NAN YA PLASTICS CORPORATION

SPECIFICATION OF
LCD MODULE
PRODUCT NO.: LMAJ6R003APS

SPEC. NO.: LM003-0D-△0

CUSTOMER
APPROVED BY
DATE:

LCD DEPARTMENT
ELECTRONIC MATERIALS DIVISION
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EDITED ON : Mar. 06. 2006

Q.C. DEPT.	DESIGN MANAGER	DESIGN CHECK	DESIGNER
			W.R.HSU

RECORDS OF REVISION

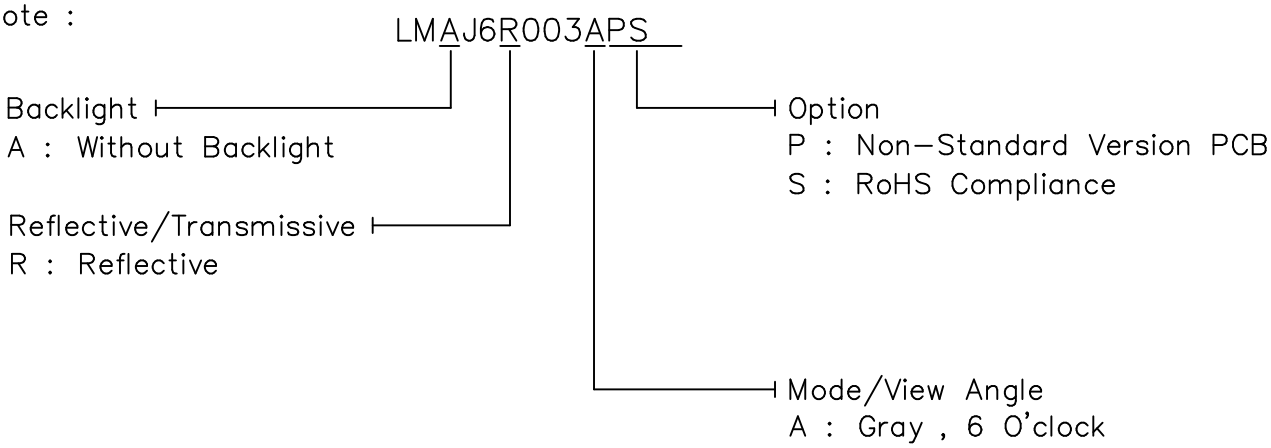
SPEC. NO.: LM003–0D

DATE	REVISED NO.	REF. PAGE	SUMMARY	DESIGN	CHECK
03.06.06'	0	1~22/22	First Issue	W.R.HSU	

1. MECHANICAL DATA

NO	ITEM	CONTENTS	UNIT
1	Product No.	LMAJ6R003APS	–
2	Module Size	180.0 (W) x 65.0 (H) x MAX 10.5 (D)	mm
3	Dot Size	0.49 (W) x 0.49 (H)	mm
4	Dot Pitch	0.53 (W) x 0.53 (H)	mm
5	Number of Dots	240 (W) x 64 (H)	Dot
6	Duty	1/64	–
7	LCD Display Mode	STN, Gray Mode	–
8	Rear Polarizer	Reflective Type	–
9	Viewing Direction	6	O'clock
10	Backlight	Excluded	–
11	Controller	T6963CFG-0101(C)	–
12	DC/DC Converter	Excluded	–
13	Weight	130 (Approx.)	g

Note :



RoHS Compliance.

Nan Ya guarantees that this project doesn't include any materials (6 materials) or includes less than specified quantities which are regulated by RoHS Compliance.

2. ABSOLUTE MAXIMUM RATINGS

(1) ELECTRICAL ABSOLUTE RATINGS

VSS=0V

	SYMBOL	MIN.	MAX.	UNIT	COMMENT
Power Supply for Logic	VDD-VSS	-0.3	5.5	V	
Input Voltage	VI	-0.3	VDD	V	
Static Electricity	-	-	-	-	Note 1

Note 1 LCM should be grounded during handling LCM.

(2) ENVIRONMENTAL ABSOLUTE MAXIMUM RATINGS

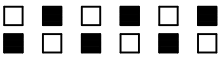
ITEM	NORMAL TEMP.			
	OPERATING		STORAGE	
	MIN.	MAX.	MIN.	MAX.
Ambient Temperature	0	50	-20	70
Humidity (Without Condensation)	Note 2,4		Note 3,4	

Note 2 Ta ≦ 50°C : 80%RH max

Note 3 Please refer to item of reliability test

Note 4 Background color will change slightly depending on ambient temperature. That phenomenon is reversible.

3. ELECTRICAL CHARACTERISTICS

ITEM	SYMBOL	CONDITION		MIN.	TYP.	MAX.	UNIT
Power Supply for Logic	VDD−VSS	−		4.5	5.0	5.5	V
Input Voltage	VIH	H level		0.8VDD	−	VDD	V
	VIL	L level		0	−	0.2VDD	
Recommended LC Driving Voltage	VDD−VEE (Vop)	Duty= 1/64	0°C	13.3	13.7	14.1	V
			25°C	12.2	12.6	13.0	
			50°C	11.4	11.8	12.2	
Power Supply Current	IDD	VDD−VSS=5.0V VDD−VEE=12.6V Ta=25°C Pattern: 		−	15	25	mA
	IEE			−	2	4	

4.OPTICAL CHARACTERISTICS

NORMAL TEMPERATURE MODE

AT V_{OP}

ITEM / MODE		Cr(Contrast Ratio)						θ(Viewing Angle)		φ(Viewing Angle)	
		0°C		25°C		50°C		25°C		25°C	
		MIN.	TYP.	MIN.	TYP.	MIN.	TYP.	MIN.	TYP.	MIN.	TYP.
R	A	2.0	3.0	3.0	4.5	1.5	2.0	–	F: 35 R: 25	–	L: 25 R: 25
NOTE		NOTE 6						NOTE 5			

NOTE :

T : Reflective

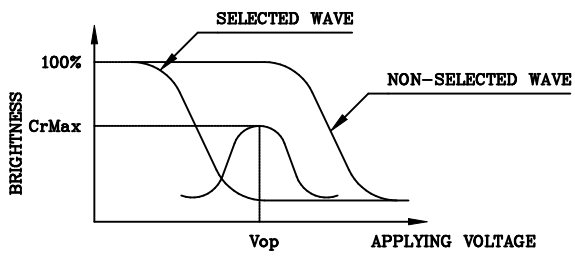
A : Gray , 6 O'clock

AT φ=0° θ=0°

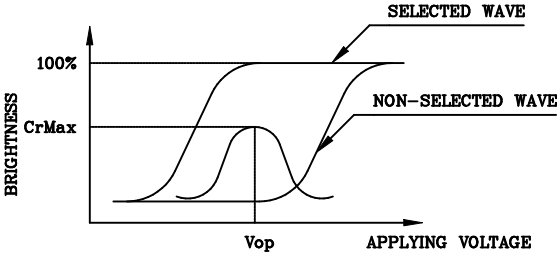
ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Response Time (rise)	Tr	0℃	–	600	900	ms	NOTE 2
		25℃	–	110	170		
		50℃	–	50	80		
Response Time (fall)	Tf	0℃	–	900	1500	ms	NOTE 2
		25℃	–	250	380		
		50℃	–	100	150		

(NOTE 1)

Definition of Operation Voltage(Vop)



(positive type)



