NAN YA PLASTICS CORPORATION

SPECIFICATION OF
LCD MODULE
PRODUCT NO.: LCCFBTB61M77S

SPEC. NO: LMB61-77A-△0

CUSTOMER
APPROVED BY
DATE:

LCD DEPARTMENT
ELECTRONIC MATERIALS DIVISION
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EDITED ON : Sep. 12. 2006

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

RECORDS OF REVISION

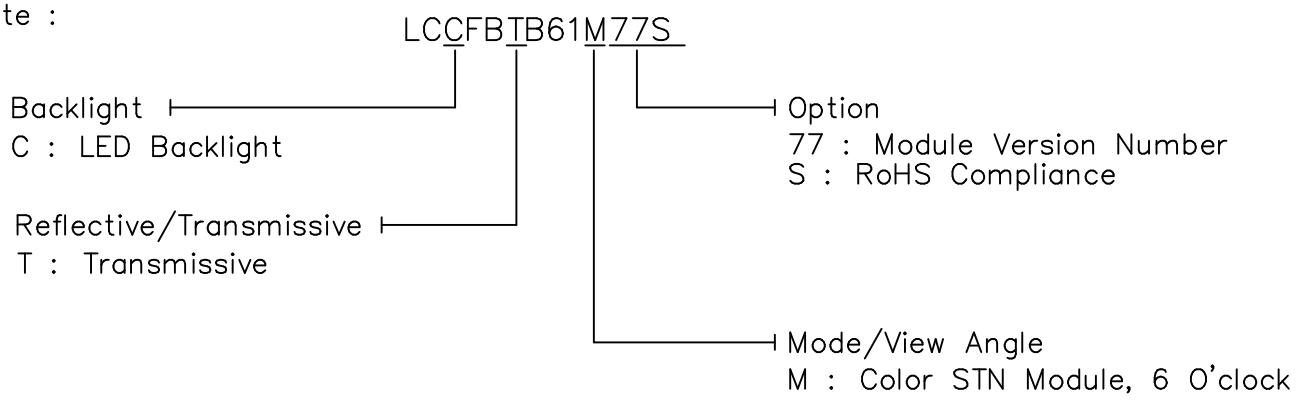
SPEC. NO.: LMB61-77A

DATE	REVISED NO.	REF. PAGE	SUMMARY	DESIGN	CHECK
09.12.06'	0	1~26/26	First Issue	W.R.HSU	

1. MECHANICAL DATA

NO	ITEM	CONTENTS	UNIT
1	Product No.	LCCFBTB61M77S	–
2	Module Size	154.6 (W) x 114.8 (H) x 10.6 (D)	mm
3	Dot Size	0.10 (W) x 0.34 (H)	mm
4	Dot Pitch	0.12 (W) x 0.36 (H)	mm
5	Number of Dots	320 x RGB (W) x 240 (H)	Dot
6	Duty	1/240	–
7	LCD Display Mode	FSTN, Color STN Module	–
8	Rear Polarizer	Color Transmissive Type	–
9	Viewing Direction	6	O'clock
10	Backlight	LED	–
11	Controller	Excluded	–
12	DC/DC Converter	Excluded	–
13	Touch Panel	Included	–
14	Weight	230 (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	WIDE TEMP.			
	OPERATING		STORAGE	
	MIN.	MAX.	MIN.	MAX.
Ambient Temperature	-20	70	-40	80
Humidity (Without Condensation)	Note 2,4		Note 3,4	

Note 2 Ta ≦ 70°C : 75%RH max

Note 3 Please refer to item of reliability test

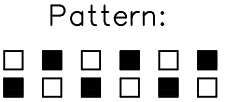
Note 4 Background color will change slightly depending on ambient temperature. That phenomenon is reversible.

Note 5

Frequency	5 Hz~13.95 Hz	13.95 Hz~33 Hz	33 Hz~51 Hz	51 Hz~500 Hz
Vibration Level	-	2X9.8 m/s²	-	5x9.8 m/s²
Vibration Width	0.2 inch	-	0.036 inch	-
Vibration Direction	X/Y/Z			
Vibration Time	20 min/cycle X 3 directions			

3. ELECTRICAL CHARACTERISTICS

3-1. ELECTRICAL CHARACTERISTICS OF LCM

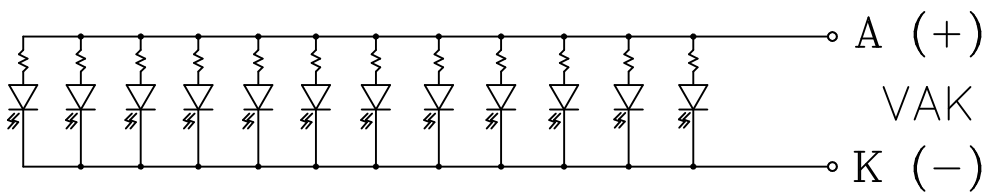
ITEM	SYMBOL	CONDITION		MIN.	TYP.	MAX.	UNIT
Power Supply for Logic	VDD-VSS	-		4.5	5.0	5.5	V
Power Supply for Logic	VDD-VSS	-		2.7	3.0	3.3	V
Input Voltage	VIH	H level		0.8VDD	-	VDD	V
	VIL	L level		0	-	0.2VDD	
Recommended LC Driving Voltage	VEE-VSS (Vop)	Duty= 1/240	-20°C	27.0	27.4	27.8	V
			0°C	26.2	26.6	27.0	
			25°C	25.2	25.6	26.0	
			50°C	24.1	24.5	24.9	
			70°C	23.5	23.9	24.3	
Power Supply Current	IDD	VDD-VSS=3V/5V VEE-VSS=25.6V Ta=25°C Pattern: 		-	4	6	mA
	IEE			-	8	12	
Surface Luminance of LCM	L	V_{AK} =5V Pattern: Dots All ON		50	70	-	cd/m²
		V_{AK} =5V Pattern: Dots All OFF		-	5	-	
Recommended Frame Frequency for Optimum Coctrast	FLM	-		115	120	125	Hz

3-2.ELECTRICAL CHARACTERISTICS OF BACKLIGHT

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

ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT	REMARK
Peak forward current	I_P	–	–	300	mA	–
Maximum reverse voltage	V_R	–	–	5	V	–
Applied forward voltage	V_{AK}	–	5	–	V	–
Applied forward current	I_{AK}	–	–	240	mA	–
LED power consumption	P_F	–	–	1.2	W	–
LED life time	L_L	–	10000	–	hrs	at V_{AK} = 5 V (*1)

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



3-3.CHARACTERISTICS OF TOUCH PANEL

Used Touch Panel Rating

Temp.=25°C

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Applied Rating Voltage	V_R	–	–	–	7.0	V
Operating Temperature	T_{OPR}	20%~85% R.H. Max. Avoid Dew Condensation at Any Time	−5	–	60	°C
Storage Temperature	T_{STO}		−30	–	70	
Resistance of Terminal Electrodes	R_{ETD}	X Electrode	300	–	900	Ω
		Y Electrode	200	–	600	
Linearity	L	–	–	–	1.5	%
Insulation Resistance	R_{OFF}	V_{DC}=25V	10	–	–	MΩ
Transparency	T	According to JIS-K7015	–	80	–	%
Surface Hardness	S_H	According to JIS-K5400	3	–	–	H

Test condition : Touch panel is placed horizonally in a vessel and no power is supplied to T/P.
Normal state is temperature : 25±10°C, relative humidity : 60±25%

4.OPTICAL CHARACTERISTICS

4-1.Optical Char. of Wide Temp. Mode

AT V_{OP}

ITEM / MODE		Cr(Contrast Ratio)										θ(Viewing Angle)		Φ(Viewing Angle)	
		-20℃		0℃		25℃		50℃		70℃		25℃		25℃	
		MIN.	TYP.	MIN.	TYP.	MIN.	TYP.	MIN.	TYP.	MIN.	TYP.	MIN.	TYP.	MIN.	TYP.
T	M	12	18	14	20	17	25	3.5	5	1.4	2	-	F: >60 R: 30	-	L: 55 R: 55
NOTE		NOTE 6										NOTE 5			

