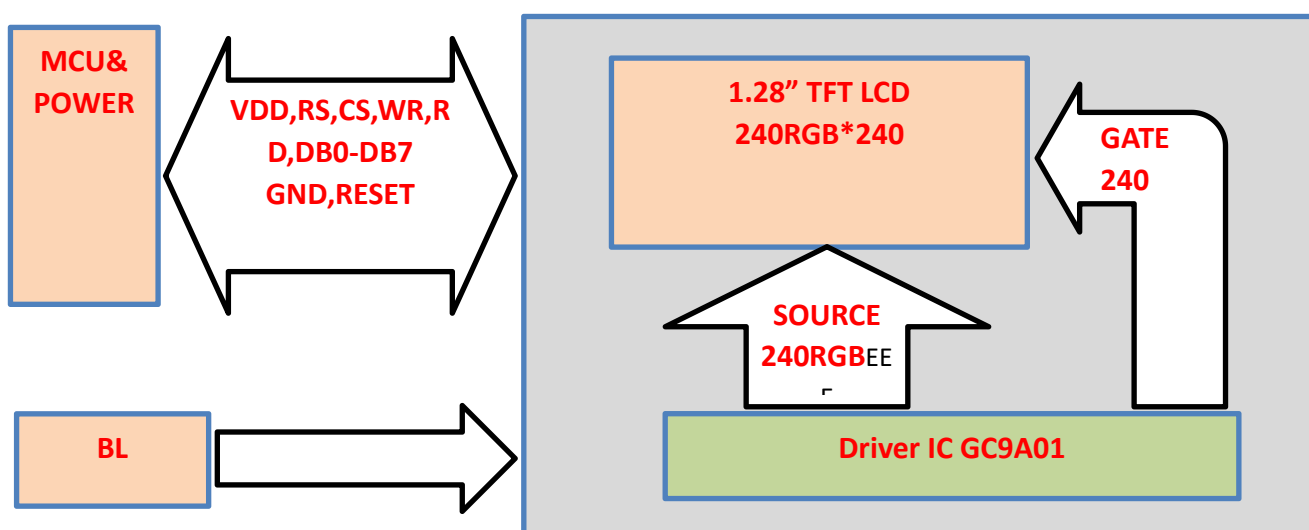
Parameter	Symbol	Min	Typ	Max	Unit
Power for analog/logic	VDD -Vss	-	3.3	3.6	V
I/O power supply	VCI	-	3.3	3.6	V
Input Current	Idd	TBD	TBD	TBD	V
Input voltage ' H ' level	Vih	0.7IOVCC	--	IOVCC	°C
Input voltage ' L ' level	Vil	GND	0	0.3IOVCC	
Output voltage ' H ' level	Voh	0.8IOVCC	--	IOVCC	°C
Output voltage ' L ' level	Vol	GND	0	0.2IOVCC	RH

■ BACKLIGHT CHARACTERISTICS

Using condition: constant current driving method $I_f = 20\text{mA}(+/-10\%)$

Item	Symbol	Min	Typ	Max	Unit	Condition
Forward voltage	Vf	2.8	3.0	3.2	V	--
Luminance with LCD	Lv	-	250	-	cd/m2	$I_f = 40\text{mA}$
Number of LED	--	2			Pcs	--
Connection mode	--	2P			--	--