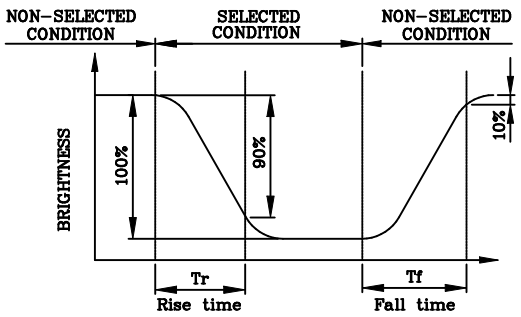
(negative type)

*Conditions

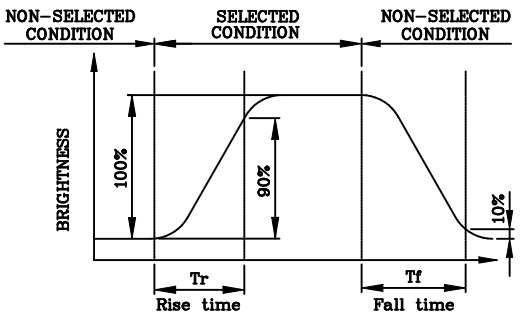
Viewing Angle : 0
Frame Frequency : 70Hz
Applying Waveform : 1/N duty 1/a bias

(NOTE 2)

Definition of Response Time(Tr,Tf)



(positive type)



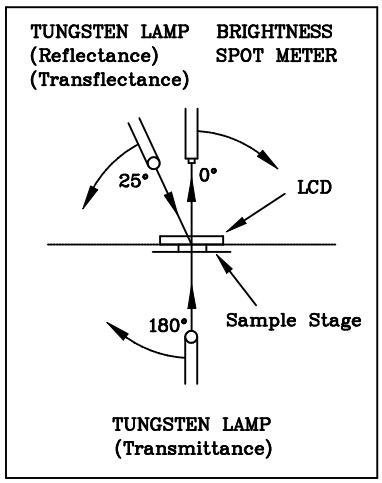
(negative type)

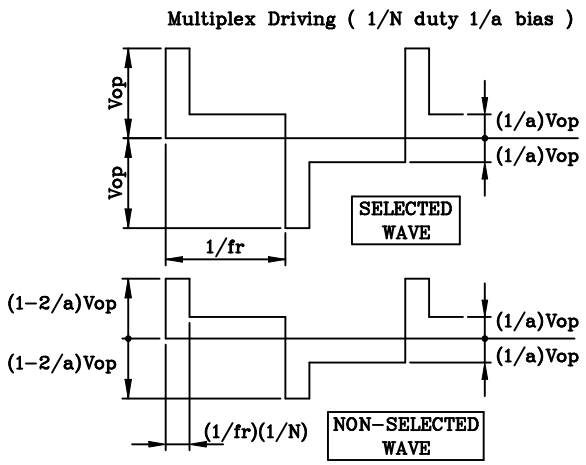
*Conditions

Operating Voltage : Vop
Viewing Angle (θ,ϕ) : (0,0)
Frame Frequency : 70Hz
Applying Waveform : 1/N duty 1/a bias

(NOTE 3)

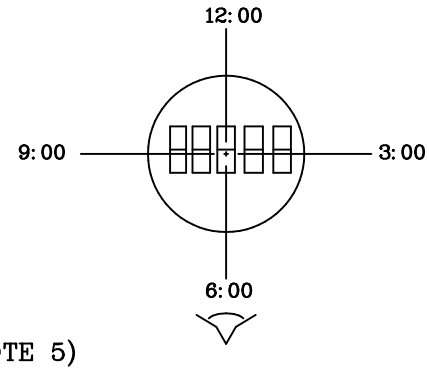
Description of Measuring Equipment and Driving Waveforms





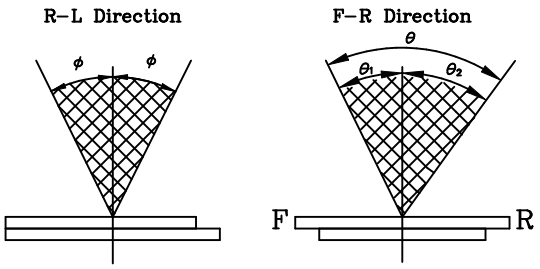
(NOTE 4)

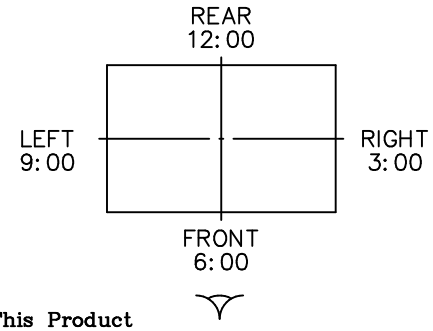
Definition of Viewing Direction



(NOTE 5)

Definition of Viewing Angle





*For This Product

The Viewing Direction Is 6 O'clock

So $\theta_1 > \theta_2$

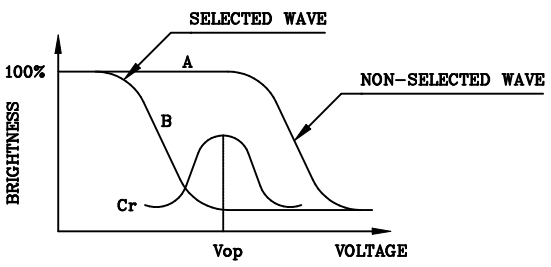
$\theta = \theta_1 + \theta_2$

*Conditions

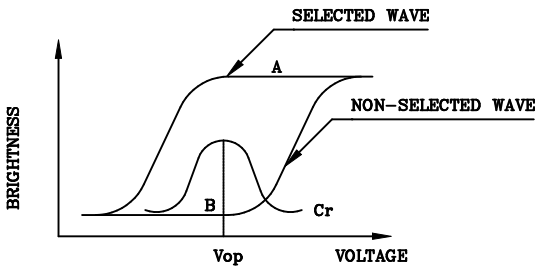
Operating Voltage : Vop
Frame Frequency : 70Hz
Applying Waveform : 1/N duty 1/a bias
Contrast Ratio : larger than 2

(NOTE 6)

Definition of Contrast Ratio (Cr)



(positive type)