NOTE :

T : Transmissive

M : Color STN Module, 6 O'clock

AT $\phi=0°$ $\theta=0°$

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Response Time (rise)	Tr	-20℃	2300	2900	4300	ms	NOTE 2
		0℃	640	800	1200		
		25℃	240	300	450		
		50℃	80	100	150		
		70℃	45	55	80		
Response Time (fall)	Tf	-20℃	1500	1800	2700	ms	NOTE 2
		0℃	360	450	670		
		25℃	80	100	150		
		50℃	48	60	90		
		70℃	32	40	60		

4-2.Color of CIE Coordinate

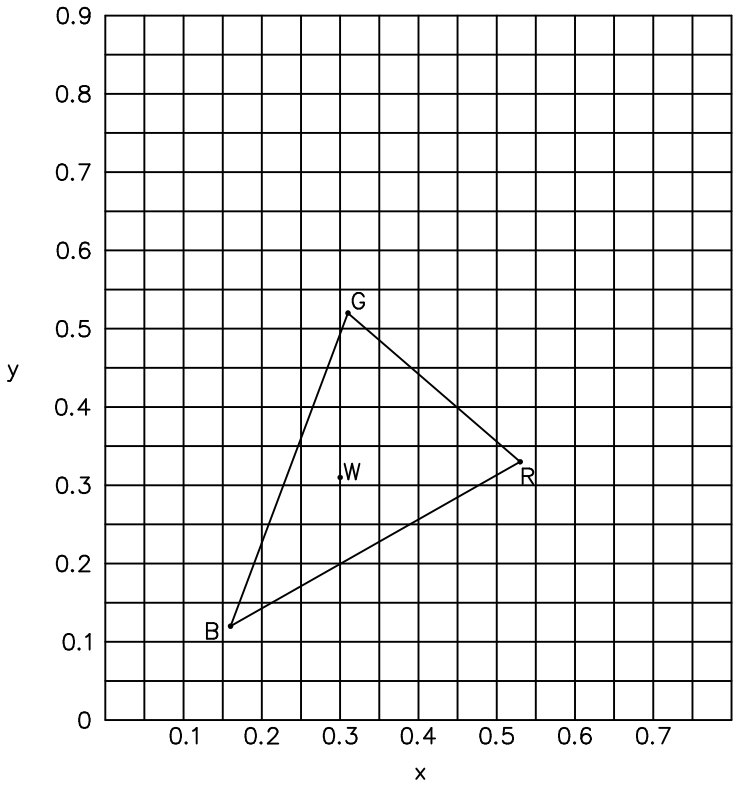
Ta = 25°C

ITEM		SYMBOL	CONDITION	VALUE	NOTE
Color of CIE Coordinate	Red	X	$\phi=0°$, $\theta=0°$	0.53	Note※
		y		0.33	
	Green	X	$\phi=0°$, $\theta=0°$	0.31	
		y		0.52	
	Blue	X	$\phi=0°$, $\theta=0°$	0.16	
		y		0.12	
	White	X	$\phi=0°$, $\theta=0°$	0.30	
		y		0.31	

Tolerance : ±0.05

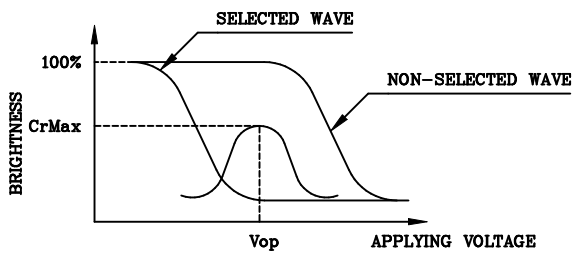
Note※ Measuring at position 3 on Fig.1
CIE chromaticity diagram

Fig.1

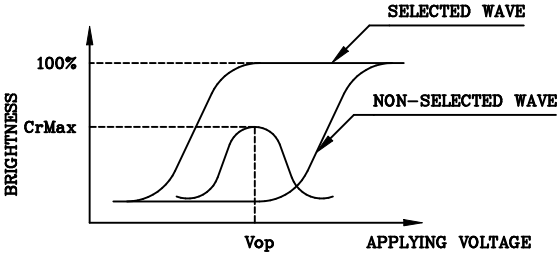


(NOTE 1)

Definition of Operation Voltage(Vop)



(positive type)



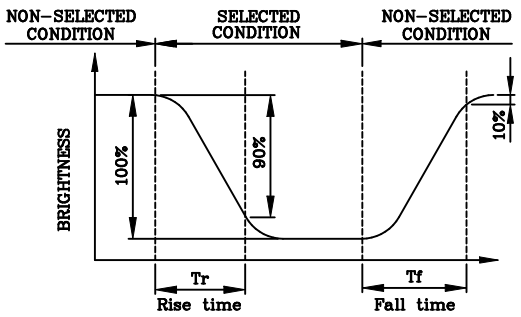
(negative type)

*Conditions

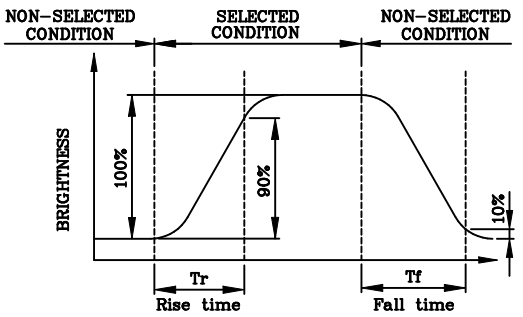
Viewing Angle : 0
Frame Frequency : 120Hz
Applying Waveform : 1/N duty 1/a bias

(NOTE 2)

Definition of Response Time(Tr,Tf)



(positive type)



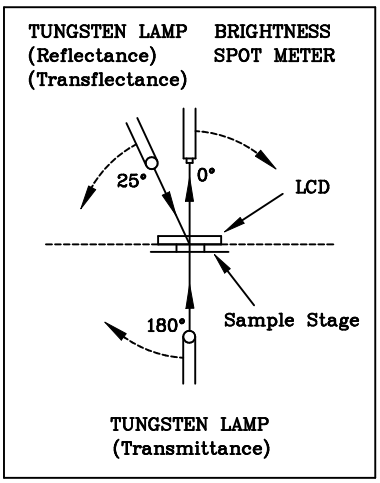
(negative type)

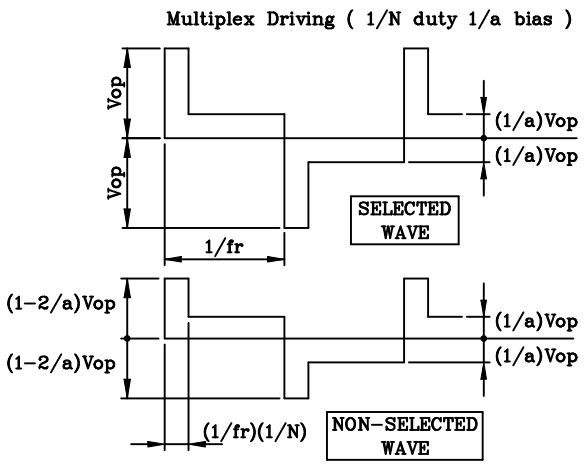
*Conditions

Operating Voltage : Vop
Viewing Angle (θ,ϕ) : (0,0)
Frame Frequency : 120Hz
Applying Waveform : 1/N duty 1/a bias

(NOTE 3)

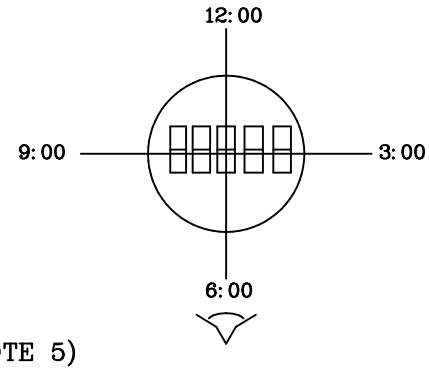
Description of Measuring Equipment and Driving Waveforms





