



PRODUCT SPECIFICATION FOR TFT LCD MODULE

MODULE NO. : V220HF01A-T

REVERSION : V1.0

CUSTOMER : _____

Customer Approval:

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PREPARED BY		DATE	
CHECKED BY		DATE	
APPROVED BY		DATE	

DOCUMENT REVISION HISTORY

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1. GENERAL SPECIFICATIONS

1-1 SCOPE:

This specification covers the delivery requirements for the liquid crystal display delivered to Customer.

1-2 PRODUCTS:

Liquid Crystal Display Module (LCM)

2. FEATURES

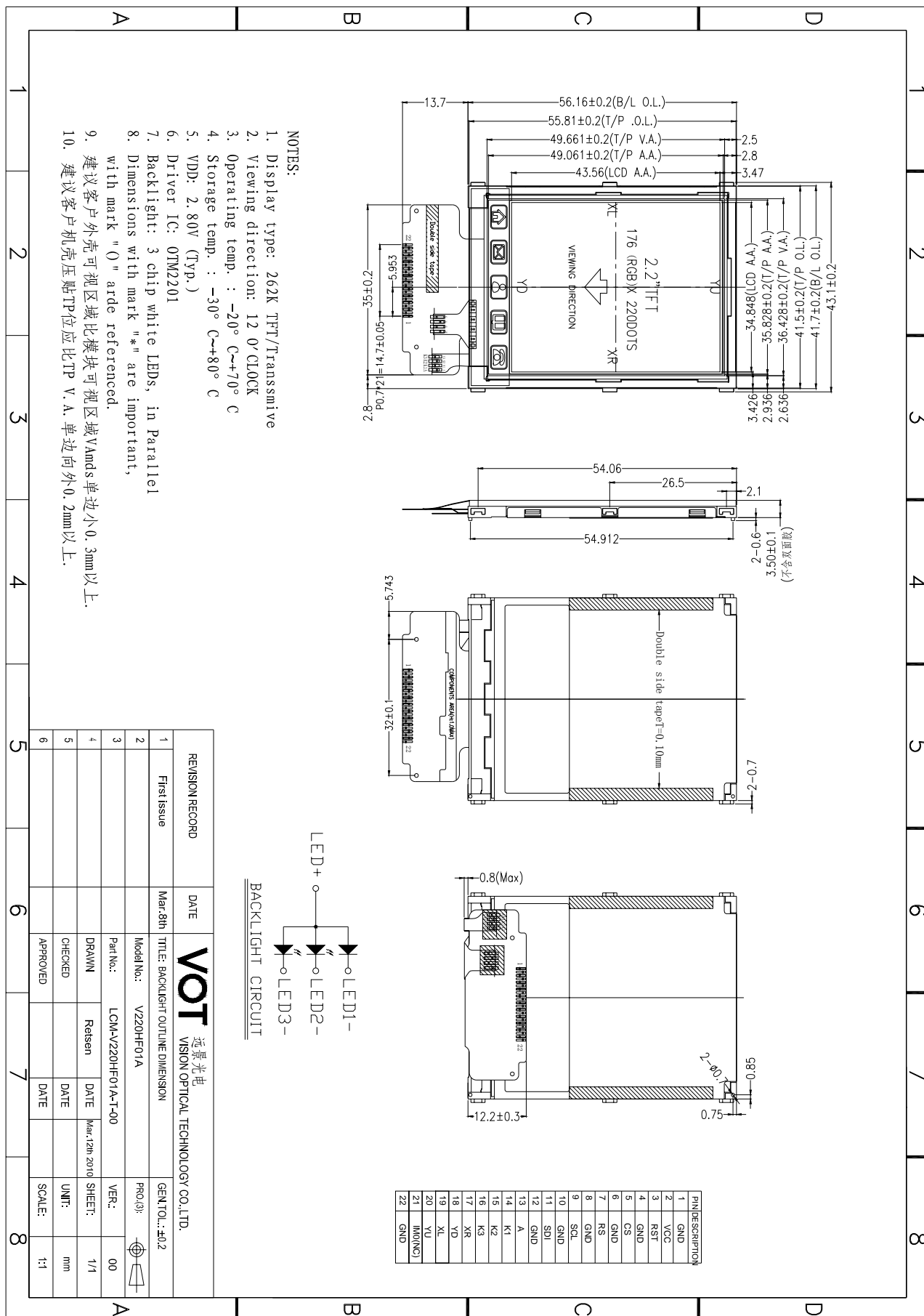
2-1 MAIN LCD (LARGE)

