NAN YA PLASTICS CORPORATION

SPECIFICATION OF
LCD MODULE
PRODUCT NO.: LMC76S026C_

SPEC. NO.: LM026-0A-0

CUSTOMER
APPROVED BY
DATE:

LCD DEPARTMENT
ELECTRONIC MATERIALS DIVISION
NAN YA PLASTICS CORPORATION
201, TUNG HWA N. ROAD, TAIPEI
TEL: 886-2-27122211 EXT. 5993~5995
FAX: 886-2-27178253
E-mail: lcdsales@npc.com.tw

EDITED ON : MARCH.30.2006

Q.C. DEPT.	DESIGN MANAGER	DESIGN CHECK	DESIGNER
			C.Y.CHAN

RECORDS OF REVISION

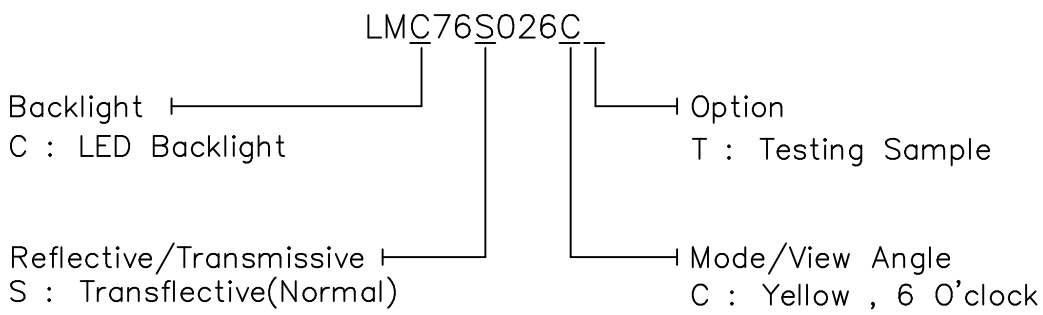
SPEC.NO: LM026-0A

DATE	REVISED NO.	REF. PAGE	SUMMARY	DESIGN	CHECK
03.30.2006	0	1/24~24/24	First Issue	C.Y.CHAN	

1. MECHANICAL DATA

NO	ITEM	CONTENTS	UNIT
1	Product No.	LMC76S026C_	–
2	Module Size	72.4 (W) x 69.9 (H) x 13.5 MAX. (D)	mm
3	Dot Size	0.32 (W) x 0.32 (H)	mm
4	Dot Pitch	0.35 (W) x 0.35 (H)	mm
5	Number of Dots	128 (W) x 128 (H)	Dot
6	Duty	1/128	–
7	LCD Display Mode	Yellow	–
8	Rear Polarizer	Transflective(Normal)	–
9	Viewing Direction	6	O'clock
10	Backlight	LED	–
11	Controller	T6963CFG-0101 OR COMPATIBLE	–
12	DC/DC Converter	Exclude	–
13	Touch Panel	Exclude	–
14	Weight	65 (Approx.)	g

Note :



2. ABSOLUTE MAXIMUM RATINGS

(1) ELECTRICAL ABSOLUTE RATINGS

Vss=0V

ITEM	SYMBOL	MIN	MAX	UNIT	COMMENT
Power Supply for Logic	VDD−VSS	−0.3	7.0	V	
Power Supply for LC Drive	VDD−VEE	0	25.0	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	

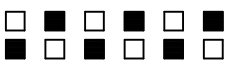
Note 2 Ta ≦ 50°C : 80%RH max

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

3-1. ELECTRICAL CHARACTERISTICS OF LCM

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= 1/128	0°C	18.8	19.3	19.8	V
			25°C	17.5	18.0	18.5	
			50°C	16.0	16.5	17.0	
Power Supply Current	IDD	VDD-VSS=5.0V VDD-VEE=18.0V Ta=25°C Pattern: 		-	10	15	mA
	IEE			-	5	10	
Surface Luminance of LCM	L	I_{AK} =190 mA Pattern: Dots All ON		8	10	-	cd/m²
		I_{AK} =190 mA Pattern: Dots All OFF		-	4	8	

3-2.ELECTRICAL CHARACTERISTICS OF BACKLIGHT

Used LED Rating (Constant Current Driving) Temp.=25°C

ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT	REMARK
Peak forward current	I_P	–	–	480	mA	–
Maximum reverse voltage	V_R	–	–	8	V	–
Applied forward current	I_{AK}	–	190	–	mA	–
Applied forward voltage	V_{AK}	–	4.3	4.6	V	–
LED power consumption	P_F	–	0.82	0.88	W	–
LED life time	L_L	–	40000	–	hrs	at I_{AK} = 190 mA (*1)

(*1) LED life time is defined as follows : The final brightness is at 50% of original brightness.

4.OPTICAL CHARACTERISTICS

AT V_{OP}

ITEM / MODE		Cr(Contrast Ratio)						θ(Viewing Angle)		ø(Viewing Angle)	
		0℃		25℃		50℃		25℃		25℃	
		MIN.	TYP.	MIN.	TYP.	MIN.	TYP.	MIN.	TYP.	MIN.	TYP.
S	C	2.5	3.5	3.5	4.5	2.5	3.5	–	63	–	55
NOTE		NOTE 6						NOTE 5			

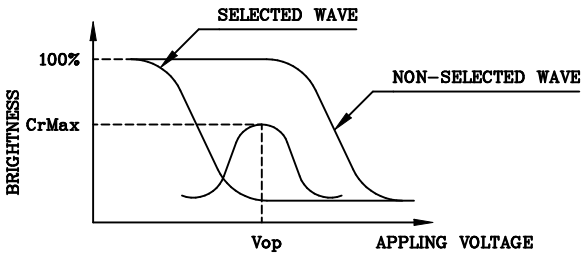
NOTE :
S : Transflective(Normal)
C : Yellow , 6 O'clock

AT ø=0° θ=0°

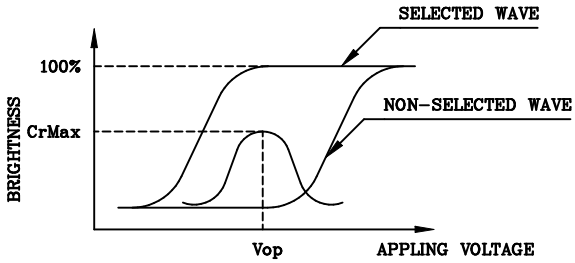
ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Response Time (rise)	Tr	0℃	450	550	650	ms	NOTE 2
		25℃	140	170	200		
		50℃	65	80	95		
Response Time (fall)	Tf	0℃	200	250	300	ms	NOTE 2
		25℃	70	90	110		
		50℃	40	50	60		