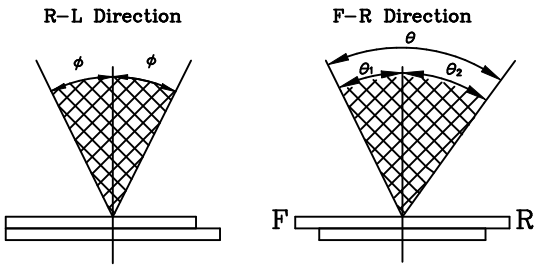
(NOTE 4)

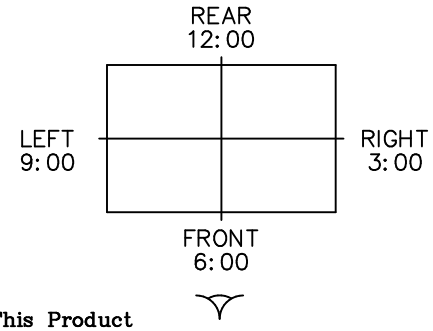
Definition of Viewing Direction



(NOTE 5)

Definition of Viewing Angle





*For This Product

The Viewing Direction Is 6 O'clock

So $\theta_1 > \theta_2$

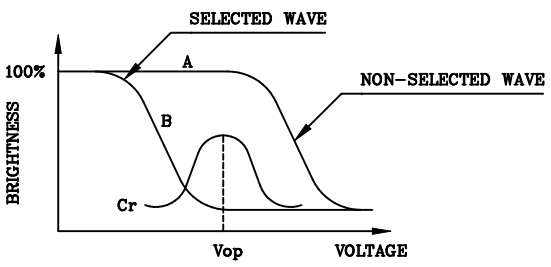
$\theta = \theta_1 + \theta_2$

*Conditions

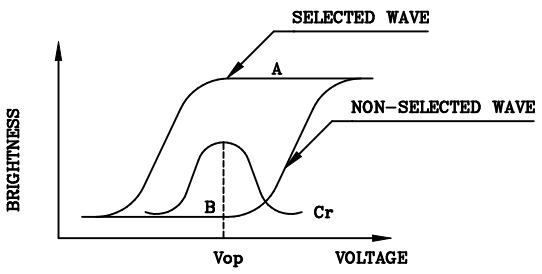
Operating Voltage : Vop
Frame Frequency : 120Hz
Applying Waveform : 1/N duty 1/a bias
Contrast Ratio : larger than 2

(NOTE 6)

Definition of Contrast Ratio (Cr)



(positive type)



(negative type)

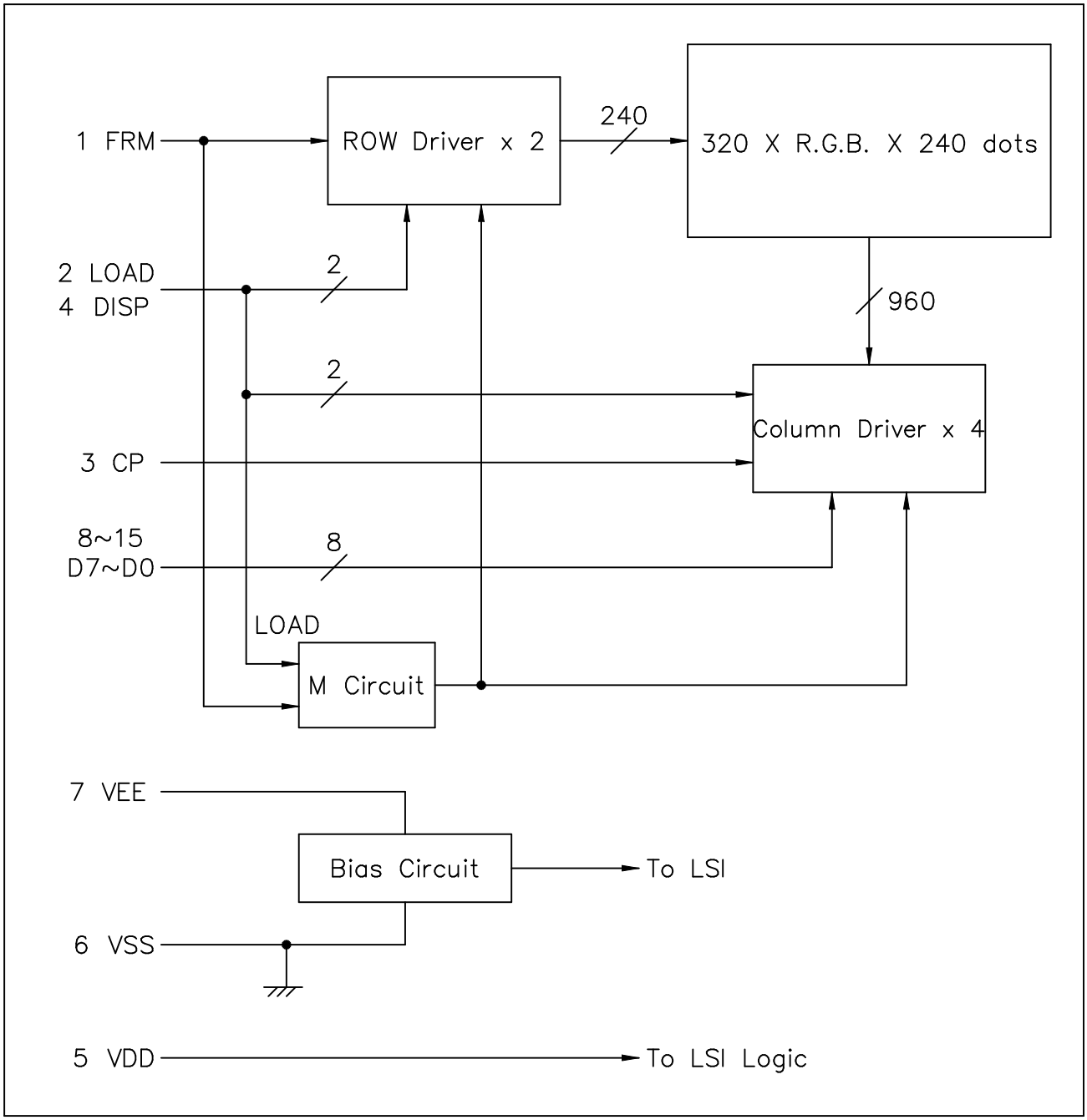
Contrast Ratio : Cr=A/B

*Conditions

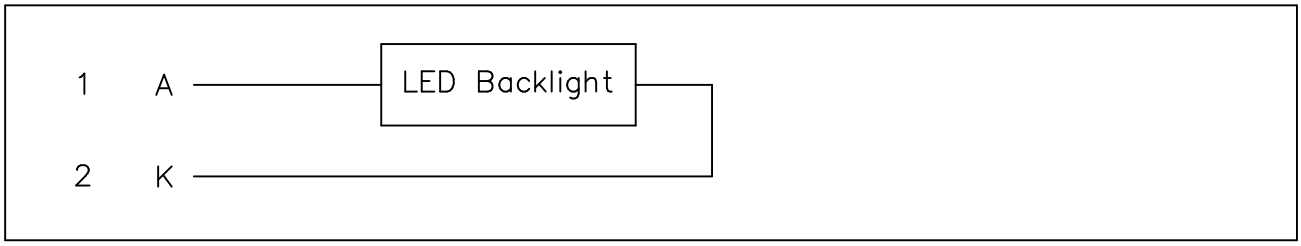
Viewing Angle : 0
Frame Frequency : 120Hz
Applying Waveform : 1/N duty 1/a bias

5. BLOCK DIAGRAM

LCD



LED



6. INTERNAL PIN CONNECTION

LCD

Pin No.	Symbol	Function	Level
1	FRM	Synchronous signal for driving scanning line	H
2	LOAD	Data signal latch clock	H → L
3	CP	Data signal shift clock	H → L
4	DISP	Display control signal	H(ON),L(OFF)
5	VDD	Power supply for logic	–
6	VSS	GND	–
7	VCON	Power supply for LCD	–
8	D7	Display data	H(ON),L(OFF)
9	D6		
10	D5		
11	D4		
12	D3		
13	D2		
14	D1		
15	D0		