- (1) Display Type: TFT Transmissive, 12o'clock,Negative
- (2) With WHITE LED Backlight
- (3) DISP COLOR : 65K/262K

3. MECHANICAL SPECIFICATIONS

ITEM	SPECIFICATIONS	UNIT
OUTLINE DIMENSIONS	56.16(H) x 41.7(W) x 3.5±0.1 (T)	mm
ACTIVE AREA	43.56(H) x 34.848 (W)	mm
PIXEL ARRANGEMENT	RGB VERTICAL STRIPE	---
NUMBER OF DOTS	176x RGB x220	Dots
DOT PITCH	0.198(H) x 0.198(V)	um
VIEWING DIRECTION	12 O'CLOCK	
DRIVER IC	OTM2201	
ASSY.TYPE	COG+FPC	---
BACKLIGHT	WHITE LED	—
WEIGHT	TBD	g

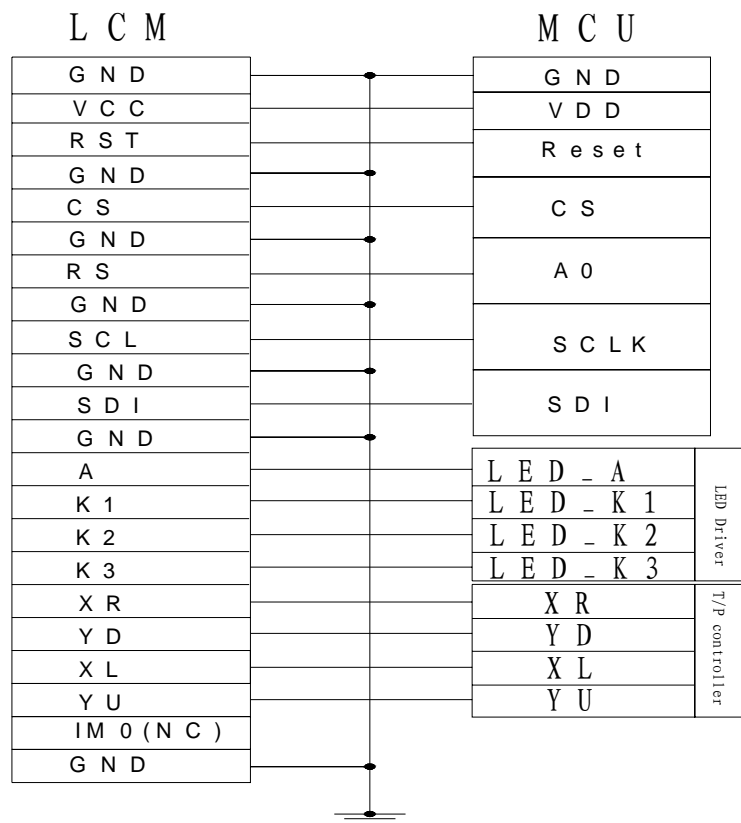
4. OUTLINE DIMENSIONS



5. INTERFACE ASSIGNMENT

PIN NO.	SYMBOL	FUNCTION DESCRIPTIONS
1	GND	Power Supply (GND)
2	VCC	Power Supply (+2.8V)
3	RST	Reset signal
4	GND	Power Supply (GND)
5	CS	Chip selection pin, Low enable
6	GND	Power Supply (GND)
7	RS	Data/Instruction select input pin
8	GND	Power Supply (GND)
9	SCL	Serial clock signal
10	GND	Power Supply (GND)
11	SDI	Serial data input / output pin
12	GND	Power Supply (GND)
13	A	Anode of Backlight
14	K1	Cathode of Backlight
15	K2	
16	K3	
17	XR	Touch Panel Control PIN
18	YD	
19	XL	
20	YU	
21	IM0	Not connect
22	GND	Power Supply (GND)