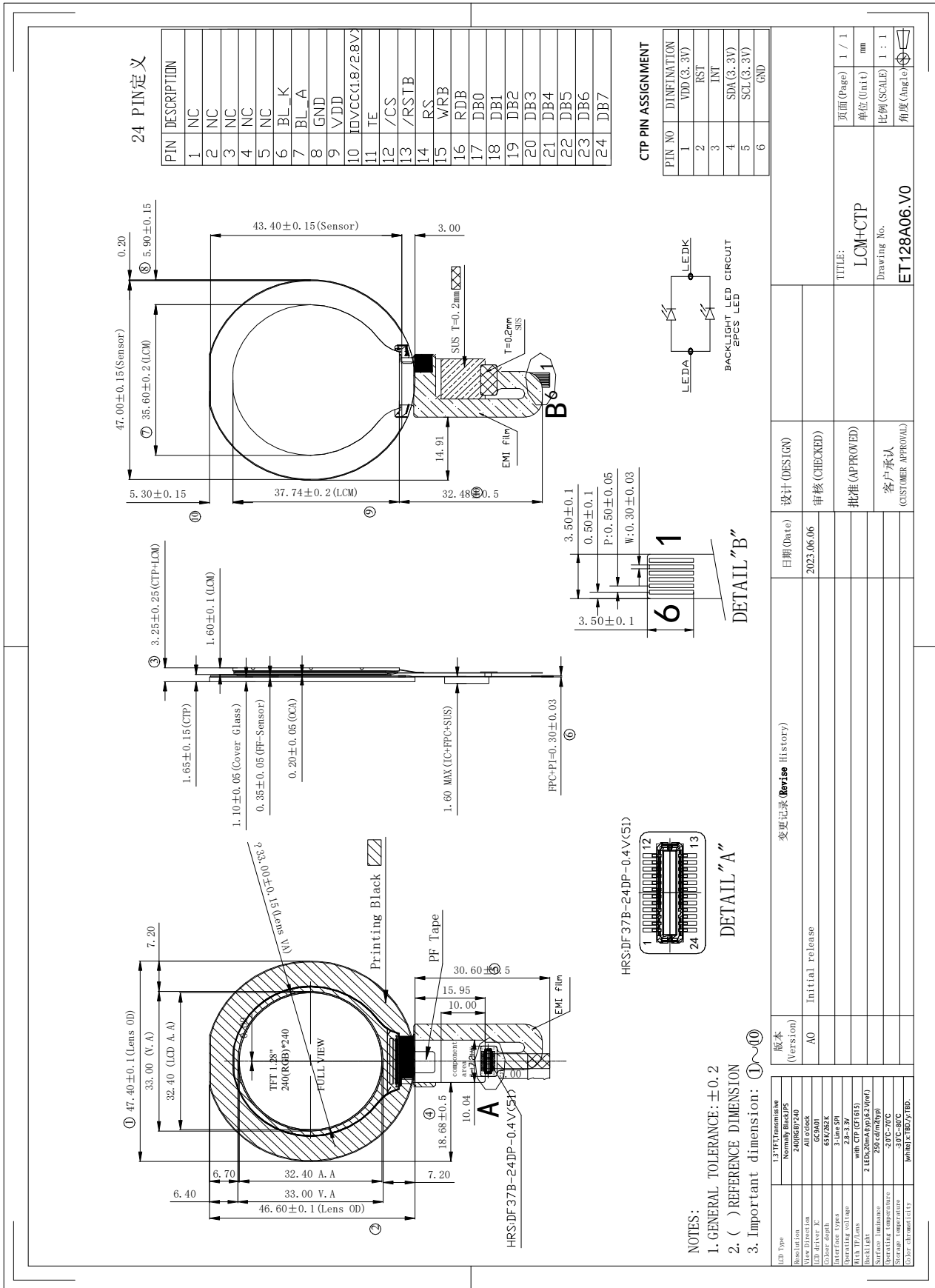
■ BLOCK DIAGRAM



■ PIN DESCRIPTION

Pin.No	Symbol	DESCRIPTION
1-5	NC	NC
6	LEDK	LED BACKLIGHT CATHODE
7	LEDA	LED BACKLIGHT ANODE
8	GND	GROUND
9	VCC	POWER SUPPLY
10	IOVCC	POWER SUPPLY
11	TE	Serve as a TE (Tearing Effect) output signal Leave the pin open when not in use.
12	CS	Chip selection pin
13	RSTB	This signal will reset the device
14	RS	Display data/command selection (RS) pin in MCU interface. DCX='1': display data or parameter. DCX='0': register index / command.
15	WR	Write enable in MCU parallel interface
16	RD	Read enable in 8080 MCU parallel interface.
17	DB0	DATA
18	DB1	DATA
19	DB2	DATA
20	DB3	DATA
21	DB4	DATA
22	DB5	DATA
23	DB6	DATA
24	DB7	DATA

