NAN YA PLASTICS CORPORATION

SPECIFICATION OF

LCD MODULE

PRODUCT NO.: LKCEAZ740YKS_

SPEC. NO.: LM740-0A-0

CUSTOMER
APPROVED BY
DATE:

LCD DEPARTMENT
ELECTRONIC MATERIALS DIVISION
NAN YA PLASTICS CORPORATION
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EDITED ON : MARCH.02, 2007

Q.C. DEPT.	DESIGN MANAGER	DESIGN CHECK	DESIGNER
			J.P Weng

RECORDS OF REVISION

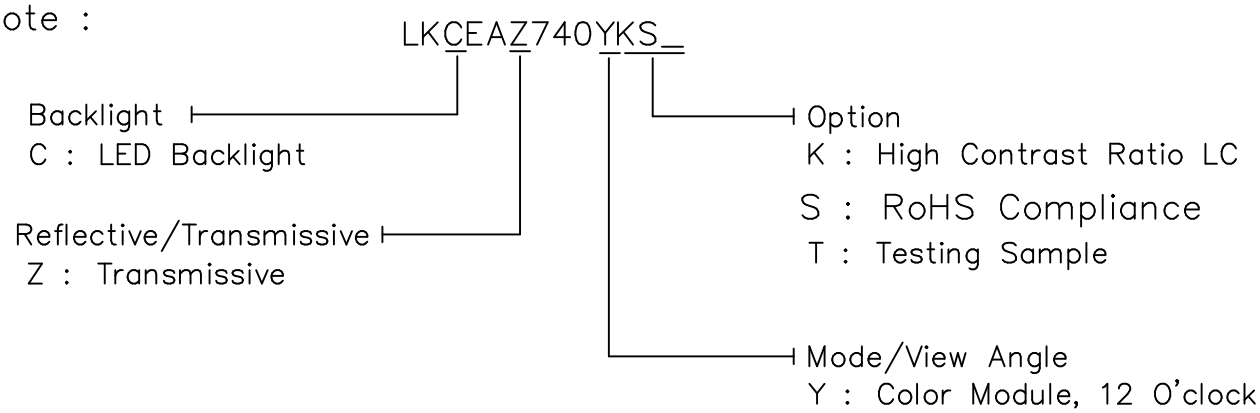
SPEC. NO.: LM740-0A

DATE	REVISED NO.	REF. PAGE	SUMMARY	DESIGN	CHECK
03.02,07'	0	1~21/21	First Issue	J.P Weng	

1. MECHANICAL DATA

NO	ITEM	CONTENTS	UNIT
1	Product No.	LKCEAZ740YKS_	–
2	Module Size	143.7 (W) x 104.4 (H) x 12.0 (D)	mm
3	Dot Size	-- (W) x -- (H)	mm
4	Dot Pitch	0.12 (W) x 0.36 (H)	mm
5	Active Area	115.2 (W) x 86.4 (H)	Dot
6	Number of Dots	320 RGB (W) x 240 (H)	–
7	LCD Display Mode	TFT Module	–
8	Rear Polarizer	Transmissive	–
9	Viewing Direction	12	O'clock
10	Backlight	LED	–
11	Controller	Source: HX8218-C01(COG); Gate: HX8615-C(COG)	–
12	Touch Panel	Excluded	–
13	Weight	200 (Approx.)	g
14	Soldering	Lead Free	–

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=GND=0 Vdc

	SYMBOL	MIN.	MAX.	UNIT	COMMENT
Power Supply for Logic	VCC-GND	-0.3	7.0	V	
Input Voltage	VI	-0.3	VCC	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.

3. ELECTRICAL CHARACTERISTICS

3-1. ELECTRICAL CHARACTERISTICS OF LCM

Vss=GND=0 Vdc

ITEM		SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Power Supply Voltage		VCC	–	3.0	3.3	3.6	V
Input Voltage		VIH	H level	0.7VCC	–	VCC	V
		VIO	L level	GND	–	0.3VCC	
LC Driving Voltage		VGH *1)	–	–	15	–	V *3)
		VGL *2)		–	−10	–	
		VcomH		2.5	–	5.5	
		VcomL		−2.0	–	0	
Power Supply Current		IDD/Ta=25℃	Normal Picture	–	100	160	mA
Surface Luminance		L Ta=25℃	Pattern: Dots All On IAK=140mA	350	400	–	cd/m^2
			Pattern: Dots All Off IAK=140mA	–	1	–	
Contrast Ratio(LCM)	LCM	Cr Ta=25℃	L(White) / L(Black)	250	400	–	–

Notes:

*1) VGH is TFT Gate on operating Voltage.

*2) VGL is TFT Gate off operating Voltage, VGL signal must be fluctuates with same phase as Vcom when Storage on Gate structure.