(NOTE 1)

Definition of Operation Voltage(Vop)



(positive type)



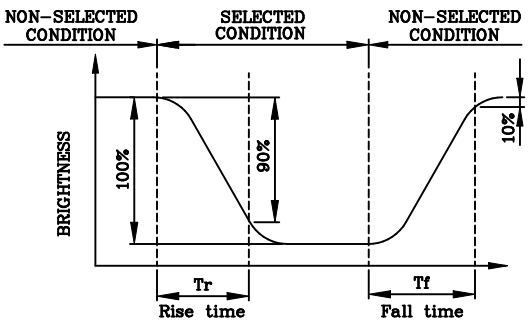
(negative type)

*Conditions

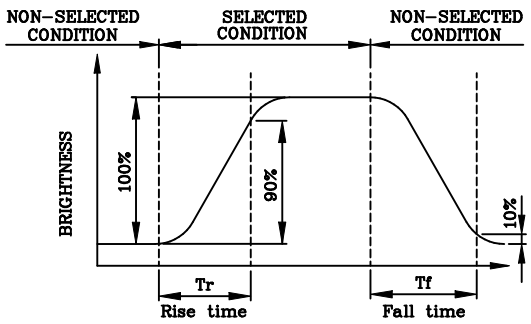
Viewing Angle : 0
Frame Frequency : 70Hz
Applying Waveform : 1/N duty 1/a bias

(NOTE 2)

Definition of Response Time(Tr,Tf)



(positive type)



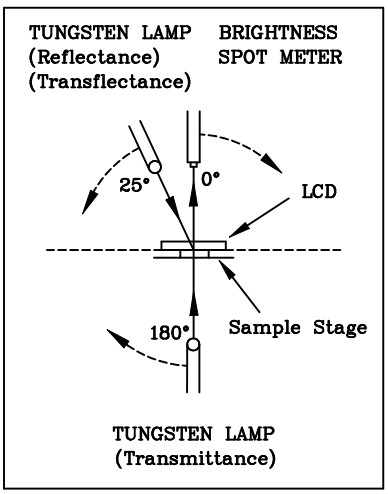
(negative type)

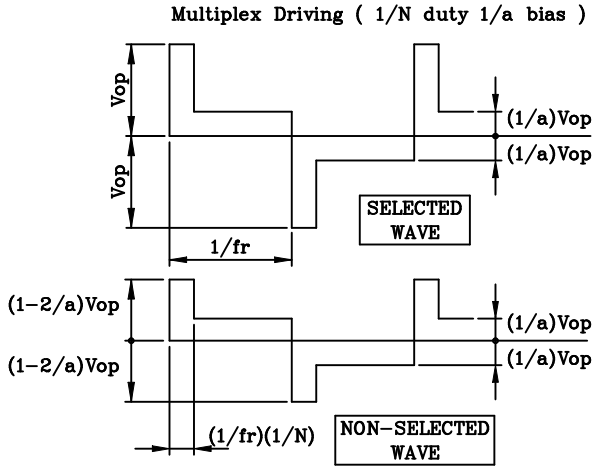
*Conditions

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

(NOTE 3)

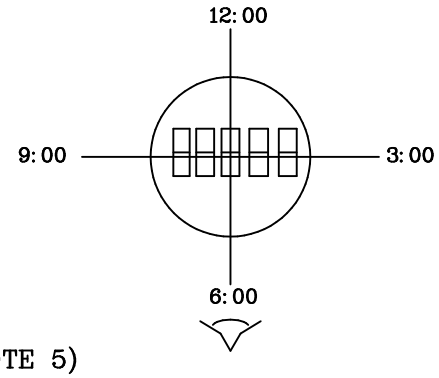
Description of Measuring Equipment and Driving Waveforms





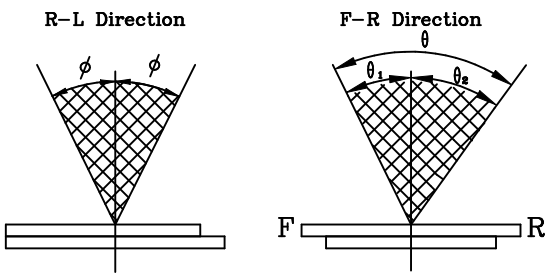
(NOTE 4)

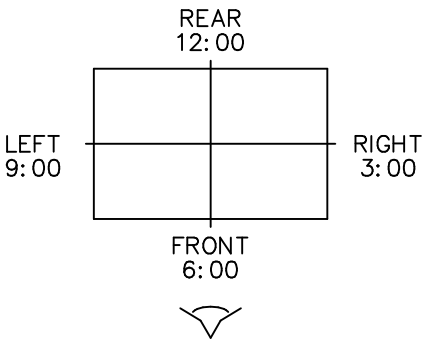
Definition of Viewing Direction



(NOTE 5)

Definition of Viewing Angle





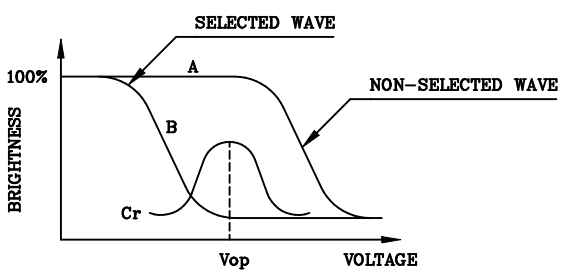
$\theta = \theta_1 + \theta_2$

*Conditions

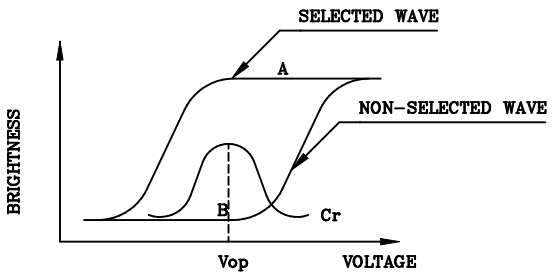
Operating Voltage : Vop
Frame Frequency : 70Hz
Applying Waveform : 1/N duty 1/a bias
Contrast Ratio : larger than 2

(NOTE 6)

Definition of Contrast Ratio (Cr)



(positive type)