CN1 : 53261-1571 (Molex)

Recommended Matching Connector :51021-1500(Molex) or Compatible

LED

Pin No.	Symbol	Function	Level
1	A	Power supply for LED Backlight (+)	–
2	K	Power supply for LED Backlight (-)	–

CN2 : BHR-02VS-1 (JST)

Recommended Matching Connector :SM02(4.0)B-BHS-1-TB(JST) or Compatible

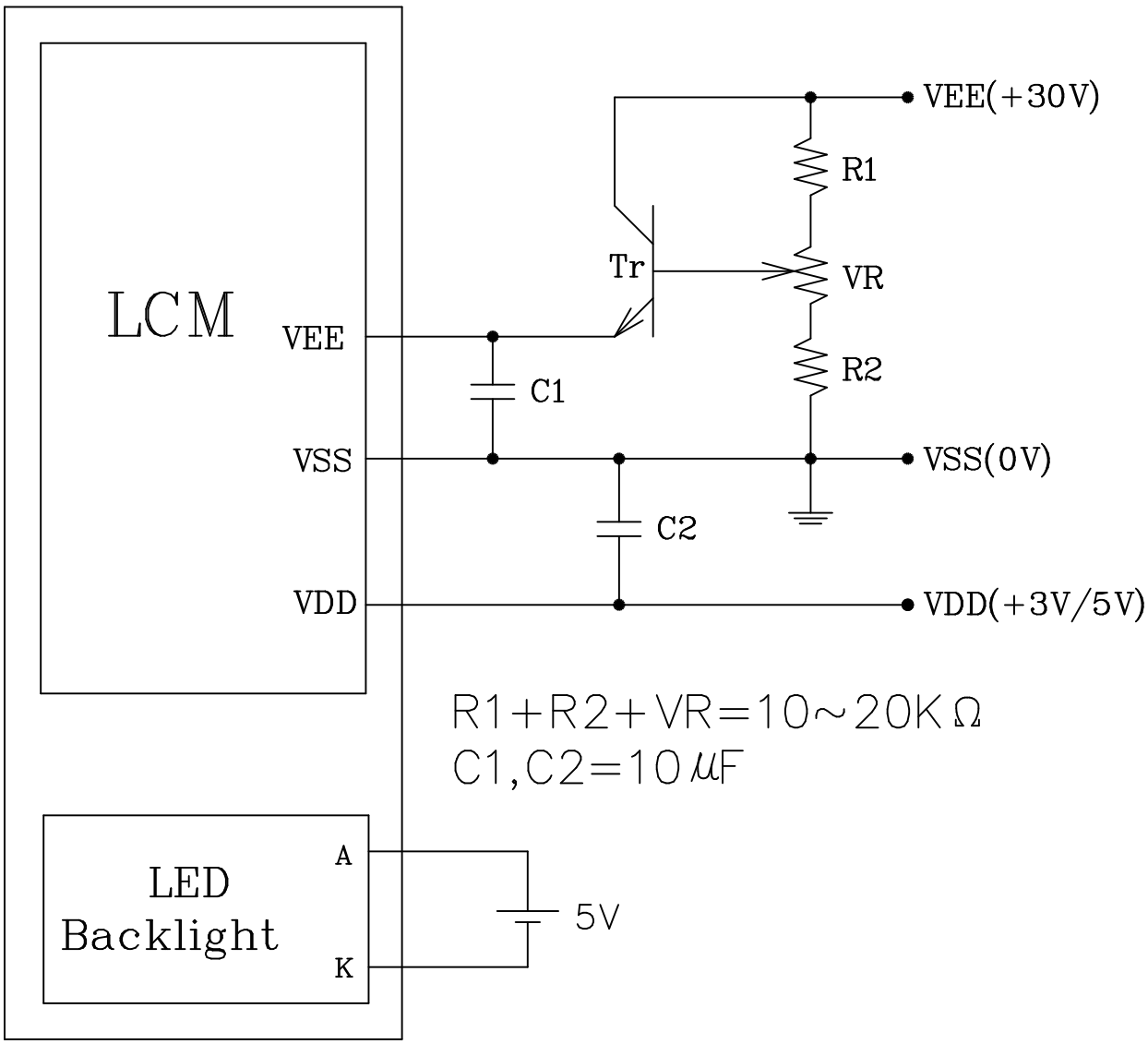
TOUCH SCREEN

Pin No.	Symbol	Level	Function
1	DOWN	–	Down Direction
2	LEFT	–	Left Direction
3	UP	–	Up Direction
4	RIGHT	–	Right Direction

TOUCH SCREEN CABLE : N4,Pitch 1.0mm(Thikness = 0.3 mm)

Recommended Matching Connector : 52852-0470(molex)