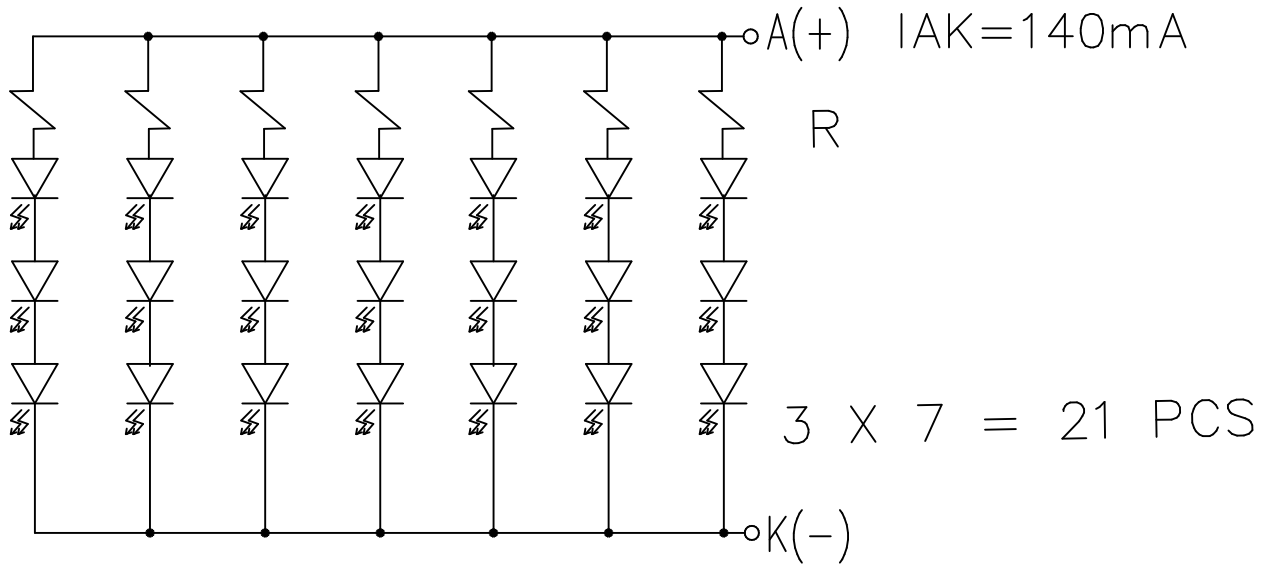
*3) Vcom must be adjusted to optimize display quality_Crosstalk,Contrast Ratio and etc.

3-2.ELECTRICAL CHARACTERISTICS OF BACKLIGHT

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

ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT	REMARK
Peak forward current	I_P	–	–	210	mA	–
Maximum reverse voltage	V_R	–	–	15	V	–
Applied forward current	I_F	–	140	–	mA	–
Applied forward voltage	V_F	–	10.2	10.8	V	–
LED power consumption	P_F	–	–	2.25	W	–
LED life time	L_L	–	40000	–	hrs	at I_{AK} = 140mA (*1)

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



4. OPTICAL CHARACTERISTICS

4.1 Optical Char. of LCD Panel

Parameter	SYMBOL	Values			Unit	NOTE
		MIN.	TYP.	MAX.		
Response Time	Tr+Tf	–	50	–	ms	NOTE 2,3
Contrast Ratio	C/R	–	250	–		*1)
θ(Viewing Angle)		–	F: 40 R: 60	–		NOTE 3,5
ϕ(Viewing Angle)		–	L: 60 R: 60	–		
Degree of Saturation	NTSC	–	58	–	%	

***1) Contrast Ratio(CR) is define mathematically as :**

$$\text{Contrast Ratio} = \frac{\text{Surface Luminance with all white pixels}}{\text{Surface Luminance with all black pixels}}$$

4.2 Color of CIE Coordinate

Ta = 25°C Tolerance : ±0.05

ITEM		SYMBOL	CONDITION	VALUE	NOTE
Color of CIE Coordinate	Red	X	$\phi=0°$, $\theta=0°$	0.55	Note※
		y		0.31	
	Green	X		0.30	
		y		0.58	
	Blue	X		0.15	
		y		0.10	
	White	X		0.31	
		y		0.34	