6. APPLICATION CUICIRT



7. ABSOLUTE MAXIMUM RATING

Item	Symbol	Unit	Value	Note
Power supply voltage (1)	IOVCC	V	-0.3 ~ +4.6	1, 2
Power supply voltage (1)	VCI – GND	V	-0.3 ~ +4.6	1, 4
Power supply voltage (1)	DDVDH – GND	V	-0.3 ~ +6.0	1, 4
Power supply voltage (1)	GND – VCL	V	-0.3 ~ +4.6	1
Power supply voltage (1)	DDVDH – VCL	V	-0.3 ~ +9.0	1, 5
Power supply voltage (1)	VGH – GND	V	-0.3 ~ +18.5	1, 5
Power supply voltage (1)	GND – VGL	V	-0.3 ~ +18.5	1, 6
Input voltage	Vt	V	-0.3 ~ VCI+ 0.3	1
Operating temperature	Topr	°C	-40 ~ +85	8, 9
Storage temperature	Tstg	°C	-55 ~ +110	8, 9

Notes:

1. VCI,GND must be maintained
2. (High) VCI ≥ GND (Low), (High) IOVCC ≥ GND (Low).
3. Make sure (High) VCI ≥ GND (Low).
4. Make sure (High) DDVDH ≥ ASSD (Low).
5. Make sure (High) DDVDH ≥ VCL (Low).
6. Make sure (High) VGH ≥ ASSD (Low).
7. Make sure (High) ASSD ≥ VGL (Low).
8. For die and wafer products, specified up to 85°C.
9. This temperature specifications apply to the TCP package

8. DC CHARACTERISTICS

(VCI = 2.50 ~ 3.30V, IOVCC = 1.65 ~ 3.30V, Ta = -40 ~ 85 °C)

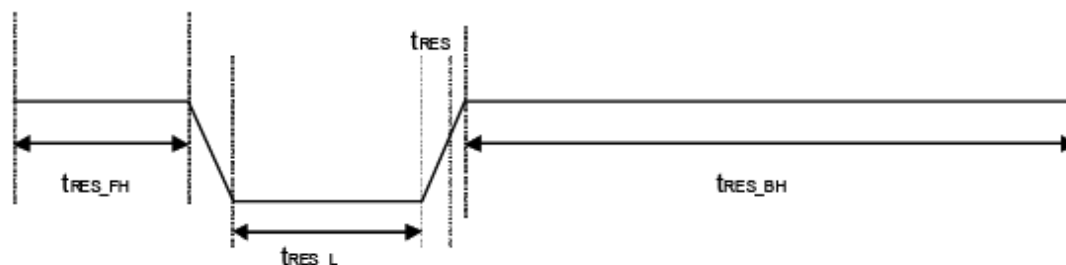
Item	Symbol	Unit	Test Condition	Min.	Typ.	Max.	Note
Input high voltage	V _{IH}	V	IOVCC = 1.65 ~ 3.3V	0.7*IOVCC	-	IOVCC	-
Input low voltage	V _{IL}	V	IOVCC = 1.65 ~ 3.3V	-0.3	-	0.3*IOVCC	-
Output high voltage(1) (DB0-17 Pins)	V _{OH1}	V	IOH = -0.1 mA	0.8*IOVCC	-	-	-
Output low voltage (DB0-17 Pins)	V _{OL1}	V	IOVCC=1.65~3.3V VCI= 2.5 ~ 3.3V IOL = 0.1mA	-	-	0. 2*IOVCC	-
I/O leakage current	I _I	μA	Vin = 0 ~ IOVCC	-0.1	-	0.1	-
Current consumption during standby mode (VCI- GND)	I _{ST}	μA	VCI=2.8V , Ta=25 °C	-	5	10	-
LCD Driving Voltage (DDVDH-GND)	DDVDH	V	-	4.5	-	6	-
Output voltage deviation		mV	-	-	5	-	-
Dispersion of the Average Output Voltage	V	mV	-	-10	-	10	-

9. RESET TIMING CHARACTERISTICS

Reset Timing Characteristics (IOVCC = 1.65 ~ 3.3 V)

Item	Symbol	Unit	Min.	Typ.	Max.
Reset front high-level width	t _{RES_FH}	ms	1	-	-
Reset low-level width	t _{RES_L}	ms	10	-	-
Reset back high-level width	t _{RES_BH}	ms	50	-	-
Reset rise time	t _{rRES}	μs			10

nRESET



10. AC CHARACTERISTICS

VISION OPTICAL TECHNOLOGY CO., LTD.