7. POWER SUPPLY

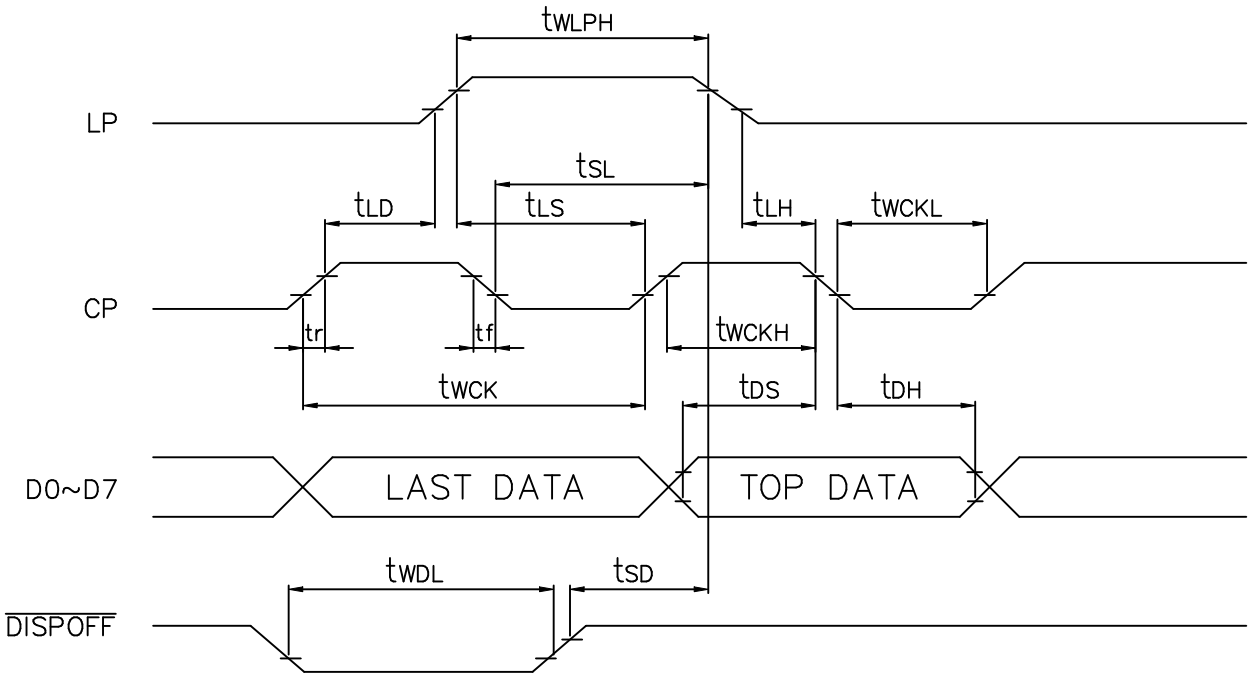


8. TIMING CHARACTERISTICS

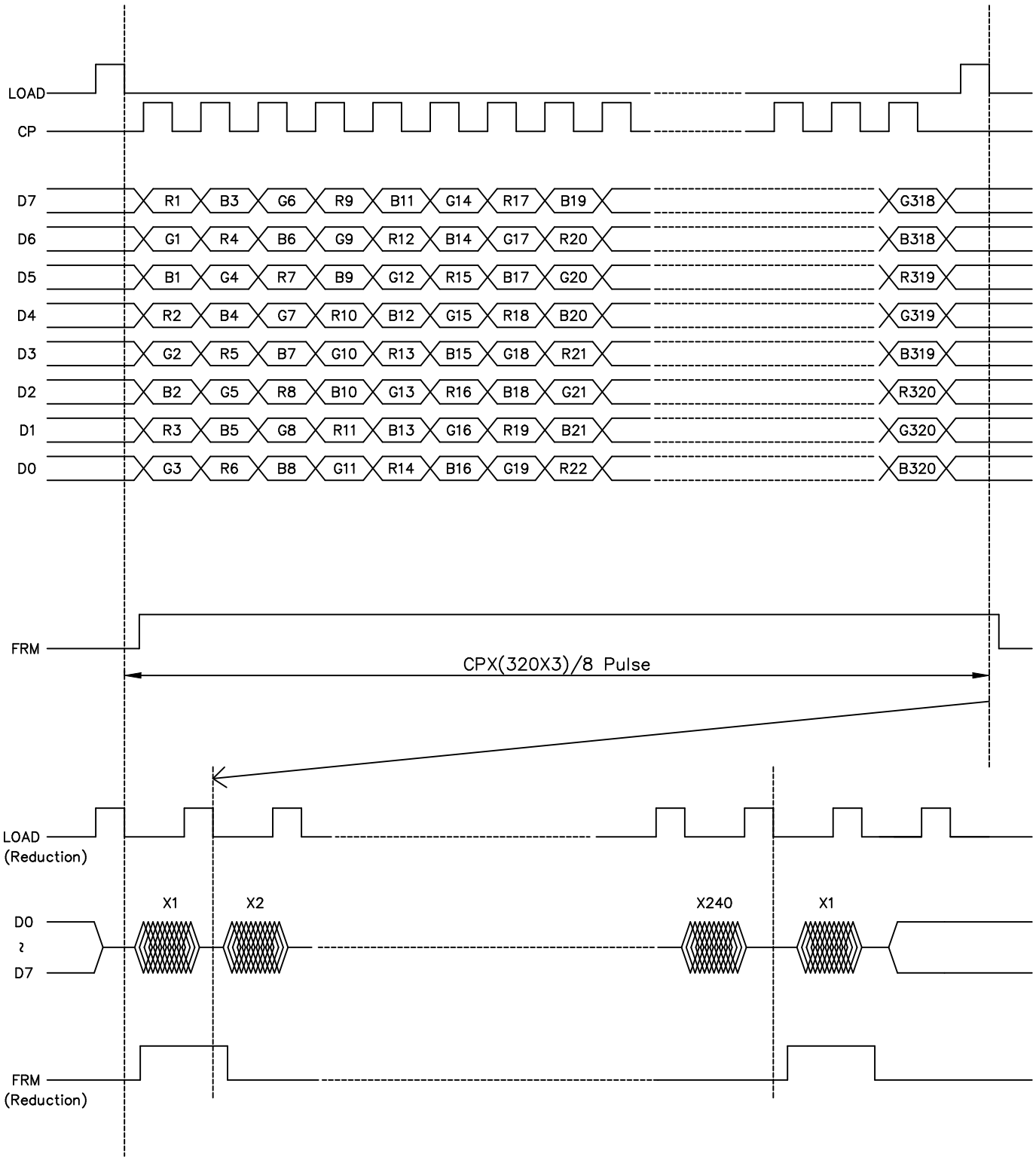
8-1. INTERFACE TIMING

VDD=3.3V ± 10%

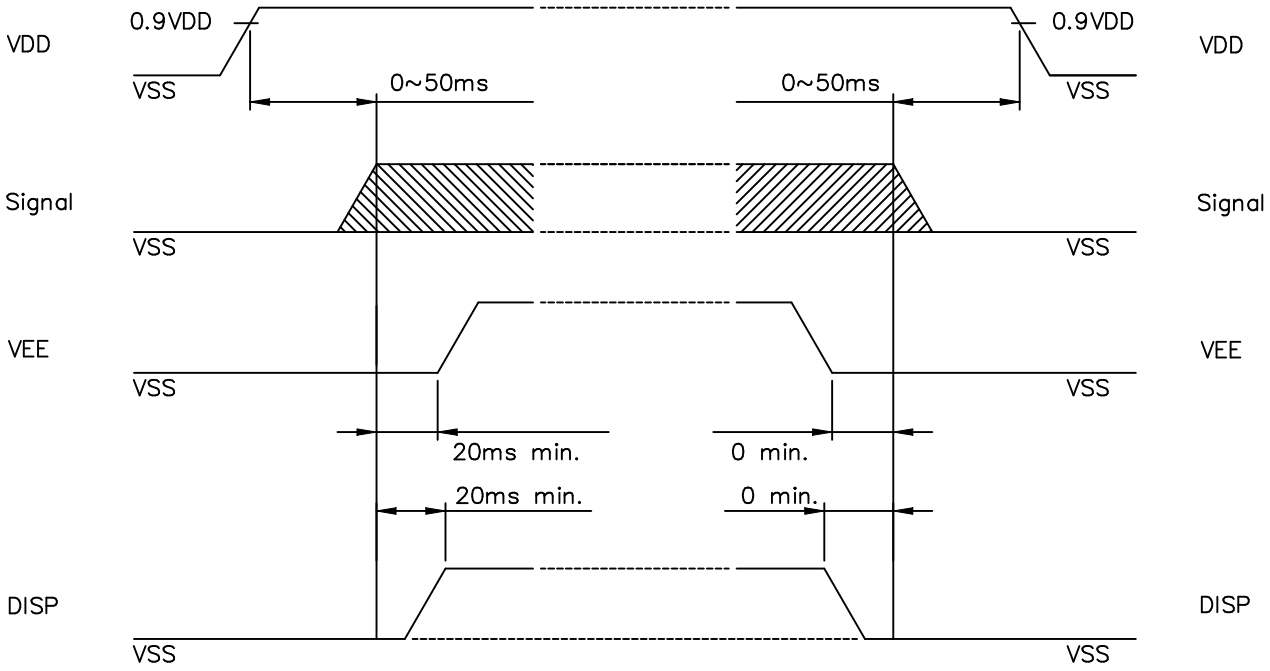
Parameter	SYMBOL	MIN.	MAX.	UNIT
CLOCK PULSE CYCLE TIME	t_{WCK}	66	–	ns
CLOCK PULSE HIGH LEVEL WIDTH	t_{WCKH}	23	–	ns
CLOCK PULSE LOW LEVEL WIDTH	t_{WCKL}	23	–	ns
LATCH PULSE HIGH LEVEL WIDTH	t_{WLPH}	30	–	ns
CP→LP RISE TIME	t_{LD}	10	–	ns
CP→LP FALL TIME	t_{SL}	30	–	ns
LP→CP RISE TIME	t_{LS}	30	–	ns
LP→CP FALL TIME	t_{LH}	30	–	ns
CLOCK PULSE RISE/FALL TIME	t_r , t_f	–	30	ns
DATA SETUP TIME	t_{DS}	10	–	ns
DATA HOLD TIME	t_{DH}	25	–	ns
$\overline{\text{DISPOFF}}$ LOW LEVEL WIDTH	t_{WDL}	1.2	–	μs
$\overline{\text{DISPOFF}}$ CANCELLATION TIME	t_{SD}	100	–	ns



8-2. TIMING CHART



8-3.POWER ON/OFF TIMING



POWER ON　　POWER OFF

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

8-4.DISPLAY PATTERN

START DATA

	Y1			Y2			Y3			----------	Y318			Y319			Y320		
X1	R1 D7	G1 D6	B1 D5	R2 D4	G2 D3	B2 D2	R3 D1	G3 D0	B3 D7		R318 D0	G318 D7	B318 D6	R319 U5	G319 D4	B319 D3	R320 D2	G320 D1	B320 D0
X2	R1 D7	G1 D6	B1 D5	R2 D4	G2 D3	B2 D2	R3 D1	G3 D0	B3 D7		R318 D0	G318 D7	B318 D6	R319 U5	G319 D4	B319 D3	R320 D2	G320 D1	B320 D0
X239	R1 D7	G1 D6	B1 D5	R2 D4	G2 D3	B2 D2	R3 D1	G3 D0	B3 D7		R318 D0	G318 D7	B318 D6	R319 U5	G319 D4	B319 D3	R320 D2	G320 D1	B320 D0
X240	R1 D7	G1 D6	B1 D5	R2 D4	G2 D3	B2 D2	R3 D1	G3 D0	B3 D7		R318 D0	G318 D7	B318 D6	R319 U5	G319 D4	B319 D3	R320 D2	G320 D1	B320 D0