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

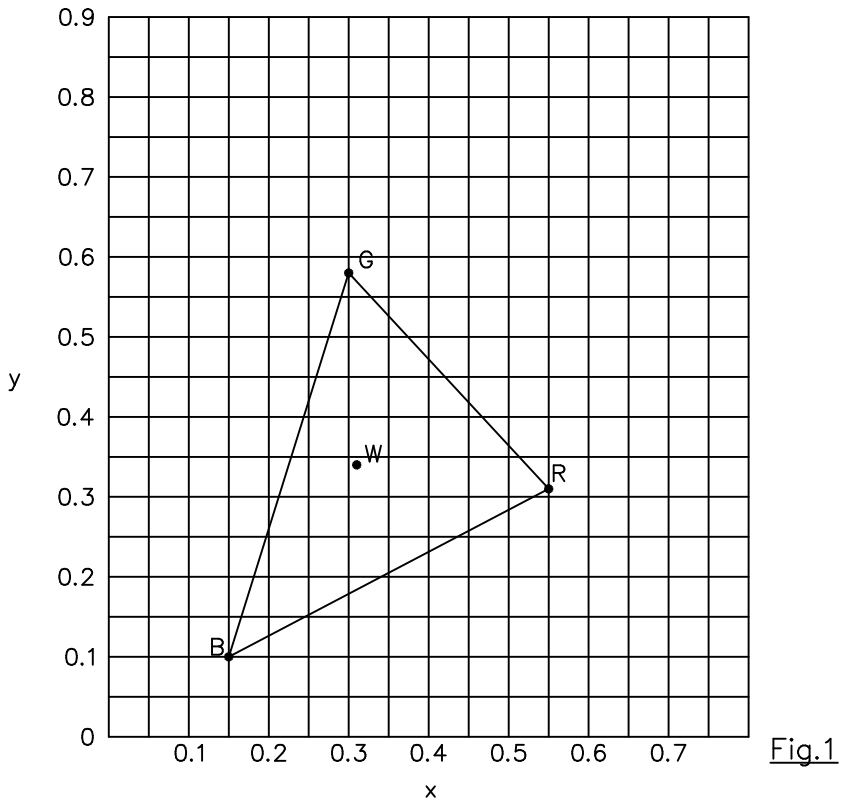
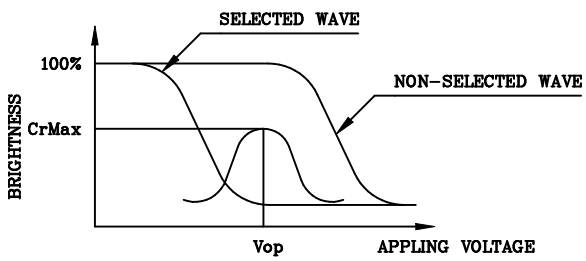


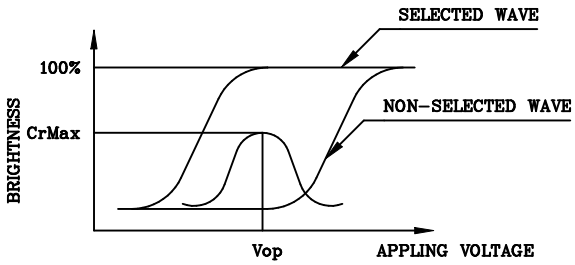
Fig.1

(NOTE 1)

Definition of Operation Voltage(Vop)



(positive type)



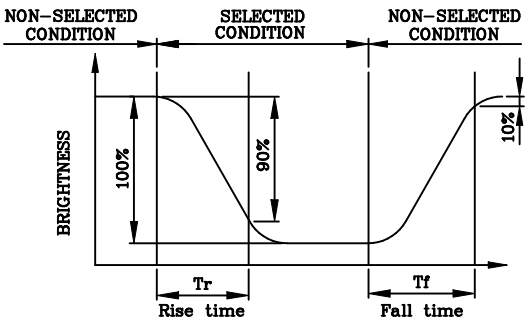
(negative type)

*Conditions

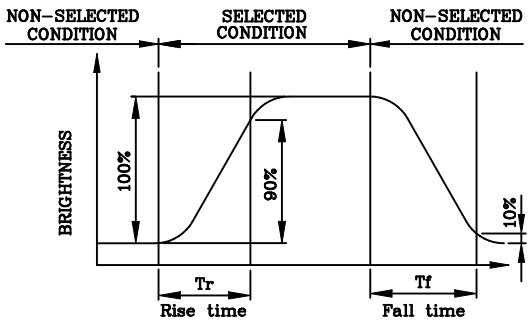
Viewing Angle : 0
Frame Frequency : 70Hz
Applying Waveform : 1/N duty 1/a bias

(NOTE 2)

Definition of Response Time(Tr,Tf)



(positive type)