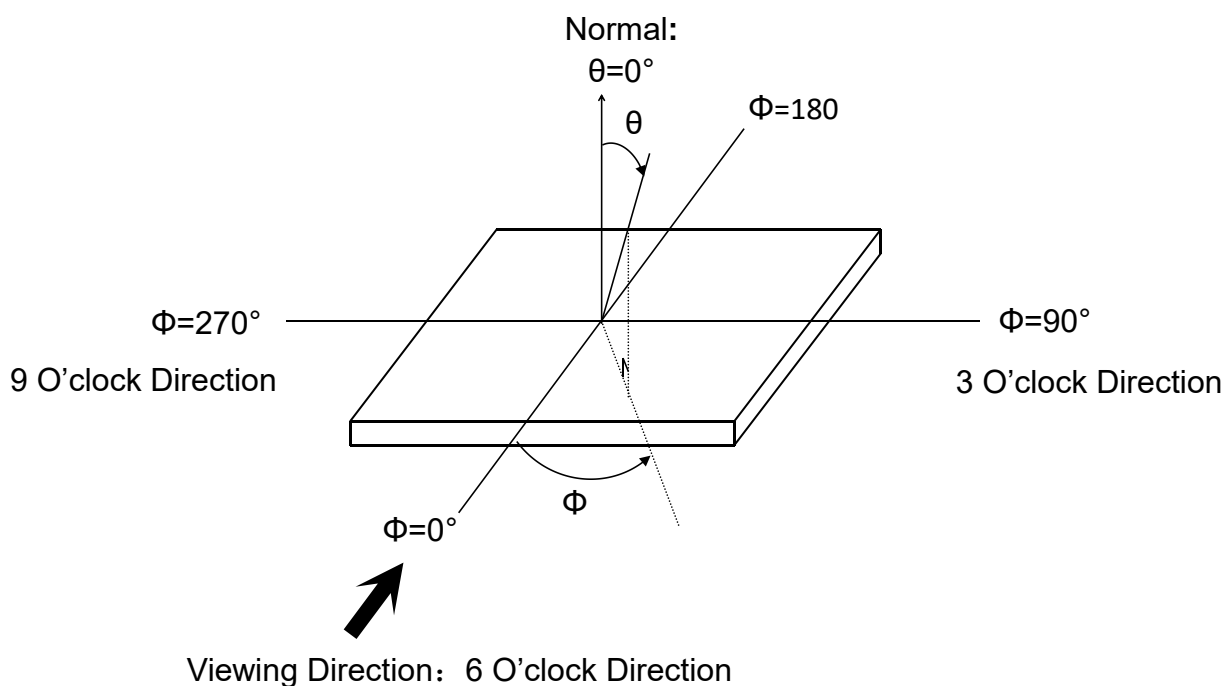
■ OUTLINE DIMENSION



■ OPTICAL SPECIFICATIONS

Item		Symbol	Condition	Min	Typ	Max	Unit	Note
Response time		Tr+Tf	$\theta=0^\circ$ $\Phi=0^\circ$ $T_a=25^\circ\text{C}$	-	20	30	ms	/
Contrast ratio		Cr		600	800	-	-	/
Luminance uniformity		δ WHITE		80	-	-	%	/
Surface Luminance		LV		-	250	-	cd/m ²	/
Viewing angle range		θ	$\Phi=90^\circ$	-	85	-	deg	/
			$\Phi=270^\circ$	-	85	-	deg	
			$\Phi=0^\circ$	-	85	-	deg	
			$\Phi=180^\circ$	-	85	-	deg	
CIE(x,y) chromaticity	Red	x	$\theta=0^\circ$ $\Phi=0^\circ$ $T_a=25^\circ\text{C}$	0.642	0.657	0.672	/	/
		y		0.306	0.321	0.336		
	Green	x		0.259	0.274	0.289		
		y		0.586	0.601	0.616		
	Blue	x		0.121	0.136	0.151		
		y		0.080	0.095	0.110		
	White	x		0.283	0.298	0.313		
		y		0.315	0.330	0.345		