9. RELIABILITY TEST

WIDE TEMPERATURE RELIABILITY TEST

NO	ITEM	CONDITION			STANDARD	NOTE
1	High Temp. Storage	80°C	120Hrs		Appearance without defect	
2	Low Temp. Storage	−40°C	120Hrs		Appearance without defect	
3	High Temp. & High Humi. Storage	60°C 90%RH	120Hrs		Appearance without defect	
4	High Temp. Operating Display	70°C	120Hrs		Appearance without defect	
5	Low Temp. Operating Display	−20°C	120Hrs		Appearance without defect	
6	Thermal Shock	−20°C,30min → 70°C,30min ↑ (1cycle)			Appearance without defect	10 cycles

Inspection Provision

1.Purpose

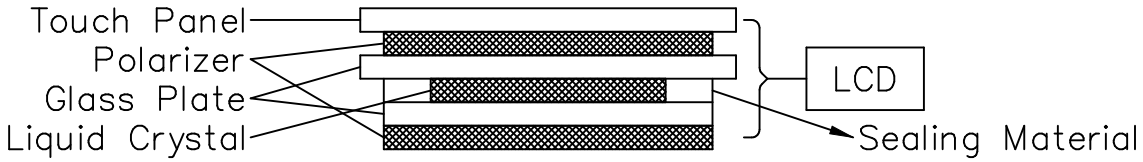
The NAN YA inspection provision provides outgoing inspection provision and its expected quality level based on our outgoing inspection of NAN YA LCD produces.

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

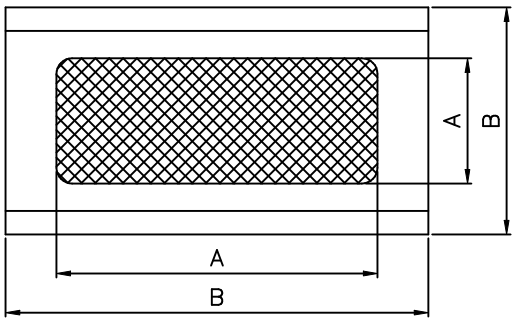
	Item		AQL(%)	Remarks
Major Defect	Dots	Opens Shorts Erroneous operation	0.4	faults which substantially lower the practicality and the initial purpose difficult to achieve.
	Solder appearance	Shorts Loose		
	Cracks	Display surface cracks		
	Touch Panel contact resistance			
	Touch Panel input load			

	Touch Panel linearity		0.4	
	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	Touch Panel contact resistance	Within Specified value
7	Touch Panel input load	Within Specified value
8	Touch Panel linearity	Within Specified value
9	Backlight turn on/off	Within Specified value

5-2 External Appearance Defect

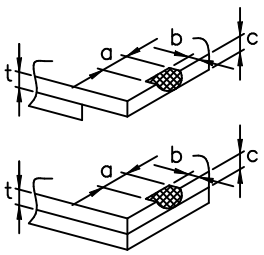
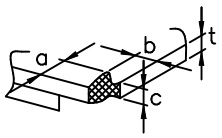
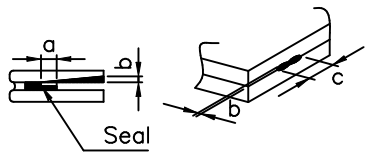
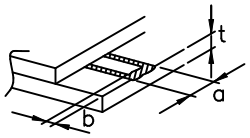
<table>
<tr><th>NO.</th><th>Item</th><th>Criterion</th></tr>
<tr><td>1</td><td>Black spots, foreign matter, and white spots (Including light leakage due to pinholes of polarizing plates, etc.)</td><td>
(1)-1-Spots
<table>
<tr><th>Average Diameter(mm): D</th><th>Number of pieces permitted</th><th>Minimum Space</th></tr>
<tr><td>D≦0.2</td><td>Ignore</td><td>-</td></tr>
<tr><td>0.2<D≦0.3</td><td>5</td><td>10mm</td></tr>
<tr><td>0.3<D≦0.4</td><td>2</td><td>30mm</td></tr>
<tr><td>0.4<D</td><td>0</td><td></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.

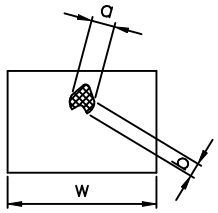
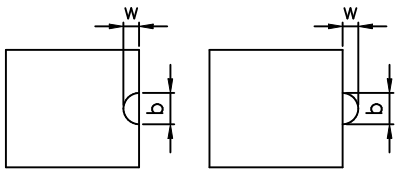
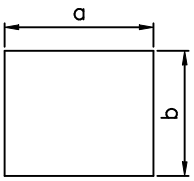
Note that when there are 2 pieces or more, they are not to be concentrated.
Set as: Average diameter = (Long diameter + Short diameter)/2
</td></tr>
</table>

<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.

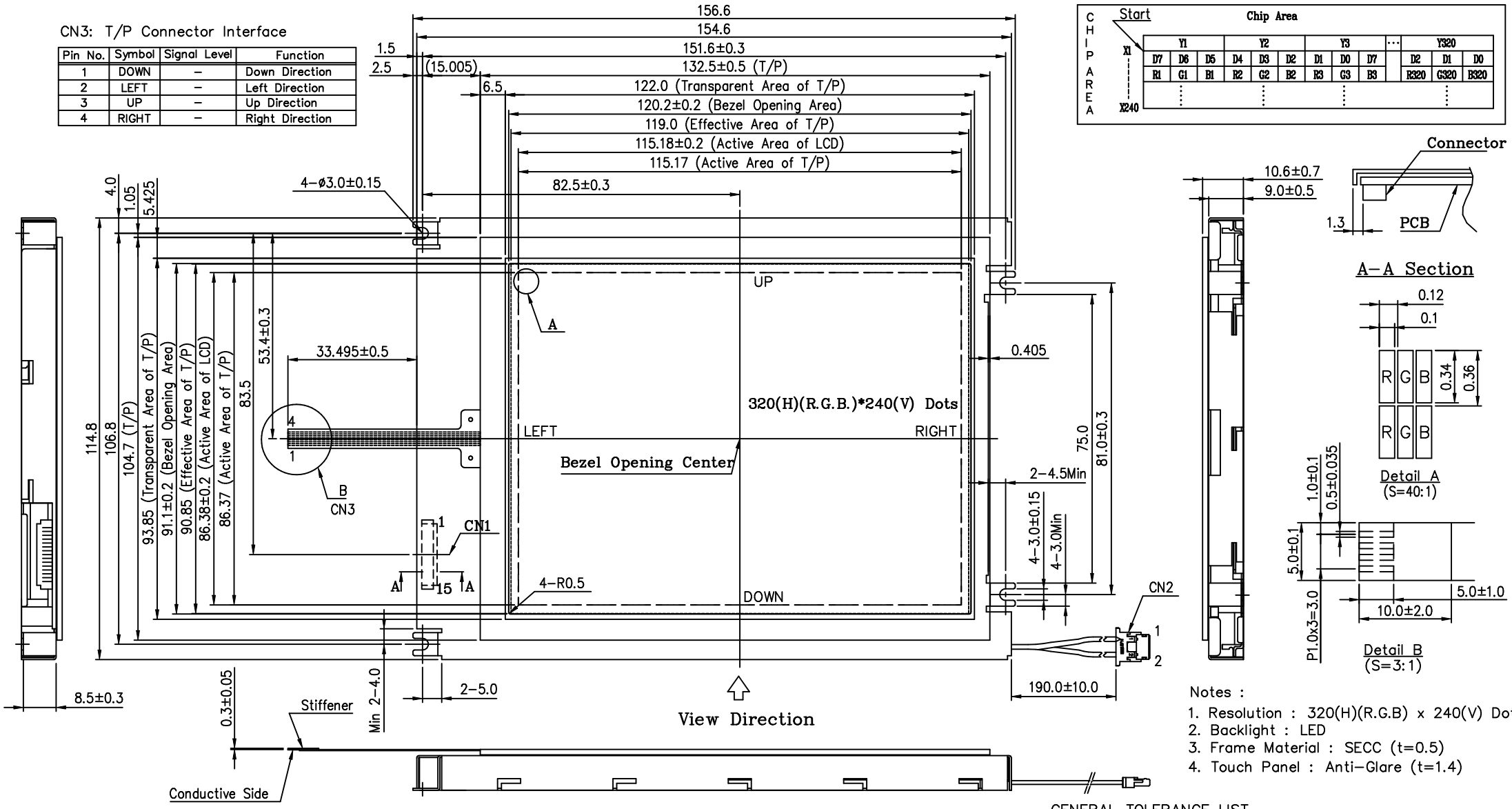
- HANDLING
  1. Avoid static electricity which can damage the CMOS LSI.
  2. Do not remove the panel or frame from the module.
  3. The polarizing plate of the display is very fragile. So, please handle it very carefully.
  4. Do not wipe the polarizing plate with a dry cloth, as it may easily scratch 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.