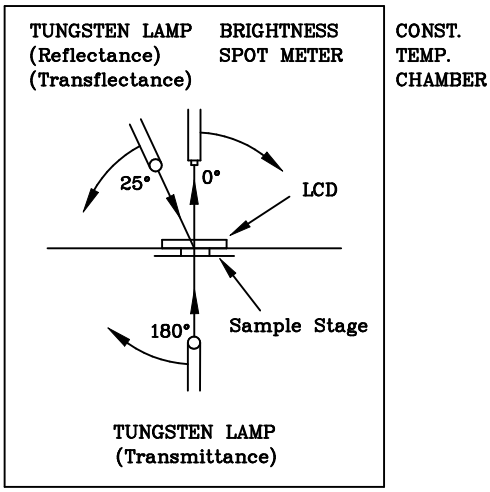
(negative type)

*Conditions

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

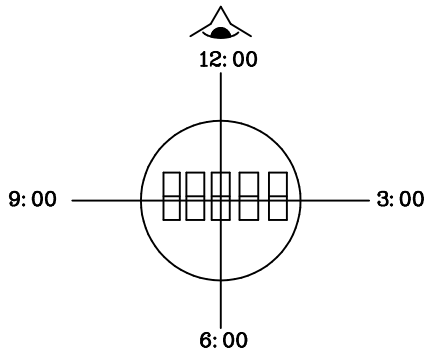
(NOTE 3)

Description of Measuring Equipment and Driving Waveforms



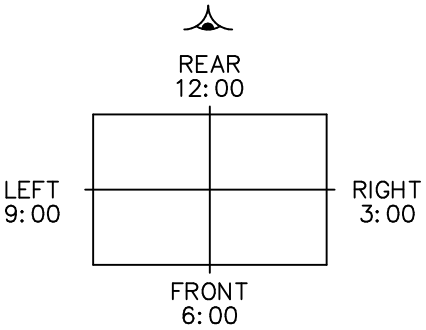
(NOTE 4)

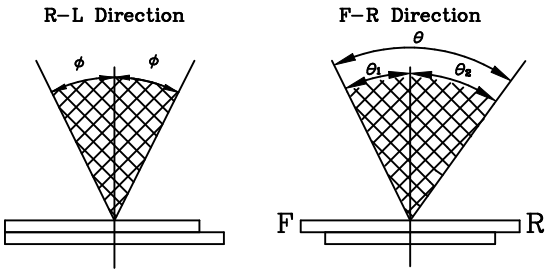
Definition of Viewing Direction



(NOTE 5)

Definition of Viewing Angle





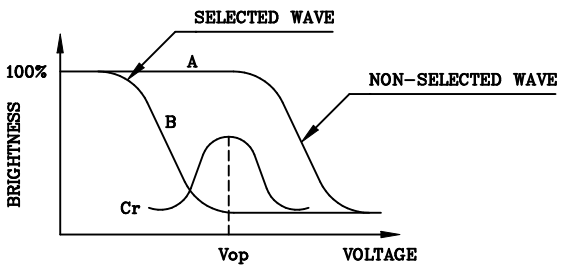
$\theta = \theta_1 + \theta_2$

*Conditions

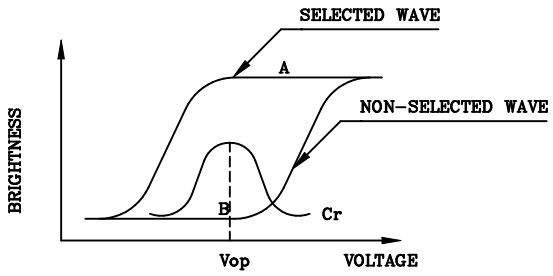
Operating Voltage : Vop
Applying Waveform : 1/N duty 1/a bias
Contrast Ratio : larger than 10

(NOTE 6)

Definition of Contrast Ratio (Cr)



(positive type)