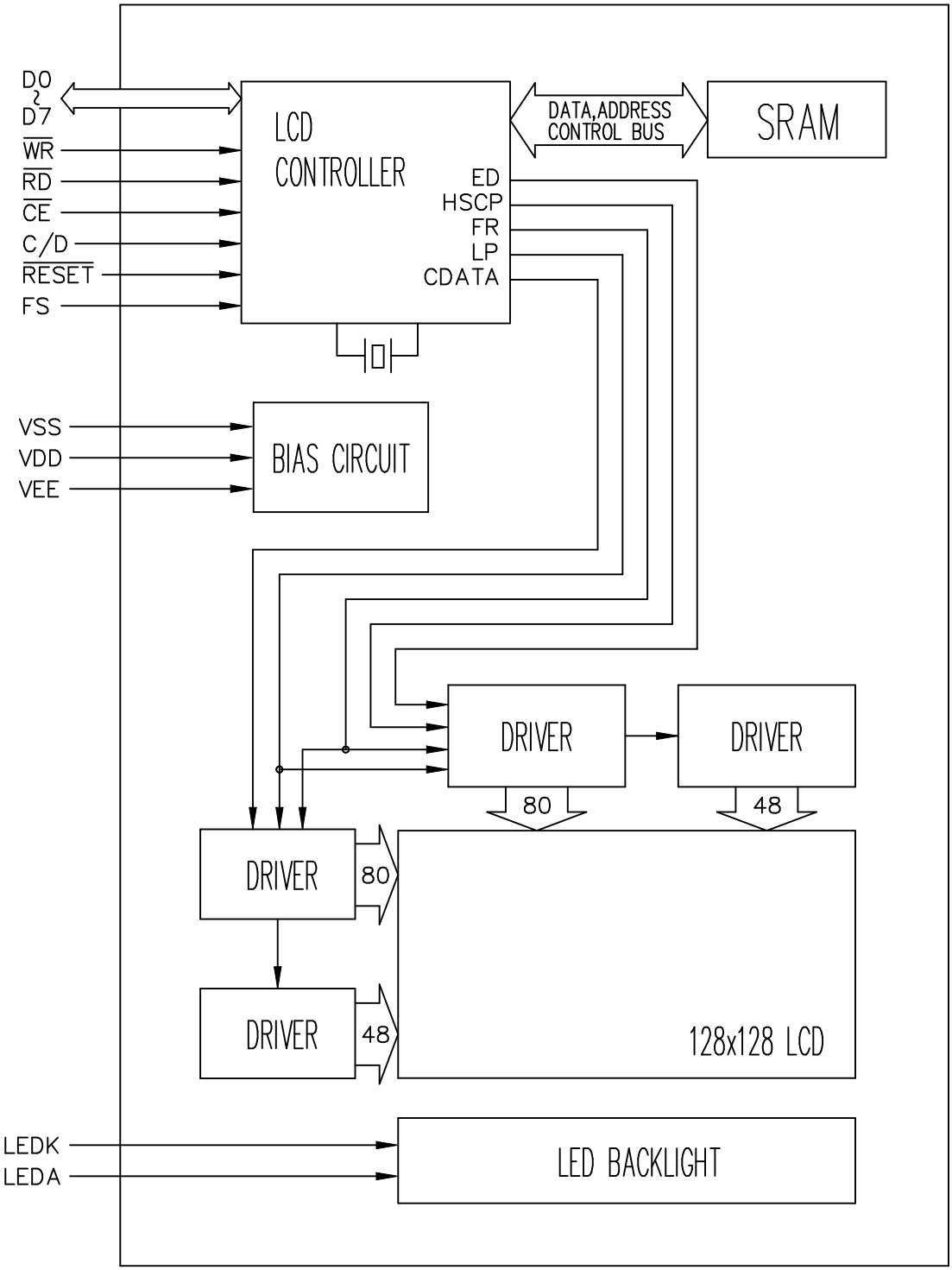
(negative type)