Definition of Viewing Angle θ and Φ



■ TIMING CHARACTERISTICS

Please refer to the datasheet of GC9A01 for details。

Item		Symbol	Min.	Typ.	Max.	Unit
DCLK Frequency		Fclk	5	9	12	MHz
DCLK Period		Tclk	83	110	200	ns
Hsync	Period Time	Th	490	531	605	DCLK
	Display Period	Thdisp		480		DCLK
	Back Porch	Thbp	8	43		DCLK
	Front Porch	Thfp	2	8		DCLK
	Pulse Width	Thw	1			DCLK
Vsync	Period Time	Tv	275	288	335	H
	Display Period	Tvdisp		272		H
	Back Porch	Tvbp	2	12		H
	Front Porch	Tvfp	1	4		H
	Pulse Width	Tvw	1	10		H

■ INSPECTION CRITERION

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

Inspection Method

1) Ambient Condition:

a. Temperature: Room temperature $25 \pm 5^{\circ}\text{C}$

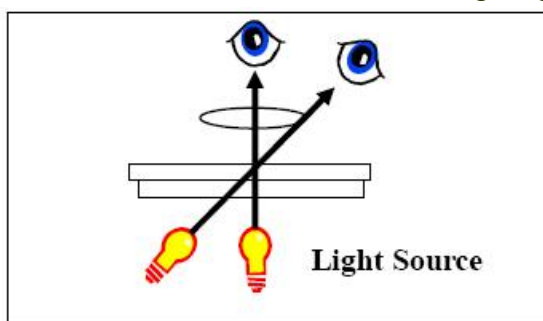
b. Illumination: Single fluorescent lamp non-directive(300 to 700 Lux)

2) Viewing distance

The distance between the LCD and the inspector' s eyes shall be at least 30-50cm.

3) Viewing Angle

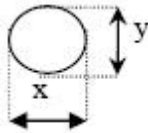
The inspection shall be conducted within normal viewing angle range.

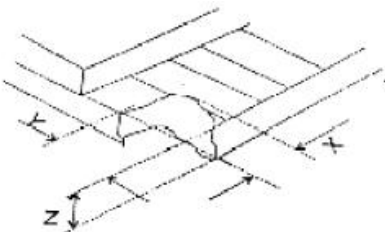
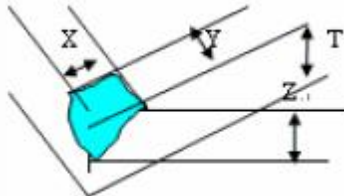
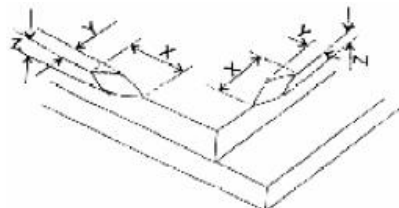
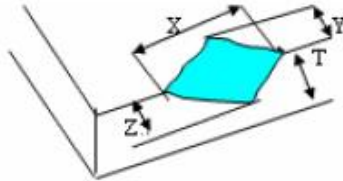
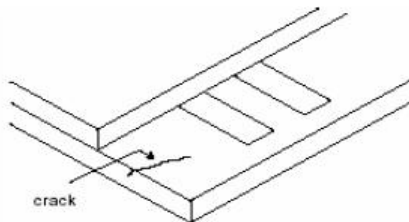


Major Defect

No	Items	Inspection Standard	Classification of defects
1	All functional defects	1.No display 2.Display abnormally 3.Missing vertical, horizontal segment 4.Short circuit 5. Back-light no lighting, flickering and abnormal lighting.	Major
2	Missing	Missing component	
3	Outline dimension	Overall outline dimension beyond the drawing is not allowed.	
4	linearity	No more than 1.5%	