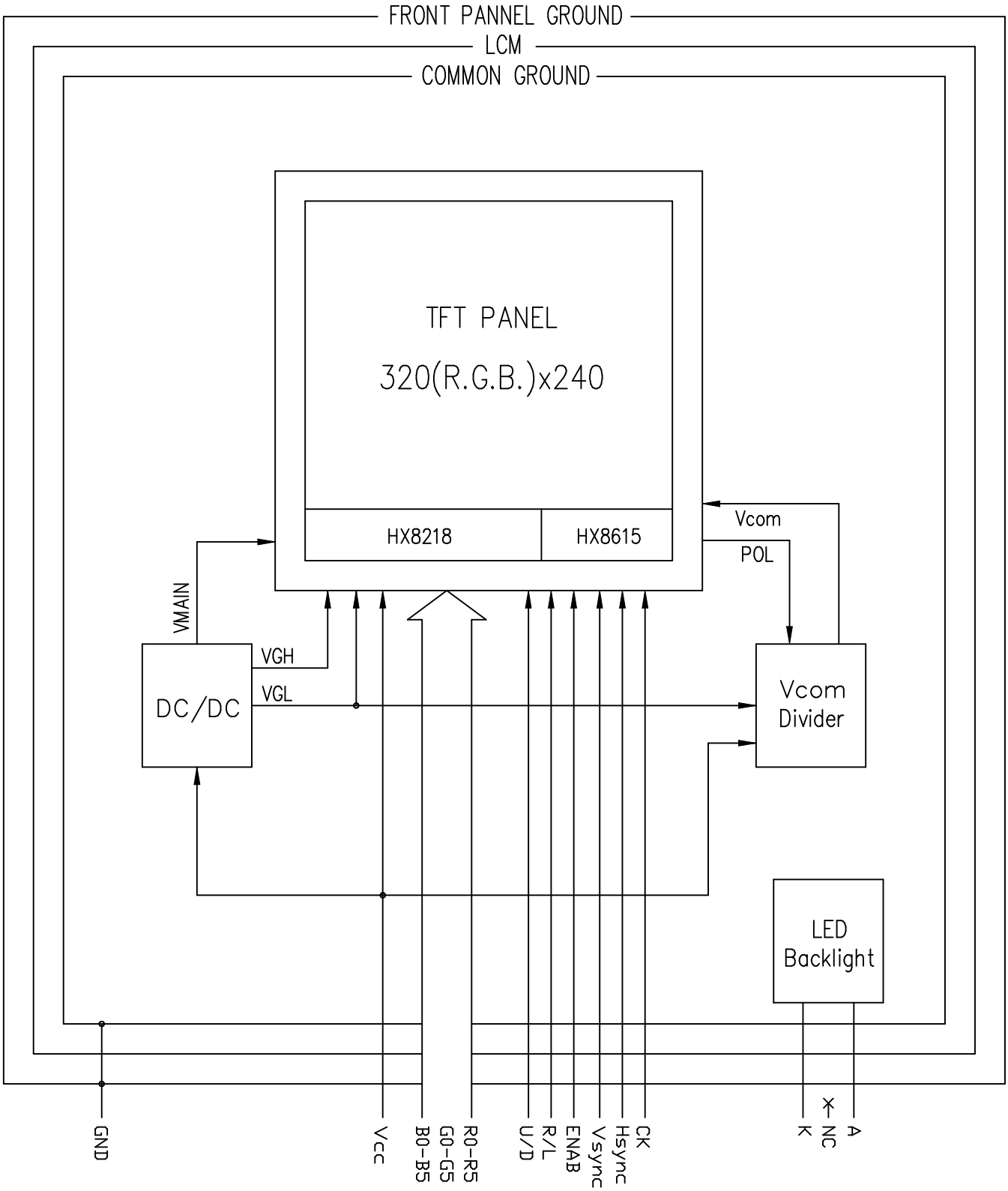
(negative type)