Contrast Ratio : Cr=A/B

*Conditions

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

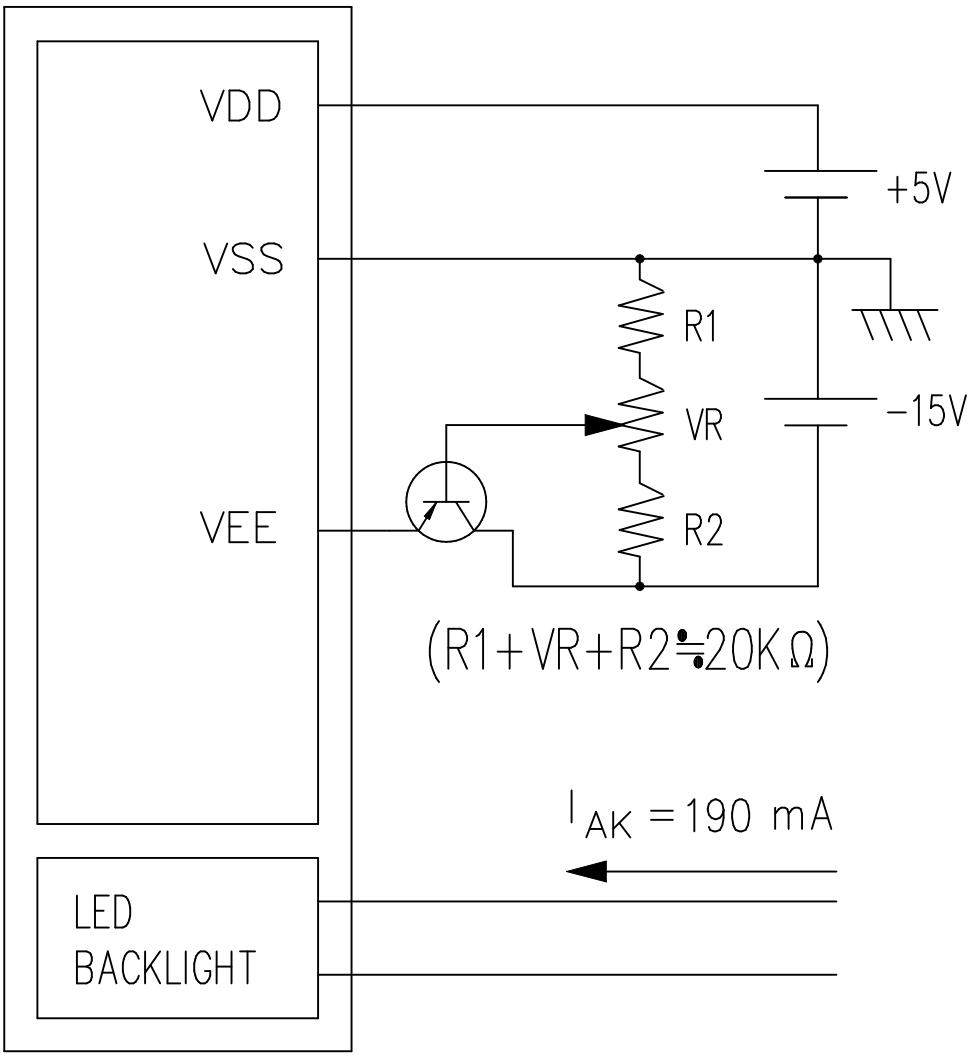
5. BLOCK DIAGRAM



6. DEFINITION OF INTERFACE

Pin No.	Symbol	Function
1	VSS	Ground
2	VDD	Power Supply for Logic Circuit
3	VEE	Power Supply for LCD Circuit
4	$\overline{WR}$	Data Write
5	$\overline{RD}$	Data Read
6	$\overline{CE}$	Chip Enable
7	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
8	$\overline{RESET}$	Controller Reset
9-16	D0-D7	Data Bus Line
17	FS	Font Select Connect to VDD : 6x8 Pixels/Character Connect to VSS : 8x8 Pixels/Character
18	NC	No Connection
19	LEDK	LED Backlight
20	LEDA	LED Backlight

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

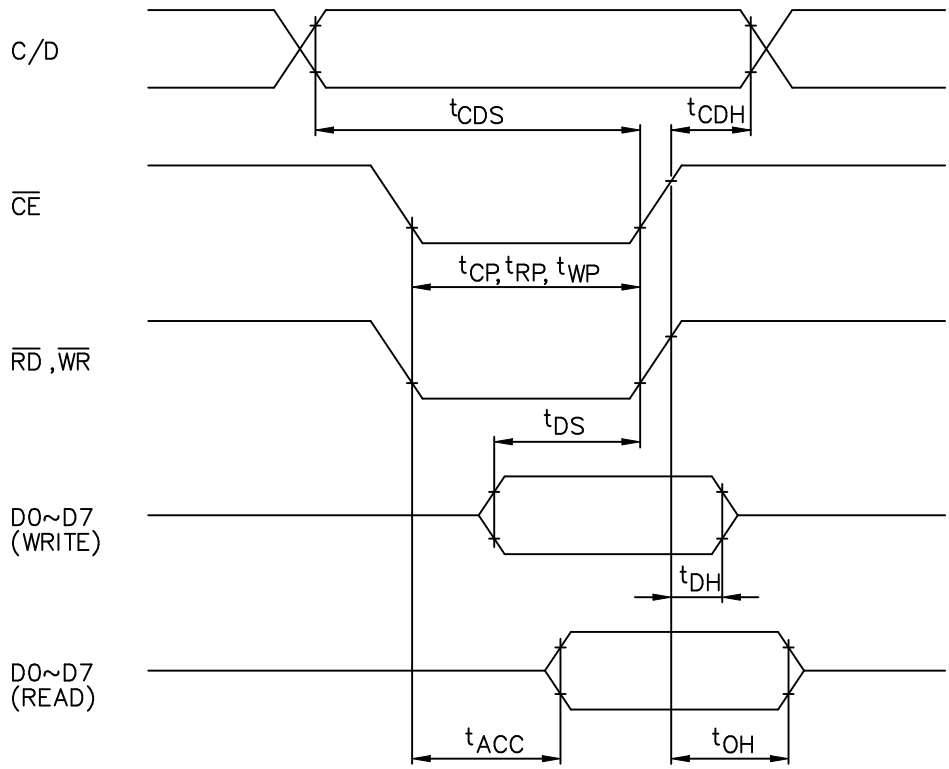
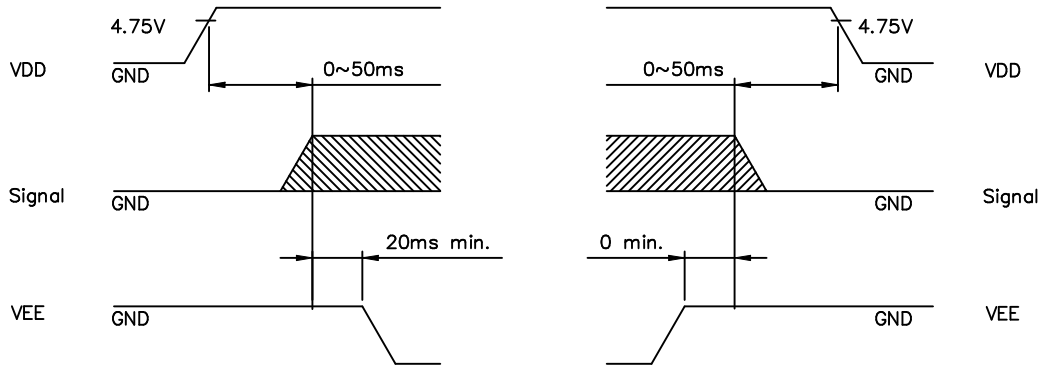