Tel: 86-755-61319228

Fax: 86-755-61319229

I80-System Interface Timing Characteristics

Normal Write Mode (IOVCC = 1.65~3.3V, VCI=2.5~3.3V)

Item	Symbol	Unit	Min.	Max.	Test Condition
Bus cycle time	Write	t_{CYCW}	ns	70	-
	Read	t_{CYCR}	ns	300	-
Write low-level pulse width	PW_{LW}	ns	15	500	-
Write high-level pulse width	PW_{HW}	ns	15	-	-
Read low-level pulse width	PW_{LR}	ns	150	-	-
Read high-level pulse width	PW_{HR}	ns	150	-	-
Write / Read rise / fall time	t_{WRr}/t_{WRf}	ns	-	15	-
Setup time	Write (RS to nCS, E/nWR)	t_{AS}	ns	10	-
	Read (RS to nCS, RW/nRD)			5	-
Address hold time	t_{AH}	ns	5	-	-
Write data set up time	t_{DSW}	ns	10	-	-
Write data hold time	t_H	ns	15	-	-
Read data delay time	t_{DDR}	ns	-	100	-
Read data hold time	t_{DHR}	ns	5	-	-

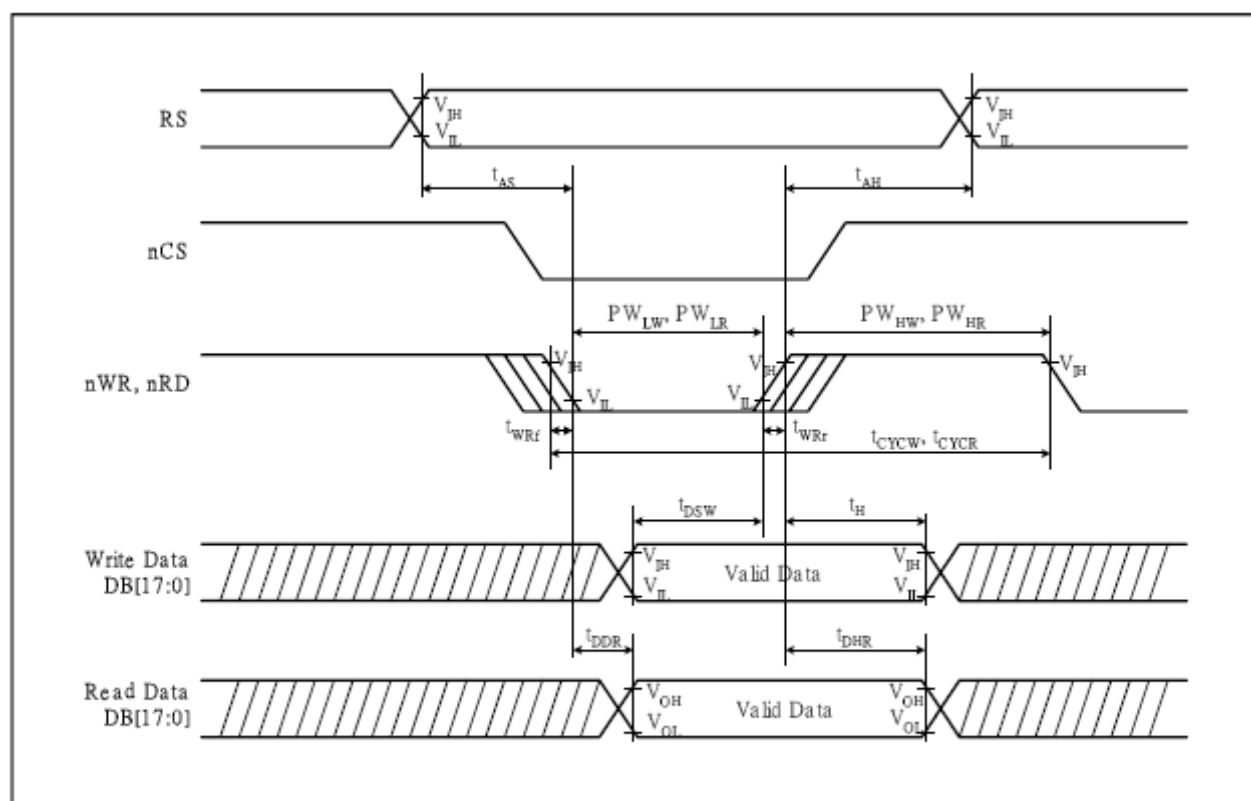
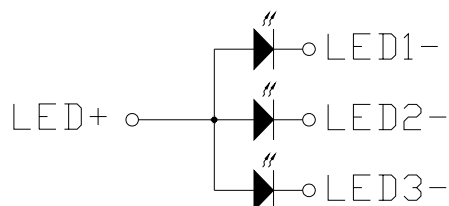