Contrast Ratio : Cr=A/B

*Conditions

Viewing Angle : 0
Applying Waveform : 1/N duty 1/a bias

5. BLOCK DIAGRAM



6. INTERNAL PIN CONNECTION

CN1 Connector : HIROSE FH12-33S-0.5SH

Mating FPC/FFC : Pitch 0.5mm/33 pin,T=0.3mm,W=17mm

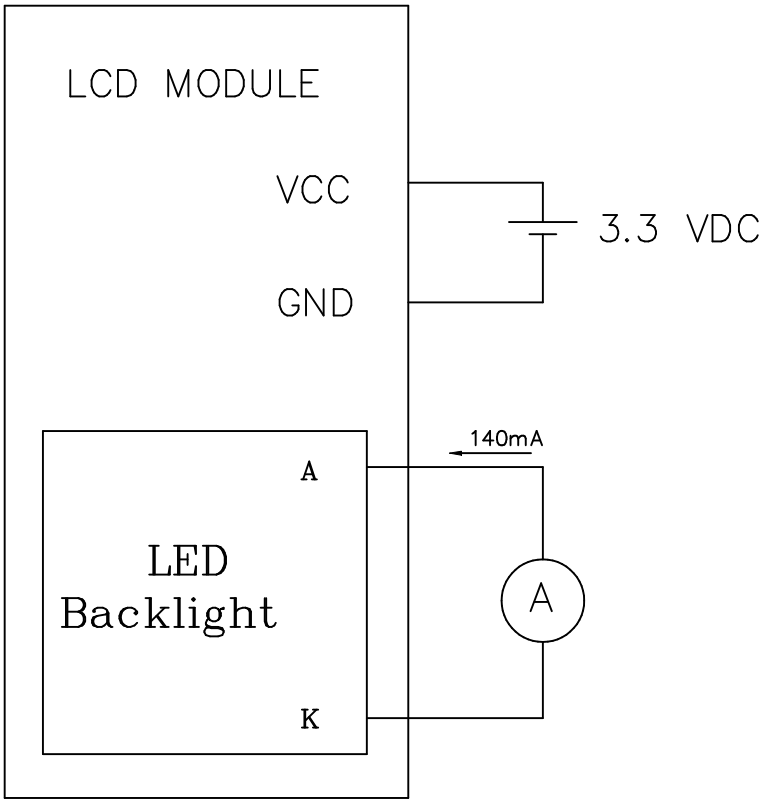
PIN NO.	SYMBOL	FUNCTION
1	GND	Ground
2	CK	Clock Signal for Sampling Each Data Signal
3	Hsync	Horizotal Synchronous Signal
3	Vsync	Vertical Synchronous Signal
5	GND	Ground
6	R0	Red Data Signal (LSB)
7	R1	Red Data Signal
8	R2	Red Data Signal
9	R3	Red Data Signal
10	R4	Red Data Signal
11	R5	Red Data Signal (MSB)
12	GND	Ground
13	G0	Green Data Signal (LSB)
14	G1	Green Data Signal
15	G2	Green Data Signal
16	G3	Green Data Signal
17	G4	Green Data Signal
18	G5	Green Data Signal (MSB)
19	GND	Ground
20	B0	Blue Data Signal (LSB)
21	B1	Blue Data Signal
22	B2	Blue Data Signal
23	B3	Blue Data Signal
24	B4	Blue Data Signal
25	B5	Blue Data Signal (MSB)
26	GND	Ground
27	ENAB	Signal to Settle the Horizontal Display Position
28	Vcc	+3.3V Power Supply
29	Vcc	+3.3V Power Supply
30	R/L	Selection Signal for Horizontal Scanning Direction
31	U/D	Selection Signal for Vertical Scanning Direction
32	NC	Non-connection
33	GND	Ground

CN2 Connector : JST BHR-03VS-1

Mating Connector : JST BHMR-03V

PIN NO.	SYMBOL	FUNCTION
1	K	Backlight LED Anode
2	NC	Non-connection
3	A	Backlight LED Cathode

7.POWER SUPPLY



8. TIMING CHARACTERISTICS

8-1. INTERFACE TIMING

Refer Himax IC SPEC

Source: HX8218-C01(COG)

Gate: HX8615-C(COG)

8-2. DISPLAY SEQUENCE

	COLUMN 1			COLUMN 2		
ROW1	R1	G1	B1	R2	G2	B2
ROW2	R1	G1	B1	R2	G2	B2

COLUMN 319			COLUMN 320		
R319	G319	B319	R320	G320	B320
R319	G319	B319	R320	G320	B320

ROW239	R1	G1	B1	R2	G2	B2
ROW240	R1	G1	B1	R2	G2	B2

R319	G319	B319	R320	G320	B320
R319	G319	B319	R320	G320	B320

9. 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

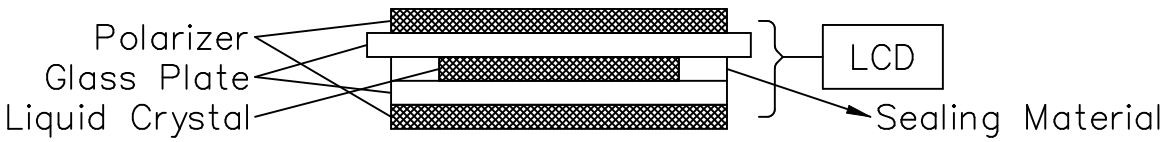
The NAN YA inspection provision provides outgoing inspection provision and its expected quality level based on our outgoing inspection of NAN YA LCD produces.

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

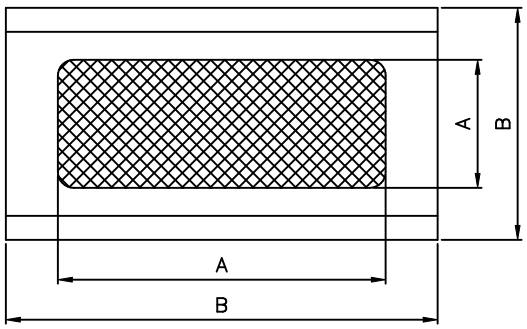
4-2 Inspection Standard

	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		

	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

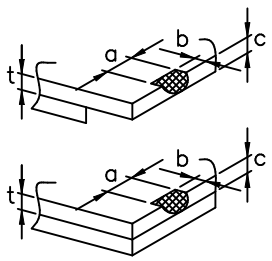
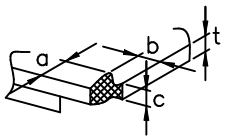
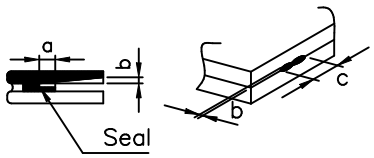
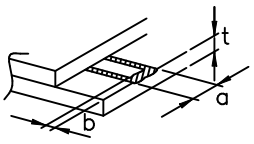
5-1 Electrical characteristics