Fig. INTERFACE TIMING CHART

8-2.POWER ON/OFF TIMING



POWER ON

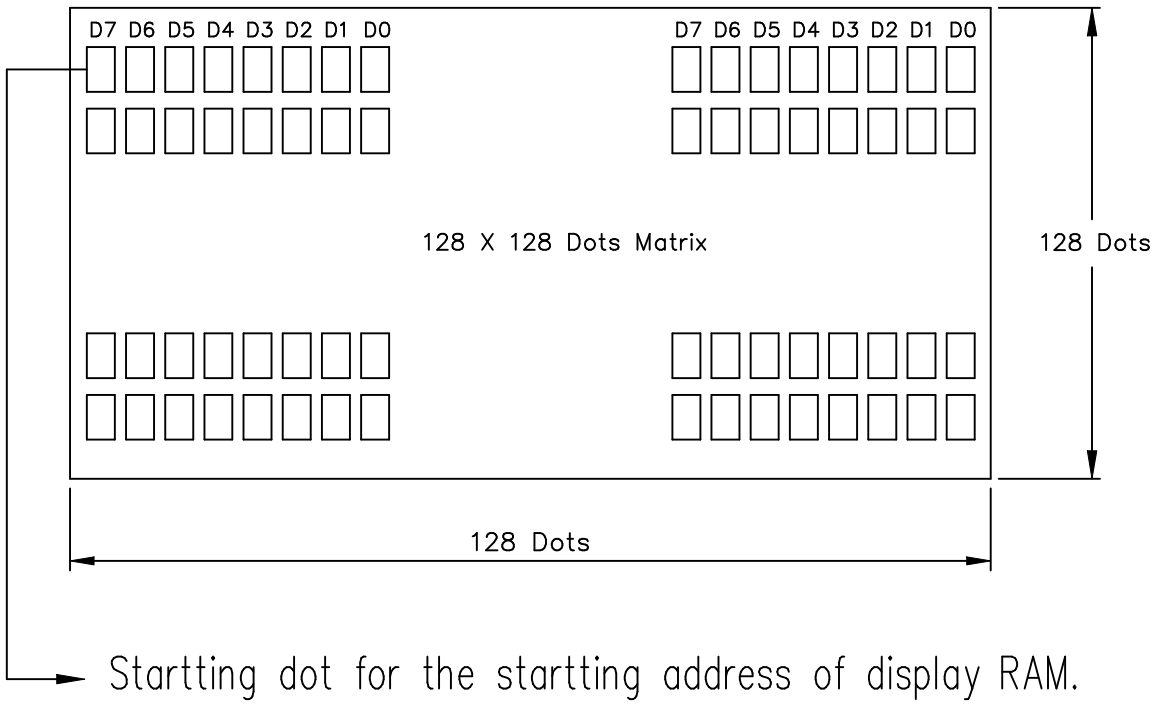
POWER OFF

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

8-3.CONTROL and DISPLAY COMMAND

COMMAND	CODE	D1	D2	FUNCTION
REGISTER SET	00100001	X address	X address	Cursor pointer set
	00100010	Data	OOH	Offset register set
	00100100	Low address	High address	Address pointer set
CONTROL WORD SET	01000000	Low address	High address	Text home address set
	01000001	Columns	OOH	Text area set
	01000010	Low address	High address	Graphic home address set
	01000011	Columns	OOH	Graphic area set
MODE SET	1000X000	—	—	"OR" mode
	1000X001	—	—	"EXOR" mode
	1000X011	—	—	"AND" mode
	1000X100	—	—	"Text attribute" mode
	10000XXX	—	—	Internal CG ROM mode
	10001XXX	—	—	External CG RAM mode
DISPLAY MODE	10010000	—	—	Display off
	1001XX10	—	—	Cursor on, blink off
	1001XX11	—	—	Cursor on, blink on
	100101XX	—	—	Text on, graphic off
	100110XX	—	—	Text off, graphic on
	100111XX	—	—	Text on, graphic on
CURSOR PATTERN SELECT	10100000	—	—	1 line cursor
	10100001	—	—	2 lines cursor
	10100010	—	—	3 lines cursor
	10100011	—	—	4 lines cursor
	10100100	—	—	5 lines cursor
	10100101	—	—	6 lines cursor
	10100110	—	—	7 lines cursor
	10100111	—	—	8 lines cursor
DATA AUTO READ/WRITE	10110000	—	—	Data auto write set
	10110001	—	—	Data auto read set
	10110010	—	—	Auto reset
DATA READ WRITE	11000000	Data	—	Data write and ADP increment
	11000001	—	—	Data read and ADP increment
	11000010	Data	—	Data write and ADP decrement
	11000011	—	—	Data read and ADP decrement
	11000100	Data	—	Data write and ADP nonvariable
	11000101	—	—	Data read and ADP nonvariable
SCREEN PEEK	11100000	—	—	Screen peek
SCREEN COPY	11101000			Screen copy
BIT SET/RESET	11110XXX	—	—	bit reset
	11111XXX	—	—	bit set
	1111X000	—	—	bit0(LSB)
	1111X001	—	—	bit1
	1111X010	—	—	bit2
	1111X011	—	—	bit3
	1111X100	—	—	bit4
	1111X101	—	—	bit5
	1111X110	—	—	bit6
	1111X111	—	—	bit7(MSB)

8-4. DISPLAY PATTERN



** 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

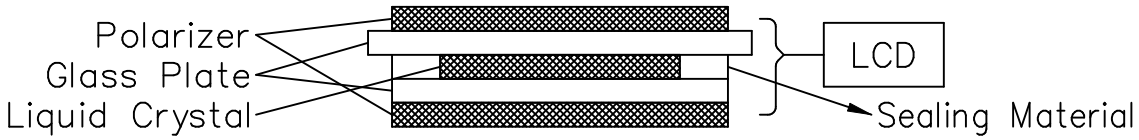
The NAN YA inspection provision provides outgoing inspection provision and its expected quality level based on our outgoing inspection of NAN YA LCD produces.

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

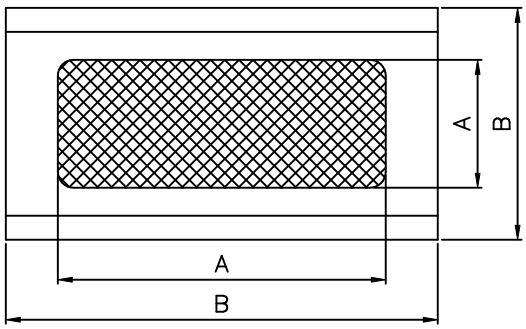
	Item		AQL(%)	Remarks
Major Defect	Dots	Opens Shorts Erroneous operation	0.4	faults which substantially lower the practicality and the initial purpose difficult to achieve.
	Solder appearance	Shorts Loose		
	Cracks	Display surface cracks		

	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
6	Backlight turn on/off	Within Specified value

5-2 External Appearance Defect

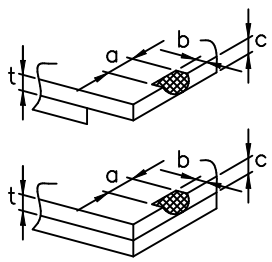
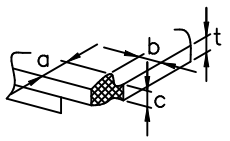
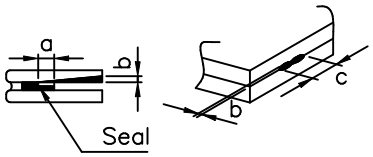
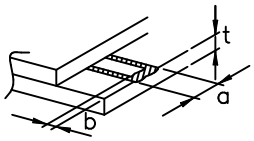
<table>
<tr><th>NO.</th><th>Item</th><th>Criterion</th></tr>
<tr><td>1</td><td>Black spots, foreign matter, and white spots (Including light leakage due to pinholes of polarizing plates, etc.)</td><td>(1)-1-Spots
<table><tr><th>Average Diameter(mm): D</th><th>Number of pieces permitted</th></tr><tr><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.