CN3: T/P Connector Interface

Pin No.	Symbol	Signal Level	Function
1	DOWN	–	Down Direction
2	LEFT	–	Left Direction
3	UP	–	Up Direction
4	RIGHT	–	Right Direction



Notes :
1. Resolution : 320(H)(R.G.B) x 240(V) Dots
2. Backlight : LED
3. Frame Material : SECC (t=0.5)
4. Touch Panel : Anti-Glare (t=1.4)

CN1 : 53261-1571 (Molex)

Pin No.	Symbol	Function	Level
1	FRM	Synchronous signal for driving scanning line	H
2	LOAD	Data signal latch clock	H → L
3	CP	Data signal shift clock	H → L
4	DISP	Display control signal	H(ON),L(OFF)
5	VDD	Power supply for logic	–
6	VSS	GND	–
7	VEE	Power supply for LCD	–
8	D7	Display data	H(ON),L(OFF)
9	D6		
10	D5		
11	D4		
12	D3		
13	D2		
14	D1		
15	D0		

Display data — H(ON),L(OFF)

CN2 : BHR-02VS-1 (JST)

Pin No.	Symbol	Function	Level
1	A	Power supply for LED Backlight (+)	–
2	K	Power supply for 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)

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

LCCFBTB61M77S

	NAME	DATE	THIRD ANGLE P.
APPROVE			
CHECK			
DESIGN	Campos Chen	95.09.06	SCALE / UNIT
DRAWN	Campos Chen	95.09.06	1/1 / mm

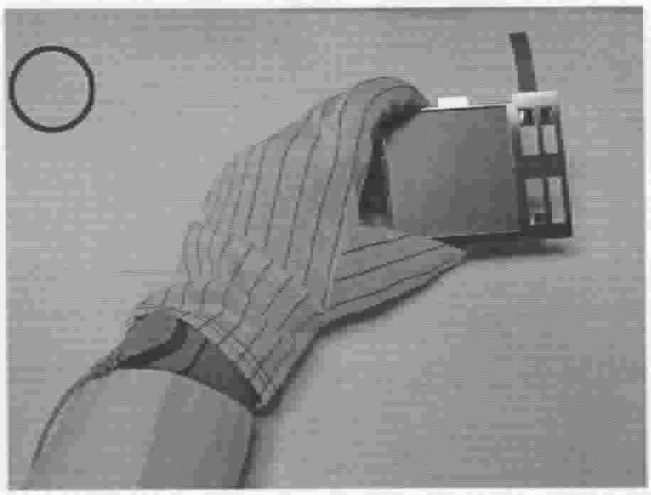
DWG NO. MB61ADT7A (1.0)

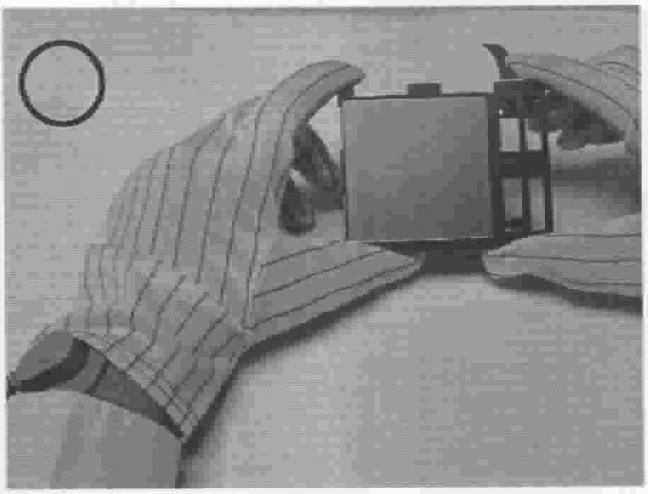
THE NOTES OF LCM USING

LCM is easy to damage.

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

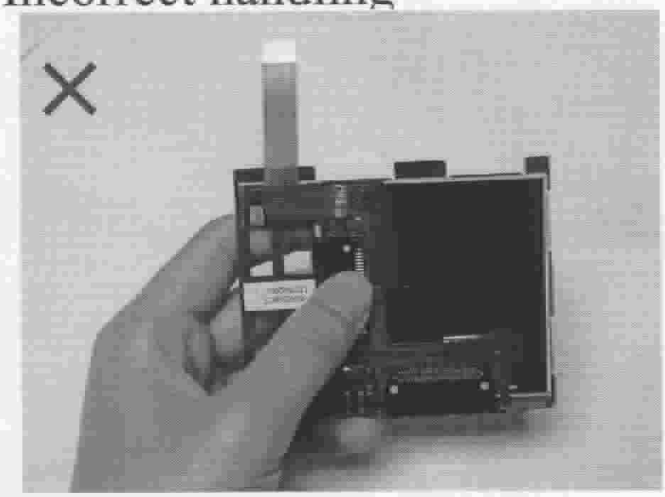
Correct handling



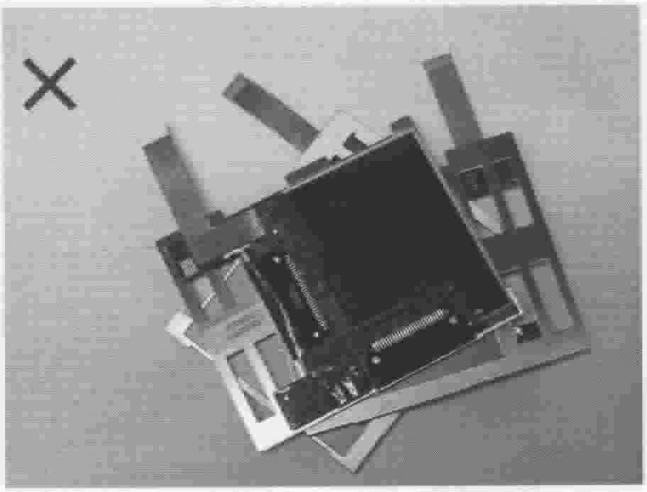


As above picture, please handle with glove by LCM edges and full EOS/ESD protection.