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

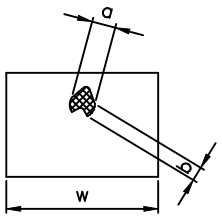
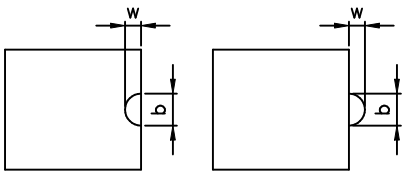
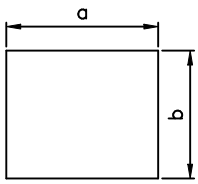
<table>
<tr><th>NO.</th><th>Item</th><th>Criterion</th></tr>
<tr><td>1</td><td>Black spots, foreign matter, and white spots (Including light leakage due to pinholes of polarizing plates, etc.)</td><td>(1)-1-Spots
<table><tr><th>Average Diameter(mm): D</th><th>Number of pieces permitted</th></tr><tr>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

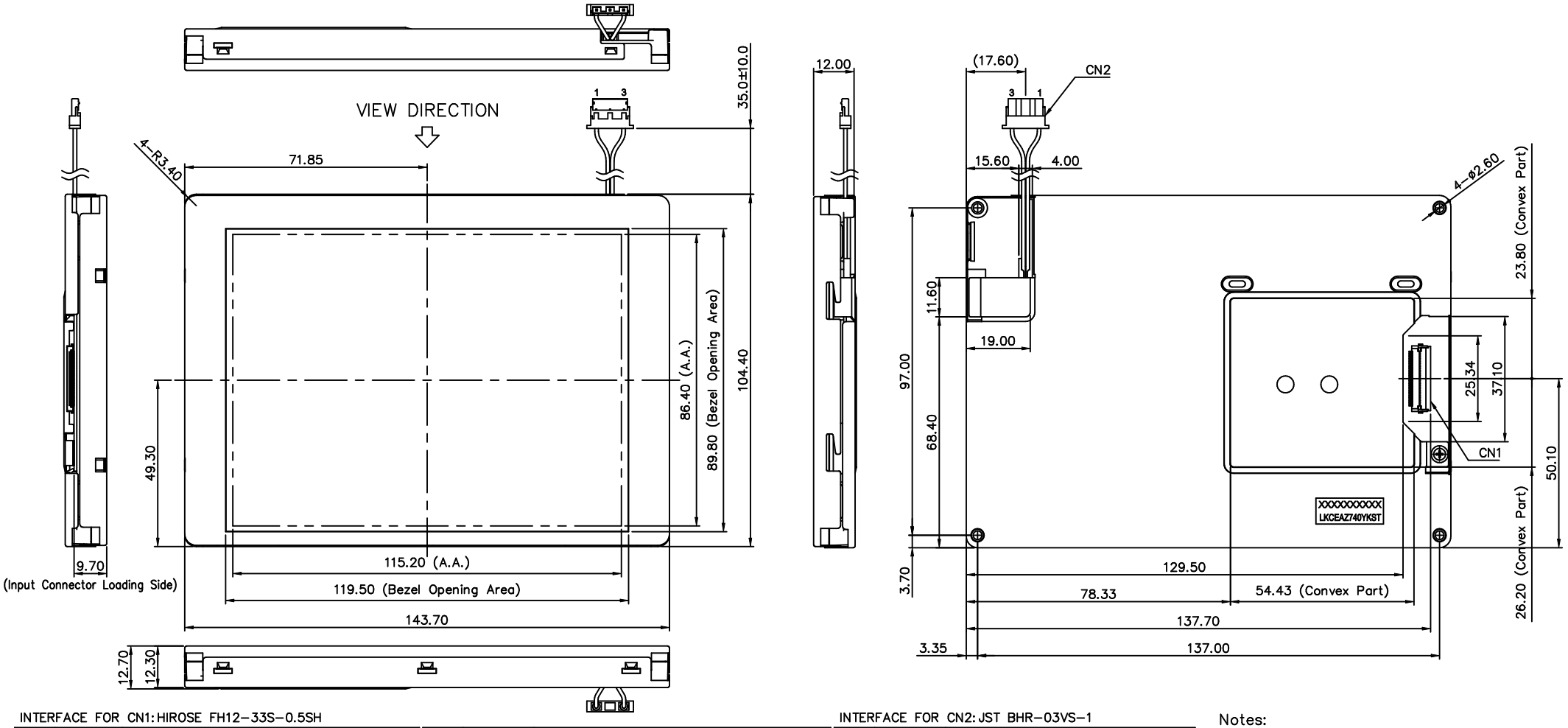
NOTICE:

- 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.