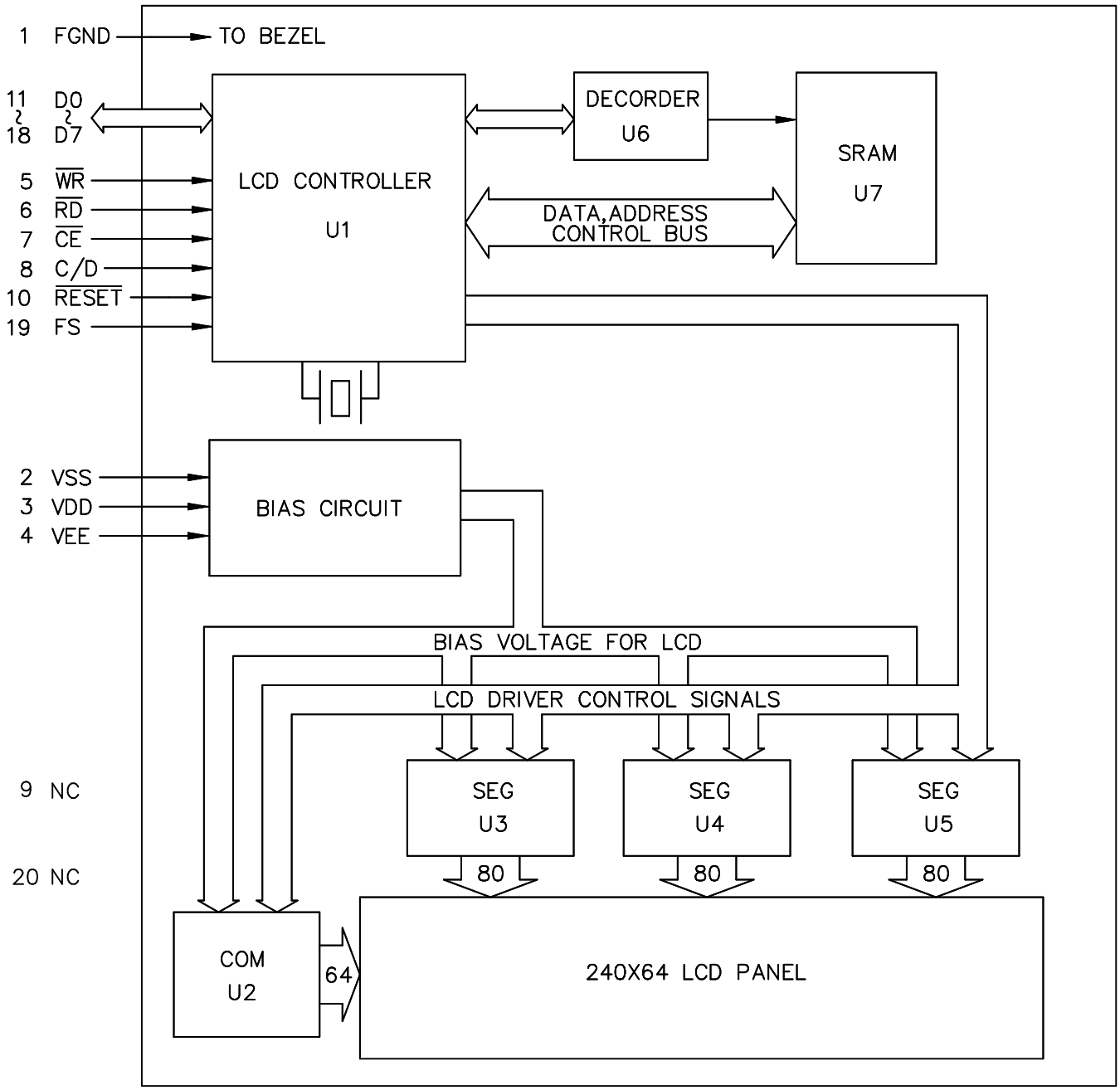
(negative type)

Contrast Ratio : Cr=A/B

*Conditions

Viewing Angle : 0
Frame Frequency : 70Hz
Applying Waveform : 1/N duty 1/a bias

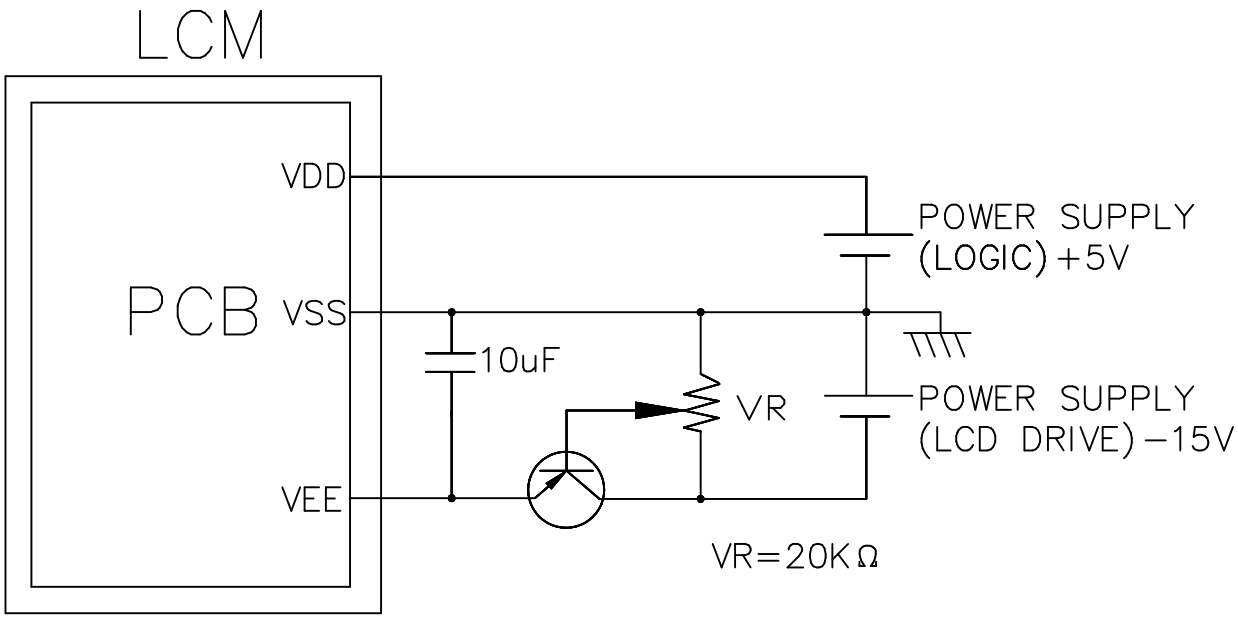
5. BLOCK DIAGRAM



6. INTERNAL PIN CONNECTION

PIN NO.	SYMBOL	FUNCTION
1	FGND	FRAME GROUND (0V)
2	VSS	GROUND
3	VDD	POWER SUPPLY FOR LOGIC (+5V)
4	VEE	POWER SUPPLY FOR LC DRIVING
5	$\overline{WR}$	DATA WRITE
6	$\overline{RD}$	DATA READ
7	$\overline{CE}$	CHIP ENABLE
8	C/D	$\overline{WR}$="L",C/D="H" :COMMAND WRITE $\overline{WR}$="L",C/D="L" :DATA WRITE $\overline{RD}$="L",C/D="H" :STATUS READ $\overline{RD}$="L".C/D="L" :DATA READ
9	NC	NO CONNECTION
10	$\overline{RESET}$	CONTROLLER RESET
11	D0	DATA INPUT/OUTPUT
12	D1	DATA INPUT/OUTPUT
13	D2	DATA INPUT/OUTPUT
14	D3	DATA INPUT/OUTPUT
15	D4	DATA INPUT/OUTPUT
16	D5	DATA INPUT/OUTPUT
17	D6	DATA INPUT/OUTPUT
18	D7	DATA INPUT/OUTPUT
19	FS	FONT SELECT CONNECT TO VDD :6X8 PIXELS/CHARACTER CONNECT TO GND :8X8 PIXELS/CHARACTER
20	NC	NO CONNECTION

7. POWER SUPPLY



8. TIMING CHARACTERISTICS

8-1 INTERFACE TIMING

ITEM	ITEM	CONDITION	MIN.	MAX.	UNIT
C/D SET UP TIME	t_{CDS}	Fig.	100	–	ns
C/D HOLD TIME	t_{CDH}	Fig.	10	–	ns
$\overline{CE}$,$\overline{RD}$,$\overline{WR}$ CLOCK WIDTH	t_{CP},t_{RP},t_{WP}	Fig.	80	–	ns
DATA SET UP TIME	t_{DS}	Fig.	80	–	ns
DATA HOLD TIME	t_{DH}	Fig.	40	–	ns
ACCESS TIME	t_{ACC}	Fig.	–	150	ns
DATA OUTPUT HOLD TIME	t_{OH}	Fig.	10	50	ns