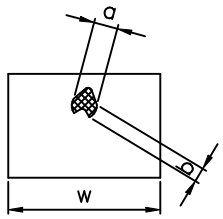
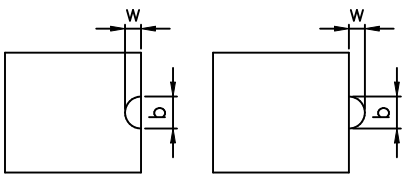
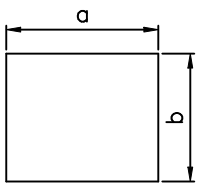
Note that when there are 2 pieces or more, they are not to be concentrated.
Set as: Average diameter = (Long diameter + Short diameter)/2</td></tr>
</table>

<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 width x1/3
b≦t x2/3
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).

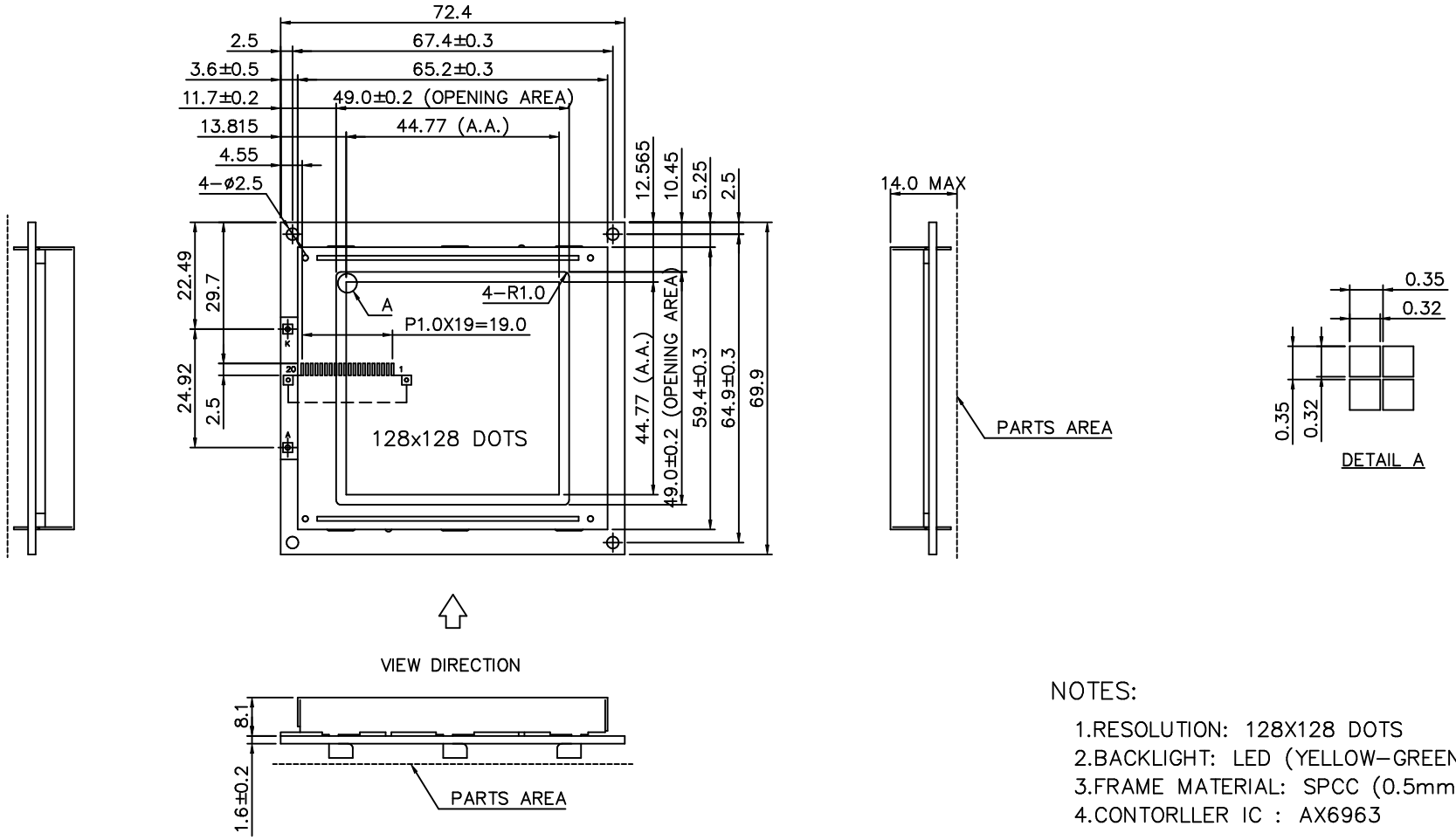
NOTICE:

- 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: 128X128 DOTS
2. BACKLIGHT: LED (YELLOW-GREEN)
3. FRAME MATERIAL: SPCC (0.5mmt)
4. CONTORLLER IC : AX6963

Pin No.	Symbol	Function
1	VSS	Ground
2	VDD	Power Supply for Logic Circuit
3	VEE	Power Supply for LCD Circuit
4	$\overline{WR}$	Data Write
5	$\overline{RD}$	Data Read
6	$\overline{CE}$	Chip Enable
7	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
8	$\overline{RESET}$	Controller Reset
9-16	D0-D7	Data Bus Line
17	FS	Font Select Connect to VDD : 6x8 Pixels/Character Connect to VSS : 8x8 Pixels/Character
18	NC	No Connection
19	LEDK	LED Backlight
20	LEDA	LED Backlight

GENERAL TOLERANCE LIST

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)

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

製 品 圖

LMC76S026C_

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

	NAME	DATE	THIRD ANGLE P.
APPROVE			
CHECK			
DESIGN	WADE LIU	93.05.10	SCALE / UNIT
DRAWN	WADE LIU	93.05.10	1/1 / mm

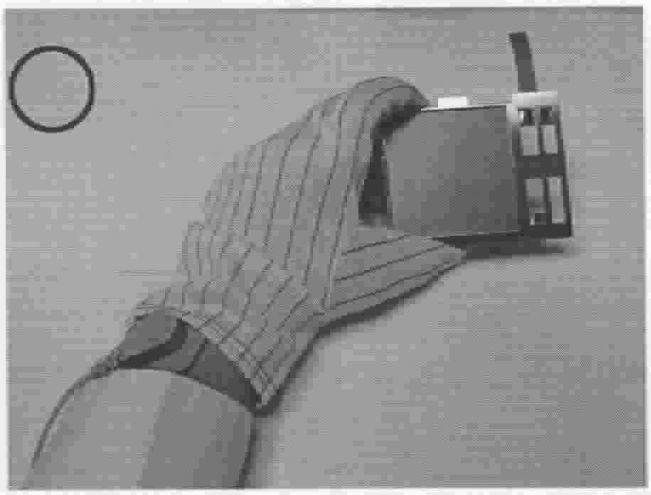
DWG NO. M026-D0A (1) (0)