Cosmetic Defect

No	Items	Inspection Standard		Classification of defects
1	Clear Spot, Black Spot, white Spot, defect Pinhole, Foreign Particle, polarizer Dirt TP Dirt	For dark/white spot, size Φ is defined as $\Phi=(x+y)/2$ <div>  </div>		Minor
		Size(mm)	Acceptable Qty	
		$\Phi \leq 0.15$	Ignore	
		$0.15 < \Phi \leq 0.20$	2	
		$0.20 < \Phi \leq 0.30$	1	
		$\Phi > 0.30$	0	
		2	(line defect) Black and White line Polarizer scratch	
Width(mm)	Length(mm);Acceptable Qty			
$W \leq 0.03$	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			
3	Dim Spots Circle shaped and dim edged defects			/
		Size(mm)	Acceptable Qty	
		$\Phi \leq 0.2$	Ignore	
		$0.20 < \Phi \leq 0.40$	2	
		$0.40 < \Phi \leq 0.60$	1	
		$\Phi > 0.60$	0	

No	Items	Inspection Standard	Classification of defects						
4	Glass defect TP defect	(1) Chips on corner (A:LCD Glass defect) <div>  <table> <tr> <th>X(mm)</th> <th>Y(mm)</th> <th>Z(mm)</th> </tr> <tr> <td>≤2.0</td> <td>≤S</td> <td>Disregard</td> </tr> </table> <p>Notes: S=contact pad length Chips on the corner of terminal shall not be allowed to extend into the ITO pad or expose perimeter seal.</p> </div>	X(mm)	Y(mm)	Z(mm)	≤2.0	≤S	Disregard	Minor
		X(mm)	Y(mm)	Z(mm)					
		≤2.0	≤S	Disregard					
		(2) Chips on corner (TP Glass defect) <div>  <table> <tr> <th>X(mm)</th> <th>Y(mm)</th> <th>Z(mm)</th> </tr> <tr> <td>≤3.0</td> <td>≤3.0</td> <td>Disregard</td> </tr> </table> </div>	X(mm)	Y(mm)	Z(mm)	≤3.0	≤3.0	Disregard	
		X(mm)	Y(mm)	Z(mm)					
≤3.0	≤3.0	Disregard							
(3) Usual surface cracks (LCD Glass defect) <div>  <table> <tr> <th>X(mm)</th> <th>Y(mm)</th> <th>Z(mm)</th> </tr> <tr> <td>≤3.0</td> <td><Inner border line of the seal</td> <td>Disregard</td> </tr> </table> </div>	X(mm)	Y(mm)	Z(mm)	≤3.0	<Inner border line of the seal	Disregard			
X(mm)	Y(mm)	Z(mm)							
≤3.0	<Inner border line of the seal	Disregard							
(4) Usual surface cracks (TP Glass defect) <div>  <table> <tr> <th>X(mm)</th> <th>Y(mm)</th> <th>Z(mm)</th> </tr> <tr> <td>≤6.0</td> <td><2.0</td> <td>Disregard</td> </tr> </table> </div>	X(mm)	Y(mm)	Z(mm)	≤6.0	<2.0	Disregard			
X(mm)	Y(mm)	Z(mm)							
≤6.0	<2.0	Disregard							
(5) Crack (Cracks tend to break are not allowed.) <div>  </div>									

■ RELIABILITY

NO.	TEST ITEM	CONDITIONS
1	High Temperature Storage	80℃; 96 hrs
2	Low Temperature Storage	-30℃; 96 hrs
3	High Temperature Operation	70℃; 96 hrs
4	Low Temperature Operation	20℃; 96 hrs
5	High Temperature and High Humidity Operation	60℃, 90% RH; 96 hrs
6	Thermal shock(Storage)	-30℃(0.5Hr)→80℃(0.5Hr) 96 Cycles

NOTE:

1. All judgement of display are performed after temperature of panel return to room temperature.
2. Display function should be no change under normal operating condition.
3. Under no condensation of dew.
4. WE only guarantee the above 6 test items, and without guarantee the others.

■ PRECAUTIONS

Handling 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 solvents

Wipe 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.