Figure46 i80-System Bus Timing

11. LED BACKLIGHT

11-1 POWER SUPPLY FOR LED BACKLIGHT



11-2 ABSOLUTE MAXIMUM RATING

PARAMETER	SYMBOL	SPECIFICATIONS	UNIT
POWER DISSIPATION	PD	144	mW
OPERATION TEMPERATURE	TOPR	-20℃ ~+70℃	℃
STORAGE TEMPERATURE	TSTG	-30℃ ~+80℃	℃

11-3 ELECTRICAL CHARACTERISTICS

PARAMETER	SYMBOL	REMARK	STANDARD VALUE			UNIT
			MIN	TYP	MAX	
FORWARD VOLTAGE	VF	If =45 mA	3.0	3.2	3.4	V
LUMINOUS INTENSITY(Without LCD)	lv	If =45 mA	3000	—	—	cd/m2
LUMINOUS TOLERANCE	lv-m	(min/max)	80	85	—	%

12. OPTICAL CHARACTERISTICS

Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Threshold voltage		Vsat		2.2	2.3	2.4	V	Fig. 1
		Vth		1.3	1.4	1.5	V	
Viewing Angle range	Horizontal	Θ_3	CR > 10	40	45		Deg.	Note 1
		Θ_9		40	45		Deg.	
	Vertical	Θ_{12}		45	50		Deg.	
		Θ_6		15	20		Deg.	
Contrast ratio		CR	$\Theta = 0^\circ$		300			Note 2
Transmittance		T(%)	$\Theta = 0^\circ$		7.5			Note 3
White Chromaticity		x_w	$\Theta = 0^\circ$	0.281	0.301	0.321		*Color Filter Glass
		y_w		0.320	0.340	0.360		
Reproduction Of color	Red	x_R	$\Theta = 0^\circ$	0.549	0.569	0.589		
		y_R		0.296	0.316	0.336		
	Green	x_G		0.284	0.304	0.324		
		y_G		0.533	0.553	0.573		
	Blue	x_B		0.125	0.145	0.165		
		y_B		0.160	0.180	0.200		
Response Time		Tr+Tf	$\Theta = 0^\circ$		25		msec	Note 4

Note :

- Viewing angle is the angle at which the contrast ratio is greater than 10. The viewing are determined for the horizontal or 3, 9 o'clock direction and the vertical or 6, 12 o'clock direction with respect to the optical axis which is normal to the LCD surface (see FIGURE 2 shown in Appendix).
- Contrast measurements shall be made at viewing angle of $\Theta = 0^\circ$ and at the center of the LCD surface. Luminance shall be measured with all pixels in the view field set first to white, then to the dark (black) state. (See FIGURE 2 shown in Appendix) Luminance Contrast Ratio (CR) is defined mathematically.

$$CR = \frac{\text{Luminance when displaying a white raster}}{\text{Luminance when displaying a black raster}}$$

3. Transmittance is the value with Polarizer The color chromaticity coordinates specified in Table 2 shall be calculated from the spectral data measured with all pixels first in red, green, blue and white. Measurements shall be made at the center of the C/F. Measurement condition is C - light source & Halogen Lamp.
4. The electro-optical response time measurements shall be made as FIGURE 3 shown in Appendix by switching the "data" input signal ON and OFF. The times needed for the luminance to change from 10% to 90% is Tr, and 90% to 10% is Tf.

13. ENVIRONMENTAL ABSOLUTE MAXIMUM RATINGS

ITEM	SYMBOL	CONDITIONS	CRITERION
OPERATING AMBIENT TEMPERATURE	TOPR	-20°C ~ +70°C	NO DEFECT IN DISPLAYING AND OPERATIONAL FUNCTION
OPERATING AMBIENT HUMIDITY	HOP	10~90%RH	WITHOUT CONDENSATION
STORAGE TEMPERATURE	TSTG	-30°C ~ +80°C	NO DEFECT IN DISPLAYING AND OPERATIONAL FUNCTION
STORAGE HUMIDITY	HSTG	10~90%RH	WITHOUT CONDENSATION