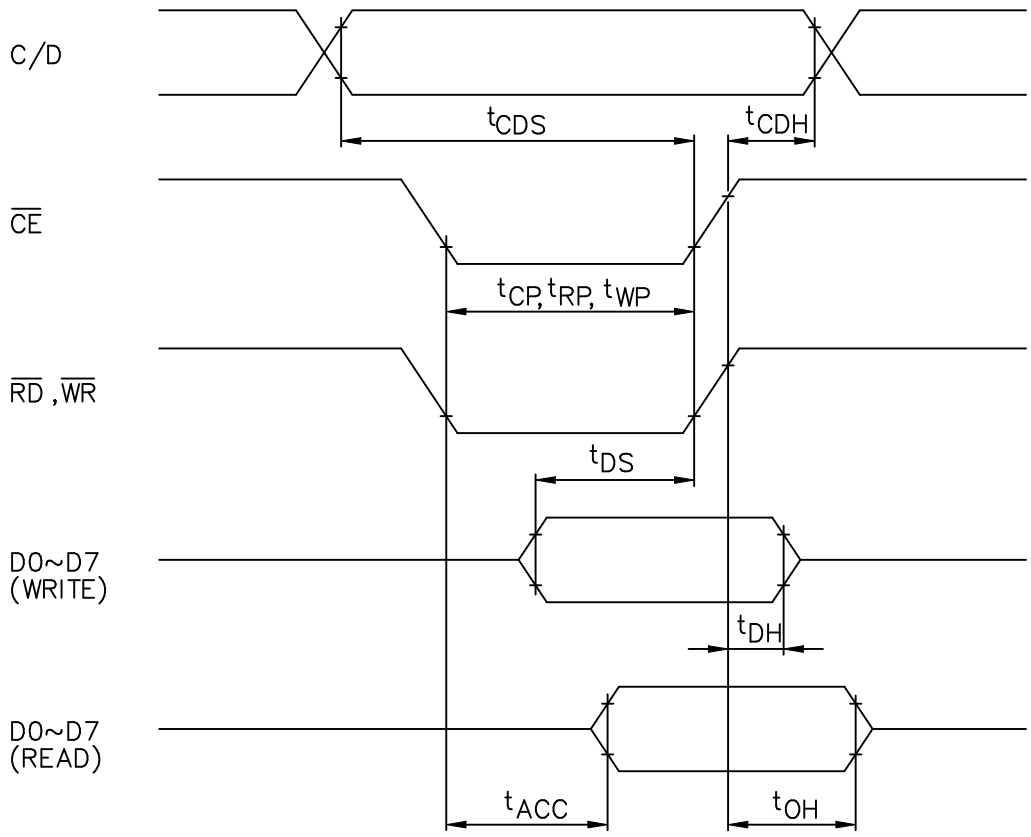
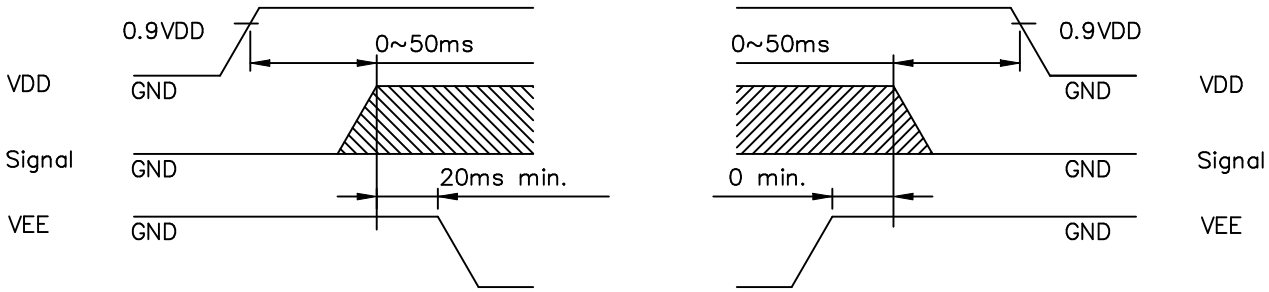


Fig. INTERFACE TIMING CHART

8-2 POWER ON/OFF TIMING

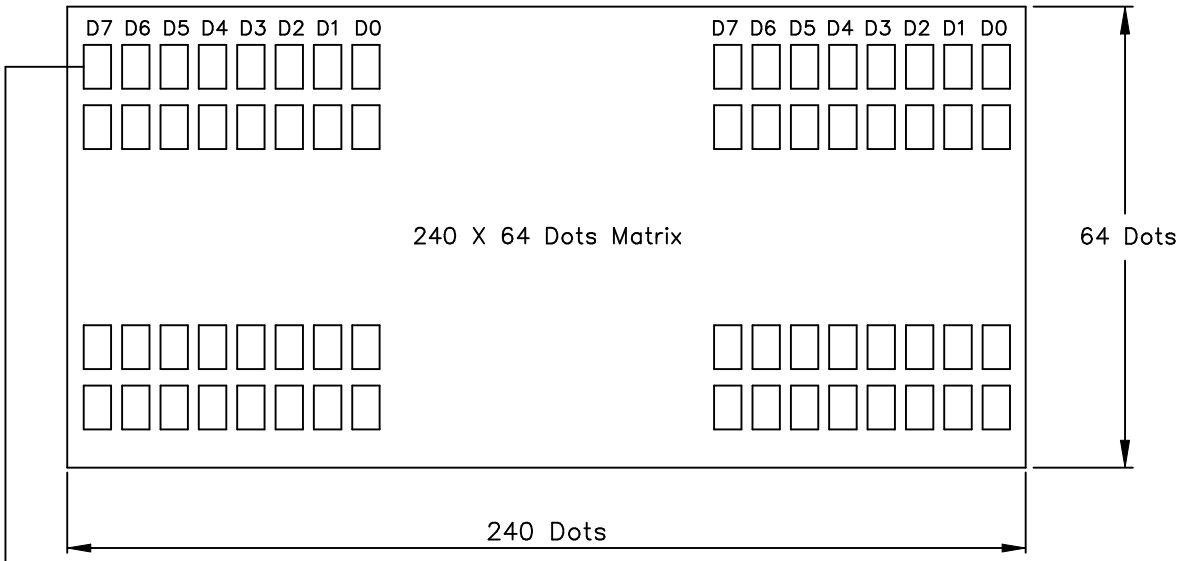


POWER ON

POWER OFF

The missing pixels may occur when the LCM is driven beyond above power interface timing sequence.

8-3. DISPLAY PATTERN



Starting dot for the starting address of display RAM D0~D7 are 8 bits transmitted data ,where D0 is LSB and D7 is MSB.

9. RELIABILITY TEST

NORMAL TEMPERATURE RELIABILITY TEST

NO	ITEM	CONDITION			STANDARD	NOTE
1	High Temp. Storage	70°C	120Hrs		Appearance without defect	
2	Low Temp. Storage	−20°C	120Hrs		Appearance without defect	
3	High Temp. & High Humi. Storage	50°C 90%RH	120Hrs		Appearance without defect	
4	High Temp. Operating Display	50°C	120Hrs		Appearance without defect	
5	Low Temp. Operating Display	0°C	120Hrs		Appearance without defect	
6	Thermal Shock	−20°C,30min → 70°C,30min ↑ (1cycle)			Appearance without defect	10 cycles

Inspection Provision

1.Purpose

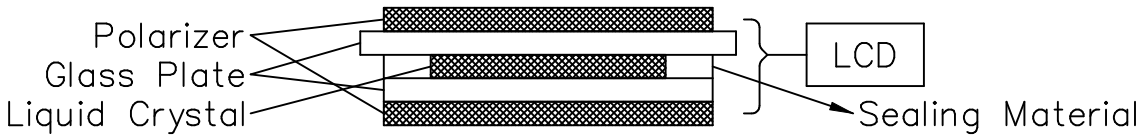
The NAN YA inspection provision provides outgoing inspection provision and its expected quality level based on our outgoing inspection of NAN YA LCD produces.