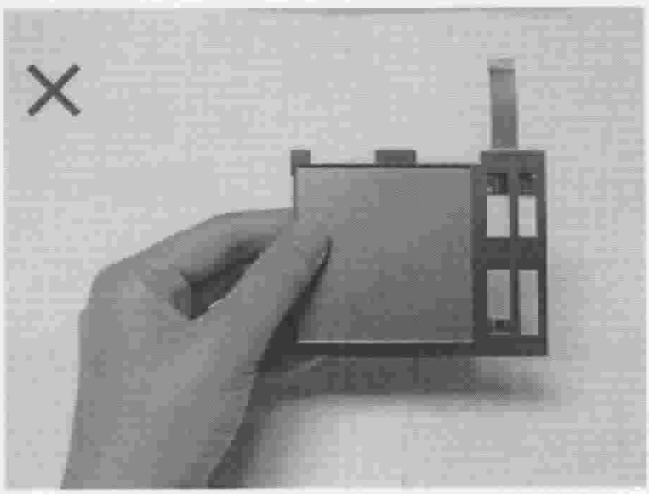
Incorrect handling



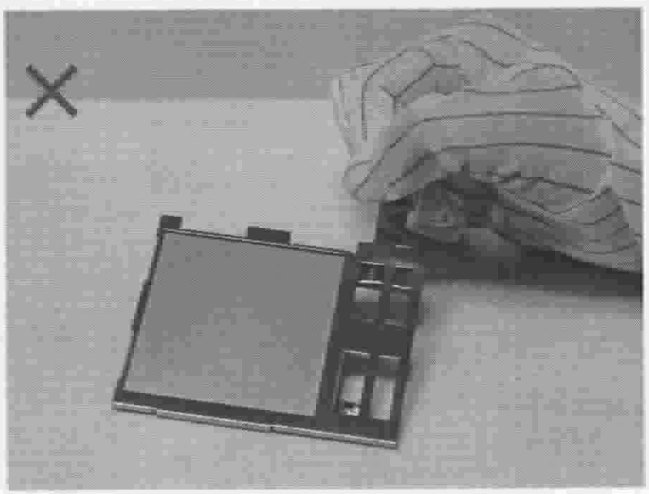
Please don't touch IC directly.



Please don't put one on another LCM.



Please don't hold the surface of LCM.

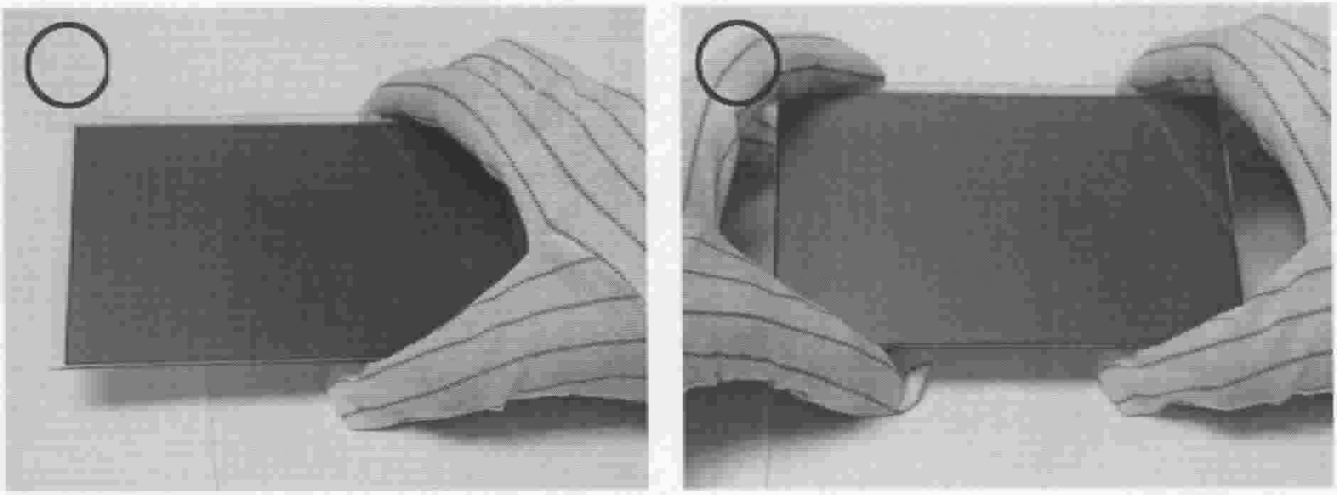


Please don't stretch interface of output.

THE NOTES OF LCD USING

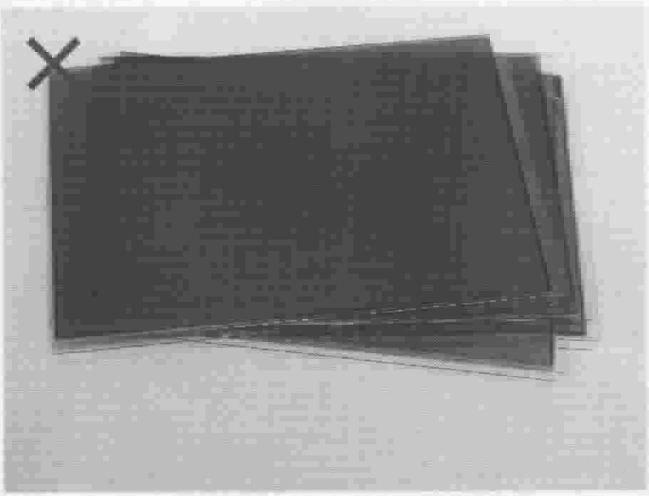
LCD is easy damage.
Please follow notes as bellows, and be careful of handling!

Correct handling

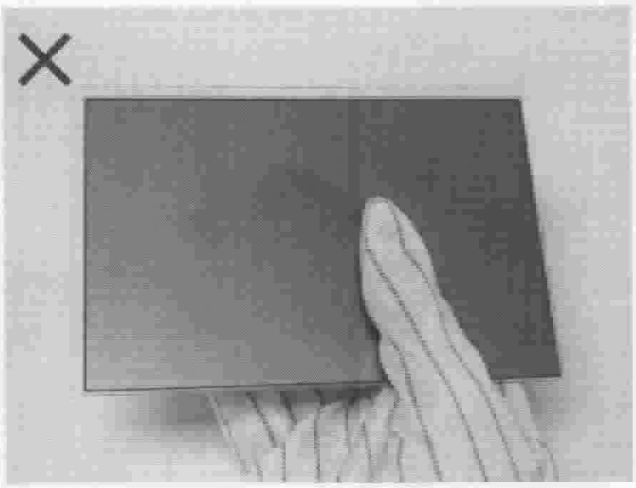


As above picture, please handle with glove by LCD edges and full EOS/ESD protection.

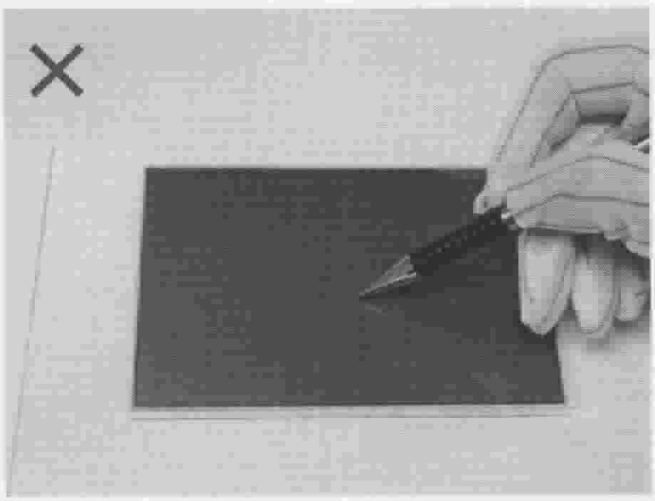
Incorrect handling



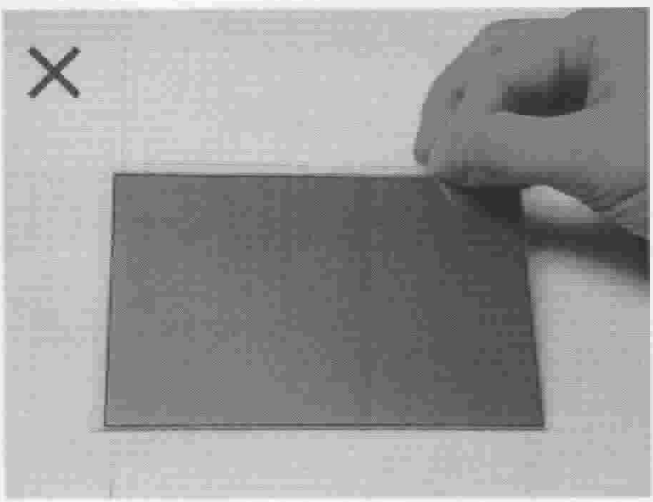
Please don't put one on another LCD.



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.