14. RELIABILITY

14-1 RELIABILITY TEST

ITEM	CONDITIONS	CRITERION
OPERATING TEMPERATURE	HIGH TEMPERATURE +70°C 24HRS	NO DEFECT IN DISPLAYING AND OPERATIONAL FUNCTION
	LOW TEMPERATURE - 20°C 12HRS	
STORAGE TEMPERATURE	HIGH TEMPERATURE +80°C 96HRS	NO DEFECT IN DISPLAYING AND OPERATIONAL FUNCTION
	LOW TEMPERATURE - 30°C 16HRS	
HUMIDITY	40°C 90%RH 96HRS	NO DEFECT IN DISPLAYING AND OPERATIONAL FUNCTION
VIBRATION	<ul style="list-style-type: none"> Operating Time: thirty minutes exposure for each direction (X,Y,Z) Sweep Frequency: 10~55Hz (1 min) Amplitude: 1.5mm 	NO DEFECT IN DISPLAYING AND OPERATIONAL FUNCTION
THERMAL SHOCK	-20°C (30mins) \leftrightarrow +65°C (30mins) 10 cycles	NO DEFECT IN DISPLAYING AND OPERATIONAL FUNCTION

*NOTE: TEST CONDITION

(1) TEMPERATURE AND HUMIDITY: IF NO SPECIFICATION, TEMP. SET AT 25±2°C, HUMIDITY SET AT 60±5%RH

(2) OPERATING STATE: SAMPLES SUBJECT TO THE TESTS SHALL BE IN "OPERATING" CONDITION

15. PRECAUTIONS FOR USE OF LCD MODULES

15-1 HANDING PRECAUTIONS

- (1) The display panel is made of glass. 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.
- (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 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 alcohol
- (6) Solvents other than those above-mentioned may damage the polarizer. Especially, do not use the following.
 - Water
 - Ketone
 - Aromatic solvents
- (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) 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 modules.
 - Tools required for assembling, such as soldering irons, must be properly grounded.
 - To reduce the amount of static electricity generated, do not conduct assembling 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.

15-2 STORAGE PRECAUTIONS

When storing the LCD modules, avoid exposure to direct sunlight or to the light of fluorescent lamps. Keep the modules in bags (avoid high temperature / high humidity and low temperatures below 0°C). Whenever possible, the LCD modules should be stored in the same conditions in which they were shipped from our company.

15-3 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.

16. USING LCD MODULES

16-1 LIQUID CRYSTAL DISPLAY MODULES

LCD is composed of glass and polarizer. Pay attention to the following items when handling.

- (1) Please keep the temperature within specified range for use and storage. Polarization degradation, bubble generation or polarizer peel-off may occur with high temperature and high humidity.
- (2) Do not touch, push or rub the exposed polarizers with anything harder than an HB pencil lead (glass, tweezers, etc.).
- (3) N-hexane is recommended for cleaning the adhesives used to attach front/rear polarizers and reflectors made of organic substances which will be damaged by chemicals such as acetone, toluene, ethanol and isopropylalcohol.
- (4) When the display surface becomes dusty, wipe gently with absorbent cotton or other soft material like chamois soaked in petroleum benzin. Do not scrub hard to avoid damaging the display surface.
- (5) Wipe off saliva or water drops immediately, contact with water over a long period of time may cause deformation or color fading.
- (6) Avoid contacting oil and fats.
- (7) Condensation on the surface and contact with terminals due to cold will damage, stain or dirty the polarizers. After products are tested at low temperature they must be warmed up in a container before coming in contact with room temperature air.
- (8) Do not put or attach anything on the display area to avoid leaving marks on.
- (9) Do not touch the display with bare hands. This will stain the display area and degrade insulation between terminals (some cosmetics are determined to the polarizers).
- (10) As glass is fragile. It tends to become chipped during handling especially on the edges. Please avoid dropping or jarring.

16-2 PRECAUTION FOR HANDLING LCD MODULES

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.

- (1) Do not alter, modify or change the shape of the tab on the metal frame.
- (2) Do not make extra holes on the printed circuit board, modify its shape or change the positions of components to be attached.
- (3) Do not damage or modify the pattern writing on the printed circuit board.
- (4) Absolutely do not modify the zebra rubber strip (conductive rubber) or heat seal connector.
- (5) Except for soldering the interface, do not make any alterations or modifications with a soldering iron.
- (6) Do not drop, bend or twist LCM.
- (7) In order to avoid the cracking of the FPC, you should pay attention to the area of FPC(R50mm) where the FPC was bent. the edge of cover lay ; the area of surface of Ni-Au plating ,the area of soldering land the area of through hole.