2.Applicable Scope

The NAN YA inspection provision is applicable to the arrangement in regard to outgoing inspection and quality assurance after outgoing.

3.Technical Terms

3-1 NAN YA Technical Terms



4.Outgoing Inspection

4-1 Inspection Method

MIL-STD-105E Level Ⅱ Regular inspection

4-2 Inspection Standard

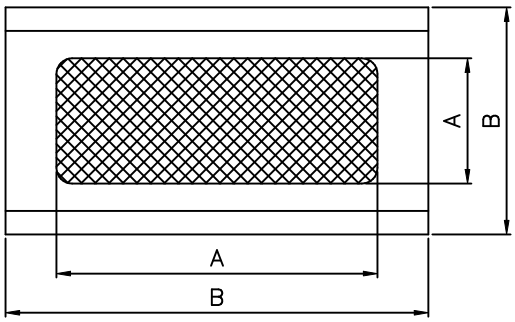
	Item		AQL(%)	Remarks
Major Defect	Dots	Opens Shorts Erroneous operation	0.4	faults which substantially lower the practicality and the initial purpose difficult to achieve.
	Solder appearance	Shorts Loose		
	Cracks	Display surface cracks		

	Dimensions	External from Dimensions	0.4	
Minor Defect	Inside the glass	Black spots	0.65	faults which appear to pose almost no obstacle to the practicality, effective use, and operation.
	Polarizing plate	Scratches, foreign Matter, air bubbles, and peeling		
	Dots	Pinhole, deformation		
	Color tone	Color unevenness		
	Solder appearance	Cold solder Solder projections		

4-3 Inspection Provisions

*Viewing Area Definition

Fig. 1



A : Zone Viewing Area
B : Zone Glass Plate Outline

*Inspection place to be 500 to 1000 lux illuminance uniformly without glaring.
The distance between luminous source(daylight fluorescent lamp and cool white fluorescent lamp) and sample to be 30cm to 50cm.

*Test and measurement are performed under the following conditions, unless otherwise specified.

Temperature	20± 15°C
Humidity	65± 20%R.H.
Pressure	860~1060hPa(mmbar)

In case of doubtful judgment, it is performed under the following conditions.

Temperature	20± 2°C
Humidity	65± 5%R.H.
Pressure	860~1060hPa(mmbar)

5. Specification for quality check

5-1 Electrical characteristics

NO.	Item	Criterion
1	Non operational	Fail
2	Miss operating	Fail
3	Missing dot	Fail
4	Contrast irregular	Fail
5	Response time	Within Specified value

5-2 External Appearance Defect

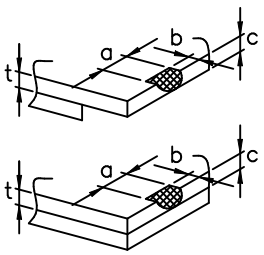
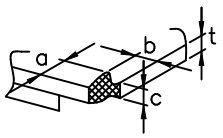
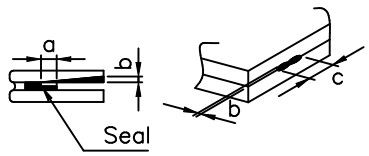
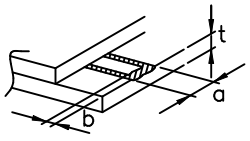
<table>
<tr><th>NO.</th><th>Item</th><th>Criterion</th></tr>
<tr><td>1</td><td>Black spots, foreign matter, and white spots (Including light leakage due to pinholes of polarizing plates, etc.)</td><td>
(1)-1-Spots
<table>
<tr><th>Average Diameter(mm): D</th><th>Number of pieces permitted</th></tr>
<tr><td>D≦0.1</td><td>Ignore</td></tr>
<tr><td>0.1<D≦0.2</td><td>5</td></tr>
<tr><td>0.2<D≦0.3</td><td>2</td></tr>
<tr><td>0.3<D</td><td>0</td></tr>
</table>
Number of total pieces is set to within 5 pieces.

Note that when there are 2 pieces or more, they are not to be concentrated.
Set as: Average diameter = (Long diameter + Short diameter)/2

(1)-2-Blurred Spots(At lighting condition)
<table>
<tr><th>Average Diameter(mm): D</th><th>Number of pieces permitted</th></tr>
<tr><td>D≦0.3</td><td>Ignore</td></tr>
<tr><td>0.3<D≦0.75</td><td>5</td></tr>
<tr><td>0.75<D</td><td>0</td></tr>
</table>
Number of total pieces is set to within 5 pieces.

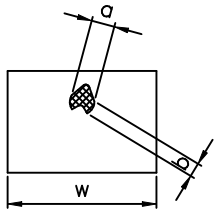
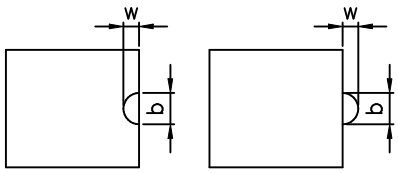
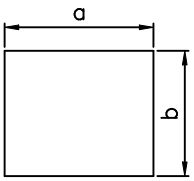
Note that when there are 2 pieces or more, they are not to be concentrated.
Set as: Average diameter = (Long diameter + Short diameter)/2
</td></tr>
</table>

<table>
<tr><td>1</td><td>Line</td><td>(1)-1-Lines
<table><tr><th>Width(mm): W</th><th>Length(mm): L</th><th>Number of pieces permitted</th></tr><tr><td>W≦0.03</td><td>Ignore</td><td>Ignore</td></tr><tr><td>0.03<W≦0.08</td><td>L≦4</td><td>2</td></tr><tr><td>0.08<W≦0.1</td><td>L≦1</td><td>1</td></tr></table>Object exceeding 0.1mm follow the standards of the spots form.
Note that when there are 2 pieces or more, they are not to be concentrated.
(1)-2-Blurred Lines(At lighting condition)
<table><tr><th>Width(mm): W</th><th>Length(mm): L</th><th>Number of pieces permitted</th></tr><tr><td>W≦0.03</td><td>Ignore</td><td>Ignore</td></tr><tr><td>0.03<W≦0.08</td><td>L≦3</td><td>6</td></tr><tr><td>0.08<W</td><td>3<L</td><td>None</td></tr></table>Object exceeding 0.1mm follow the standards of the spots form.
Note that when there are 2 pieces or more, they are not to be concentrated.</td></tr>
<tr><td>2</td><td>Scratches(Glass, reflection plates, and polarizing plates)</td><td>In accordance with black spots.
(At non lighting condition)</td></tr>
<tr><td>3</td><td>Color irregular</td><td>Not remarkable color irregular.</td></tr>
</table>

<table>
<tr><td>4</td><td>Air bubbles polarizing plates, and reflection plates</td><td colspan="2">
<table>
<tr><th>Average Diameter (mm): D</th><th>Number of pieces permitted</th></tr>
<tr><td>D≦0.3</td><td>Ignore</td></tr>
<tr><td>0.3<D</td><td>0</td></tr>
</table>
Average diameter = (Long diameter + Short diameter)/2
Note that when there are 4 pieces or more, they are not to be concentrated.
</td></tr>
<tr><td rowspan="5">5</td><td rowspan="5">Cracks</td><td>(1)General crack
 