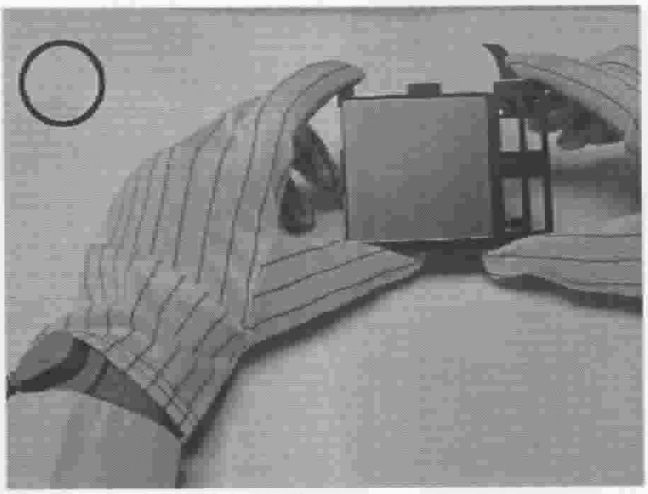
THE NOTES OF LCM USING

LCM is easy to damage.

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

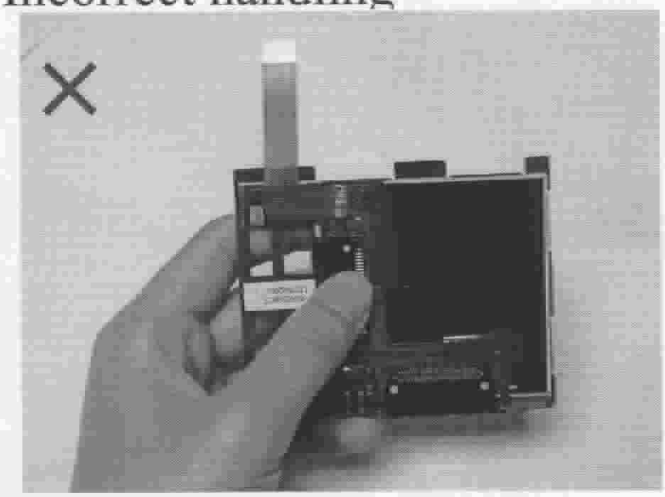
Correct handling



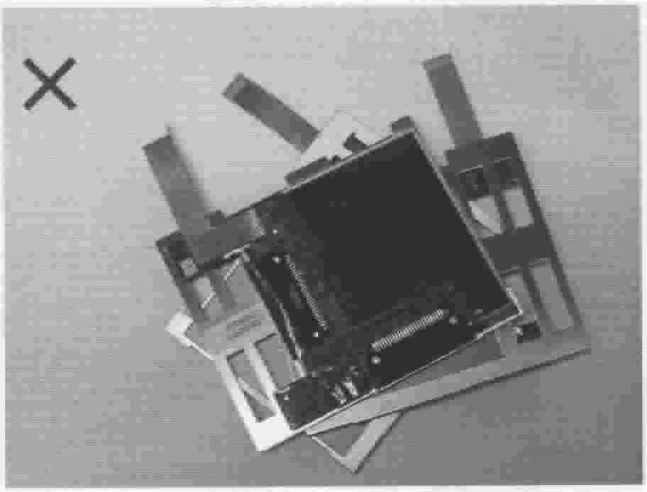


As above picture, please handle with glove by LCM edges and full EOS/ESD protection.

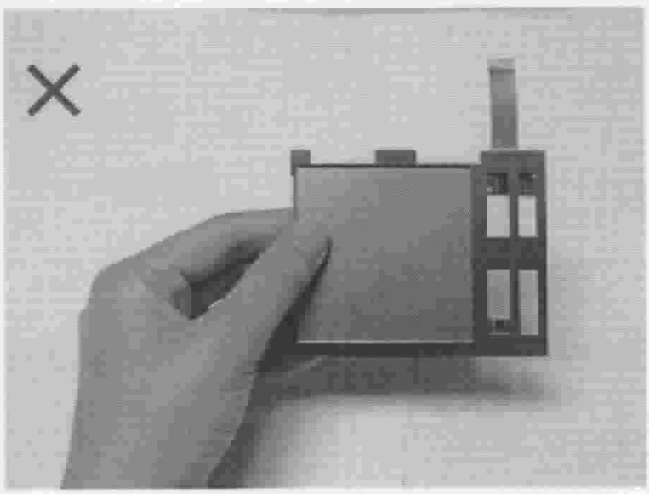
Incorrect handling



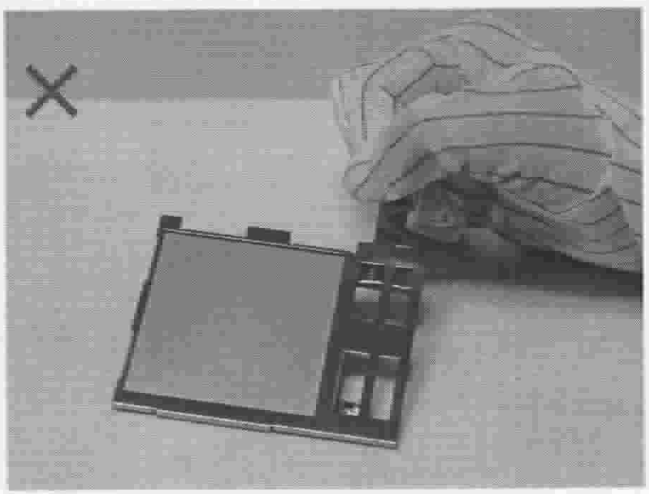
Please don't touch IC directly.



Please don't put one on another LCM.



Please don't hold the surface of LCM.