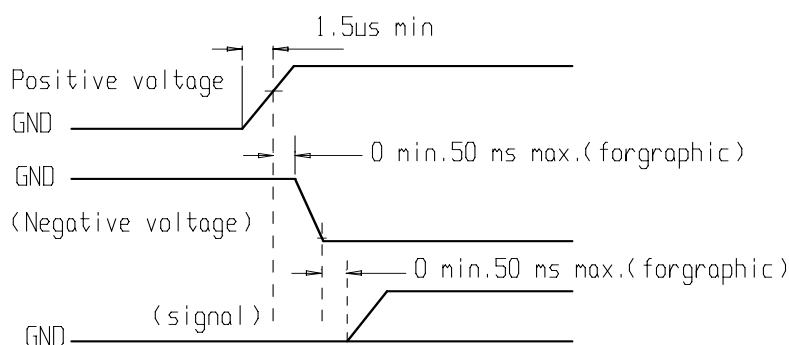
16-3 ELECTRO-STATIC DISCHARGE CONTROL

Since this module uses a CMOS LSI, the same careful attention should be paid to electrostatic discharge as for an ordinary CMOS IC.

- (1) Make certain that you are grounded when handing LCM.
- (2) Before remove LCM from its packing case or incorporating it into a set, be sure the module and your body have the same electric potential.
- (3) When soldering the terminal of LCM, make certain the AC power source for the soldering iron does not leak.
- (4) When using an electric screwdriver to attach LCM, the screwdriver should be of ground potentiality to minimize as much as possible any transmission of electromagnetic waves produced sparks coming from the commutator of the motor.
- (5) As far as possible make the electric potential of your work clothes and that of the work bench the ground potential.
- (6) To reduce the generation of static electricity be careful that the air in the work is not too dried. A relative humidity of 50%-60% is recommended.

16-4 PRECAUTIONS FOR OPERATION

- (1) Viewing angle varies with the change of liquid crystal driving voltage (VO). Adjust VO to show the best contrast.
- (2) Driving the LCD in the voltage above the limit shortens its life.
- (3) Response time is greatly delayed at temperature below the operating temperature range. However, this does not mean the LCD will be out of the order. It will recover when it returns to the specified temperature range.
- (4) If the display area is pushed hard during operation, the display will become abnormal. However, it will return to normal if it is turned off and then back on.
- (5) Condensation on terminals can cause an electrochemical reaction disrupting the terminal circuit. Therefore, it must be used under the relative condition of 40°C , 50% RH.
- (6) When turning the power on, input each signal after the positive/negative voltage becomes stable.



16-5 STORAGE

When storing LCDs as spares for some years, the following precaution are necessary.

- (1) Store them in a sealed polyethylene bag. If properly sealed, there is no need for 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.)
- (4) Environmental conditions :
 - Do not leave them for more than 160hrs. at 70°C.
 - Should not be left for more than 48hrs. at -20°C.

16-6 SAFETY

(1) It is recommended to crush damaged or unnecessary LCDs into pieces and wash them off with solvents such as acetone and ethanol, which should later be burned.

(2) If any liquid leaks out of a damaged glass cell and comes in contact with the hands, wash off thoroughly with soap and water.

16-7 LIMITED WARRANTY

Unless agreed between and customer, will replace or repair any of its LCD modules which are found to be functionally defective when inspected in accordance with LCD acceptance standards (copies available upon request) for a period of one year from date of shipments. Cosmetic/visual defects must be returned to within 90 days of shipment. Confirmation of such date shall be based on freight documents. The warranty liability of limited to repair and/or replacement on the terms set forth above. will not be responsible for any subsequent or consequential events.

16-8 RETURN LCM UNDER WARRANTY

No warranty can be granted if the precautions stated above have been disregarded. The typical examples of violations are :

- Broken LCD glass.
- Circuit modified in any way, including addition of components.

Module repairs will be invoiced to the customer upon mutual agreement. Modules must be returned with sufficient description of the failures or defects. Any connectors or cable installed by the customer must be removed completely without damaging the PCB's eyelet, conductors and terminals.