</td><td>a≦5
b≦2
c≦t
Where, a and b are ignored when less than or equal to 0.5 The numbers of pieces are set at up to 5 pieces.</td></tr>
<tr><td>(2)Corner crack
 
</td><td>a≦2.5
b≦2.5
c≦t
a+b≦4</td></tr>
<tr><td>(3)Seal portion crack
 
</td><td>a≦The seal widthx1/3
b≦tx2/3
c≦5
The numbers of pieces are set at up to 5 pieces.</td></tr>
<tr><td>(4)ITO Pin crack
 
</td><td>a≦5
b≦1/3 pin length
c≦t</td></tr>
<tr><td>(5)Progressive cracks</td><td>All taken to be unacceptable.</td></tr>
</table>

6	Outer dimensions	Should be within the tolerance.
7	Newton ring(touch panel)	Orbicular of interference fringes is not allowed in the optimum contrast within the active area under viewing angle.
8	Soldering	Should be no defective soldering such as shorting, loose terminal cold solder, peeling of printed circuit board pattern, improper mounting position, etc.

5-3 Dot Appearance Defect

NO.	Item	Criteria
1	Pinhole	 Dot display a and b are each ≦0.2mm The overall total is taken be with in 10 units. Note that they are not to be concentrated.
2	Missing	 Dot display a and b are each ≦0.2mm The overall total is taken to be with in 10 units.
3	Thick and thin display	 Taken to be within ±1.5% of display character width(a) and height(b).

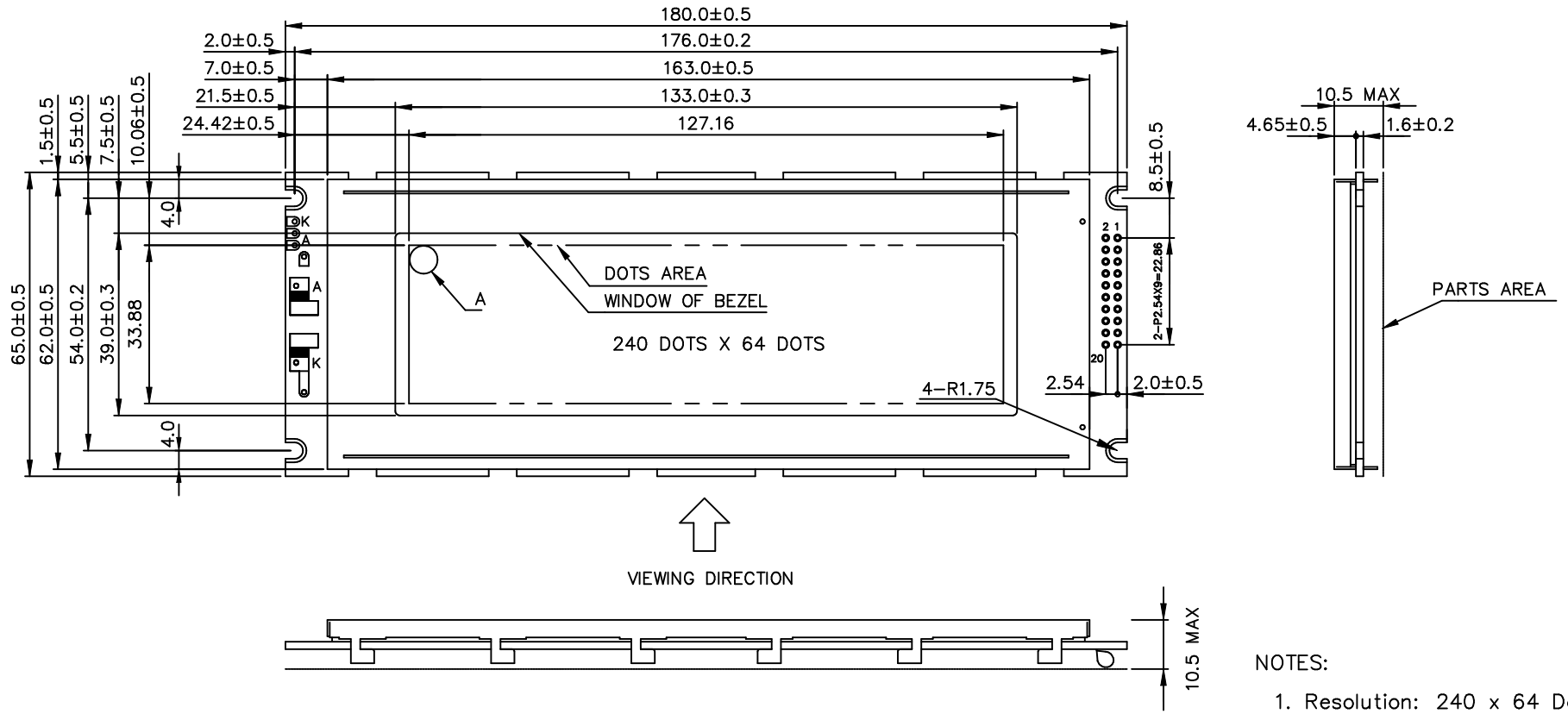
NOTICE:

- SAFETY
  1. If the LCD panel breaks, be careful not to get the liquid crystal to touch your skin.
  2. If the liquid crystal touches your skin or clothes, please wash it off immediately by using soap and water.

- HANDLING
  1. Avoid static electricity which can damage the CMOS LSI.
  2. Do not remove the panel or frame from the module.
  3. The polarizing plate of the display is very fragile. So, please handle it very carefully.
  4. Do not wipe the polarizing plate with a dry cloth, as it may easily scratch the surface of plate.
  5. Do not use ketonics solvent & Aromatic solvent. Use a soft cloth soaked with a cleaning naphtha solvent.

- STORAGE
  1. Store the panel or module in a dark place where the temperature is 25°C±5°C and the humidity is below 65% RH.
  2. Do not place the module near organics solvents or corrosive gases.
  3. Do not crush, shake, or jolt the module.

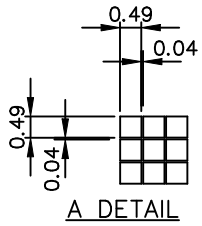
- TERMS OF WARRANT
  1. Acceptance inspection period
     The period is within one month after the arrival of contracted commodity at the buyer's factory site.
  2. Applicable warrant period
     The period is within twelve months since the date of shipping out under normal using and storage conditions.