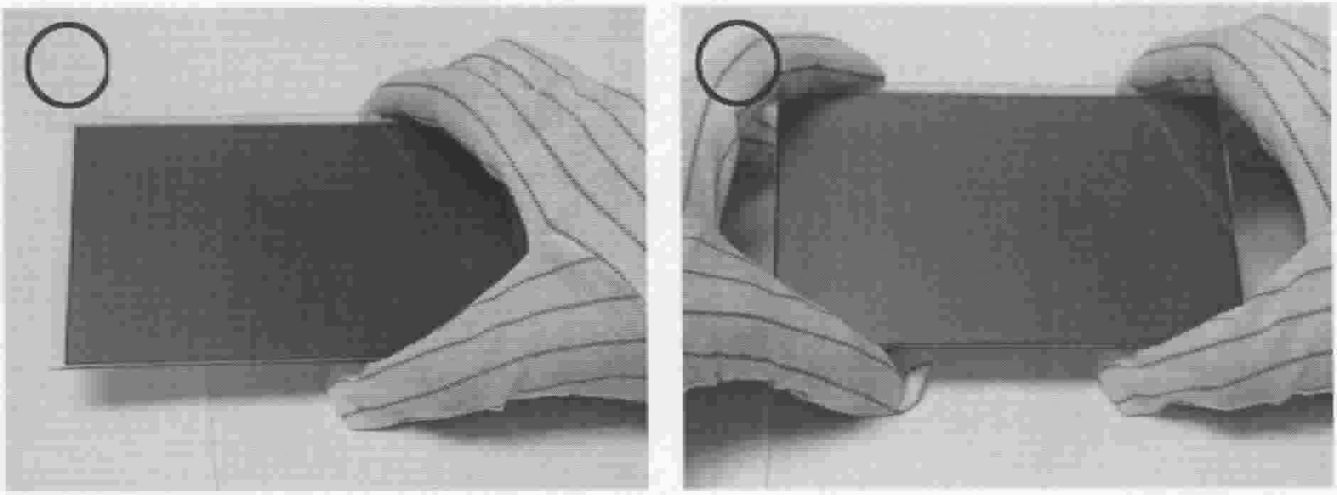


Please don't stretch interface of output.

THE NOTES OF LCD USING

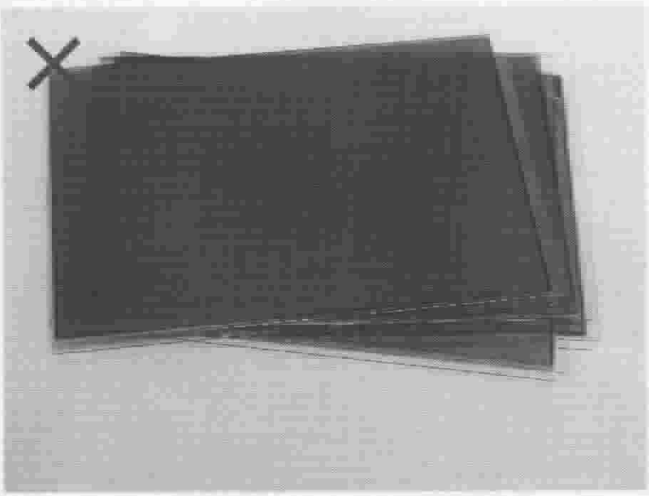
LCD is easy damage.
Please follow notes as bellows, and be careful of handling!

Correct handling

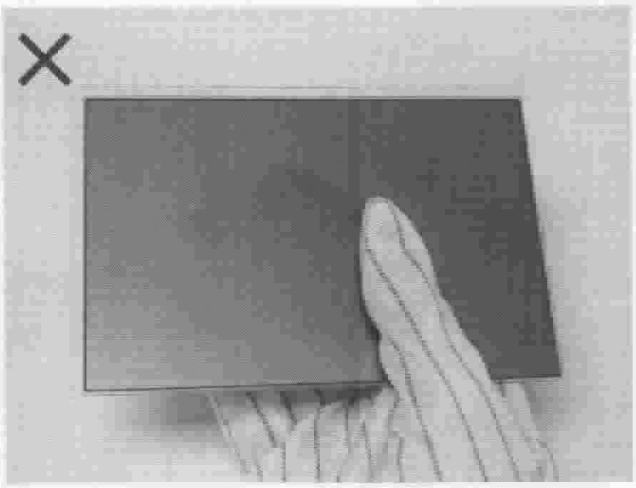


As above picture, please handle with glove by LCD edges and full EOS/ESD protection.

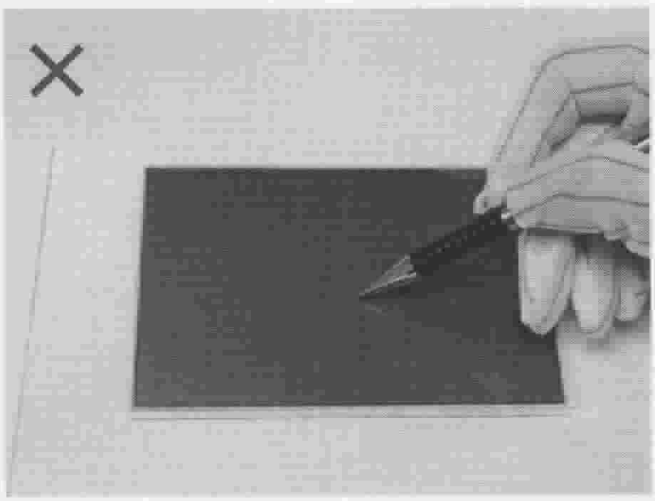
Incorrect handling



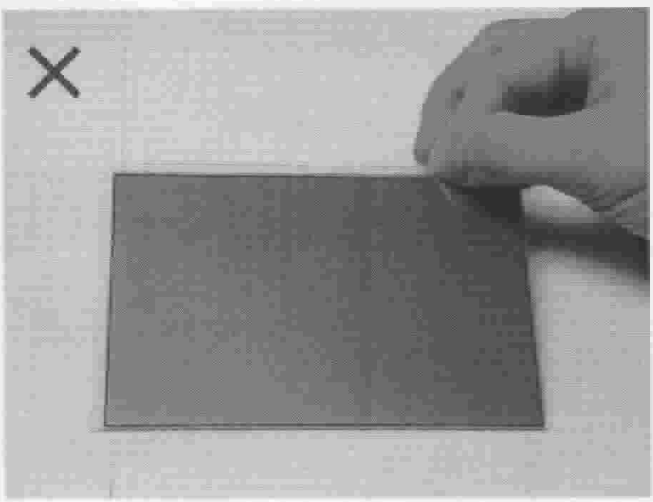
Please don't put one on another LCD.



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.