NOTES:

1. Resolution: 240 x 64 Dots
2. Controller : T6963C(Compatible)
3. DC/DC Converter: Without

PIN NO.	SYMBOL	FUNCTION	PIN NO.	SYMBOL	FUNCTION
1	FGND	FRAME GROUND (0V)	11	D0	DATA INPUT/OUTPUT, LSB
2	VSS	GROUND	12	D1	DATA INPUT/OUTPUT
3	VDD	POWER SUPPLY FOR LOGIC (+5V)	13	D2	DATA INPUT/OUTPUT
4	VEE	POWER SUPPLY FOR LC DRIVING	14	D3	DATA INPUT/OUTPUT
5	$\overline{WR}$	DATA WRITE	15	D4	DATA INPUT/OUTPUT
6	$\overline{RD}$	DATA READ	16	D5	DATA INPUT/OUTPUT
7	$\overline{CE}$	CHIP ENABLE	17	D6	DATA INPUT/OUTPUT
8	C/D	$\overline{WR}$="L",C/D="H" :COMMAND WRITE $\overline{WR}$="L",C/D="L" :DATA WRITE $\overline{RD}$="L",C/D="H" :STATUS READ $\overline{RD}$="L".C/D="L" :DATA READ	18	D7	DATA INPUT/OUTPUT, MSB
9	NC	NO CONNECTION	19	FS	FONT SELECT CONNECT TO VDD :6X8 PIXELS/CHARACTER CONNECT TO Vss :8X8 PIXELS/CHARACTER
10	$\overline{RESET}$	CONTROLLER RESET	20	NC	NO CONNECTION



DIMENSION	TOLERANCE
L ≦ 6	±0.25 (mm)
6 < L ≦ 18	±0.3 (mm)
18 < L ≦ 50	±0.4 (mm)
50 < L ≦ 125	±0.5 (mm)
125 < L	±0.6 (mm)
ANGLE	±1° (DEG)

REV. NO.	DESCRIPTION	DATE	DESIGN	CHECK	APPROVE
5					
4					
3					
2					
1					

南亞塑膠工業股份有限公司
NAN YA PLASTICS CORPORATION

製品圖

LMAJ6R003APS

	NAME	DATE	THIRD ANGLE P.
APPROVE			
CHECK			
DESIGN	CLOUDE	95.02.22	SCALE 1/1
DRAWN	CLOUDE	95.02.22	UNIT mm

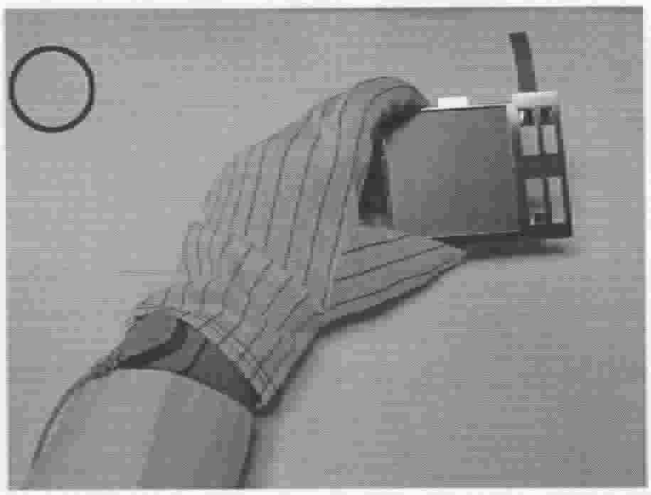
DWG NO. M003CD0A

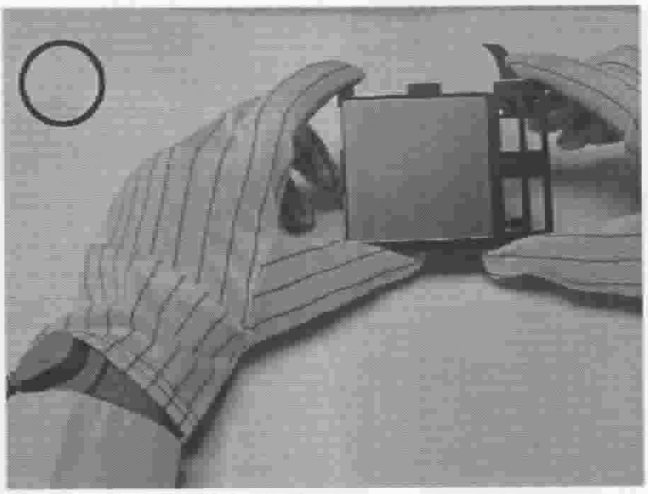
THE NOTES OF LCM USING

LCM is easy to damage.

Please follow the notes as bellows, and be careful of handling!

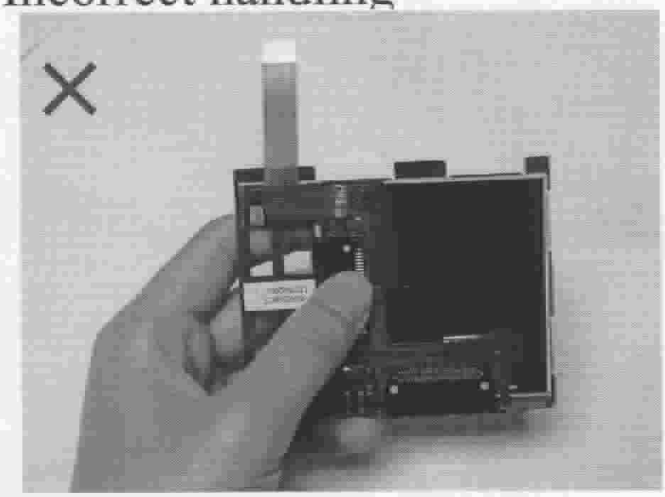
Correct handling



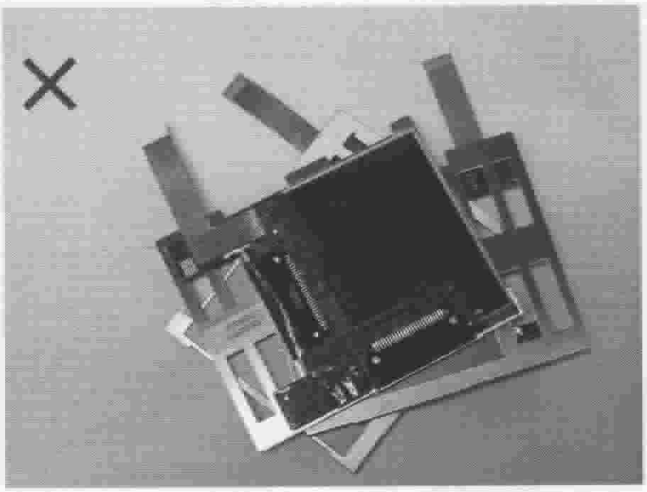


As above picture, please handle with glove by LCM edges and full EOS/ESD protection.

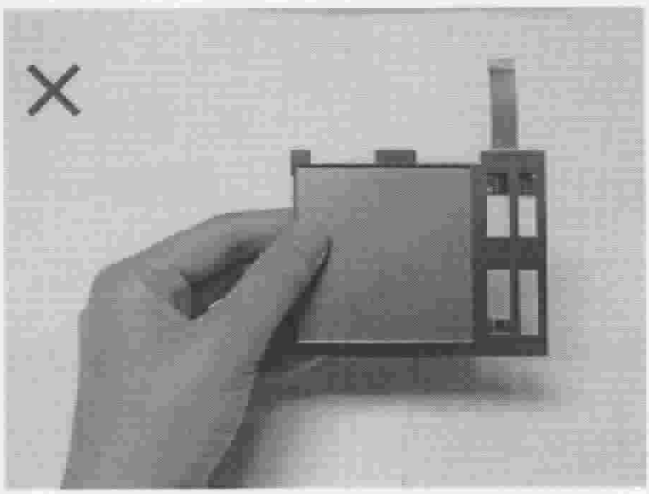
Incorrect handling



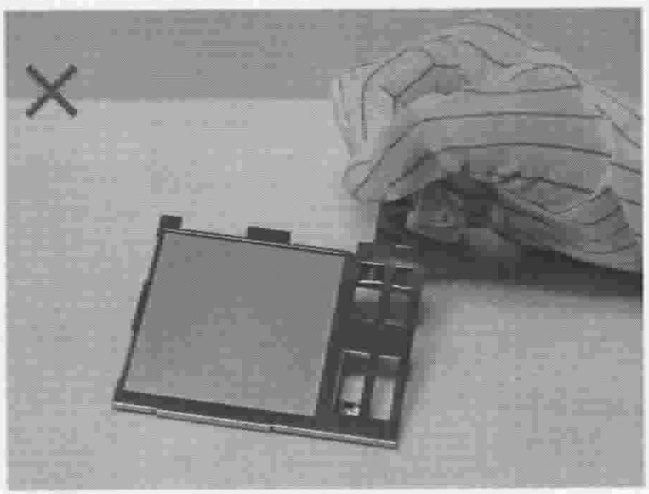
Please don't touch IC directly.



Please don't put one on another LCM.



Please don't hold the surface of LCM.

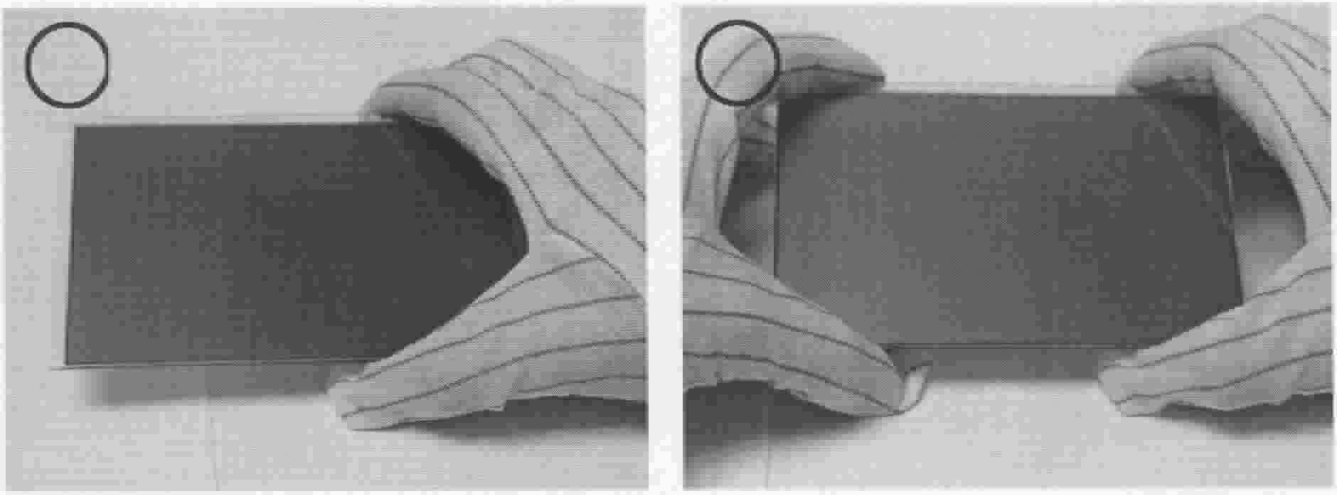


Please don't stretch interface of output.

THE NOTES OF LCD USING

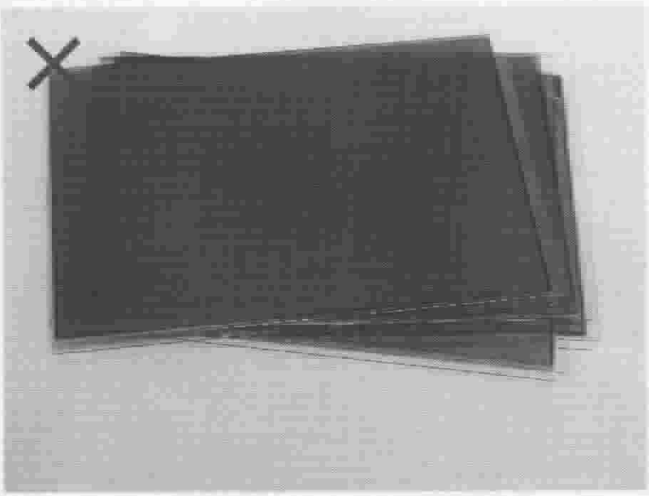
LCD is easy damage.
Please follow notes as bellows, and be careful of handling!

Correct handling

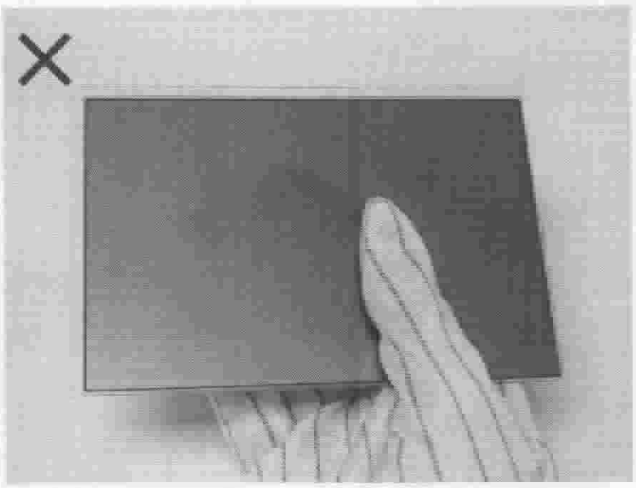


As above picture, please handle with glove by LCD edges and full EOS/ESD protection.

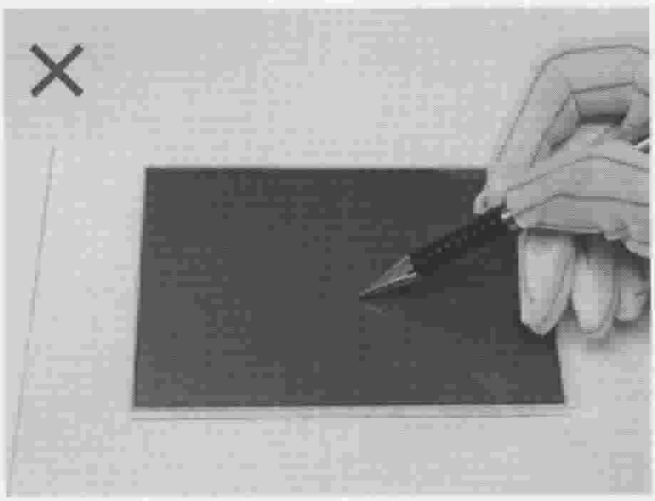
Incorrect handling



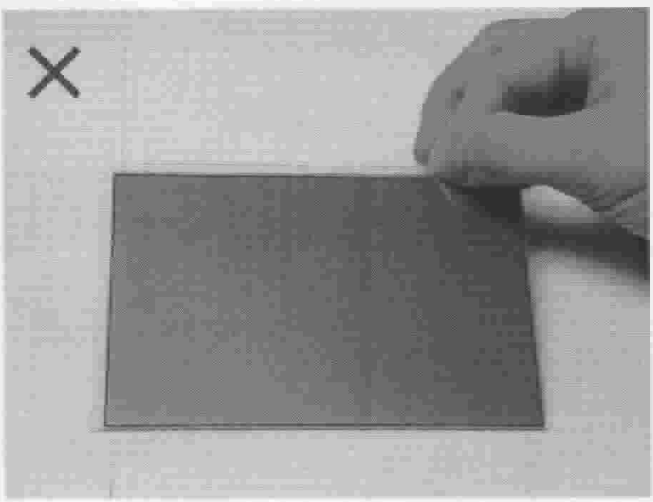
Please don't put one on another LCD.



Please don't hold the surface of LCD.



Please don't operate with sharp stick such as sharp pencil.



Please don't touch ITO glass without anti-static gloves.