INTERFACE FOR CN1: HIROSE FH12-33S-0.5SH

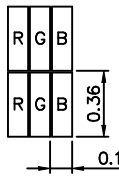
PIN NO.	SYMBOL	FUNCTION
1	GND	Ground
2	CK	Clock Signal for Sampling Each Data Signal
3	Hsync	Horizotal Synchronous Signal
3	Vsync	Vertical Synchronous Signal
5	GND	Ground
6	R0	Red Data Signal (LSB)
7	R1	Red Data Signal
8	R2	Red Data Signal
9	R3	Red Data Signal
10	R4	Red Data Signal
11	R5	Red Data Signal (MSB)
12	GND	Ground
13	G0	Green Data Signal (LSB)
14	G1	Green Data Signal
15	G2	Green Data Signal
16	G3	Green Data Signal
17	G4	Green Data Signal

PIN NO.	SYMBOL	FUNCTION
18	G5	Green Data Signal (MSB)
19	GND	Ground
20	B0	Blue Data Signal (LSB)
21	B1	Blue Data Signal
22	B2	Blue Data Signal
23	B3	Blue Data Signal
24	B4	Blue Data Signal
25	B5	Blue Data Signal (MSB)
26	GND	Ground
27	ENAB	Signal to Settle the Horizontal Display Position
28	Vcc	+3.3V Power Supply
29	Vcc	+3.3V Power Supply
30	R/L	Selection Signal for Horizontal Scanning Direction
31	U/D	Selection Signal for Vertical Scanning Direction
32	NC	Non-connection
33	GND	Ground

INTERFACE FOR CN2: JST BHR-03VS-1

PIN NO.	SYMBOL	FUNCTION
1	K	Backlight LED Anode
2	NC	Non-connection
3	A	Backlight LED Cathode

Notes:
1. Resolution : (320x3) x 240 Dots
2. Backlight : LED (White)
3. Frame Material : SUS430 (t=0.3 mm)
4. Touch Panel : Without



Dots Size (Scale 40:1)

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

LKCEAZ740YKS_

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

	NAME	DATE	THIRD ANGLE P.
APPROVE			
CHECK			
DESIGN	CLOUDE	'07.03.02	SCALE / UNIT
DRAWN	CLOUDE	'07.03.02	1/1.2 / mm

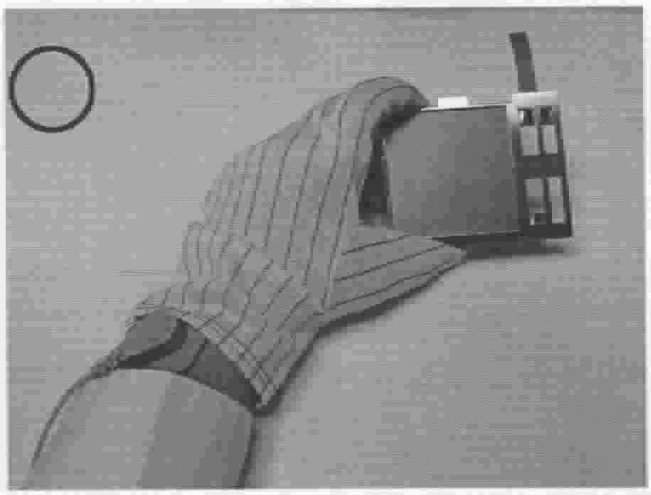
DWG NO. M740ADOA REV.A

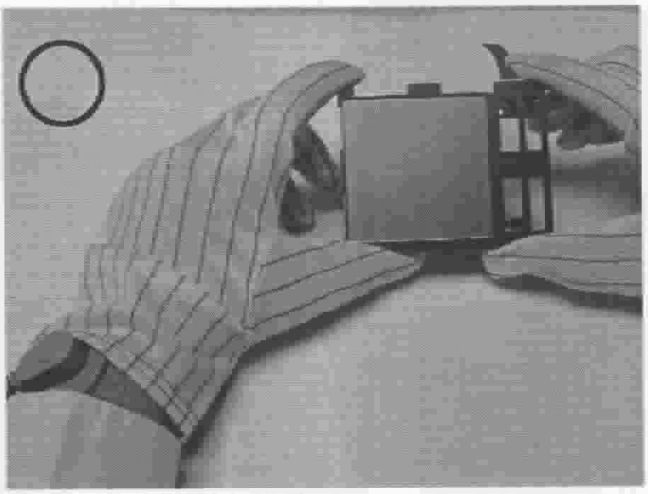
THE NOTES OF LCM USING

LCM is easy to damage.

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

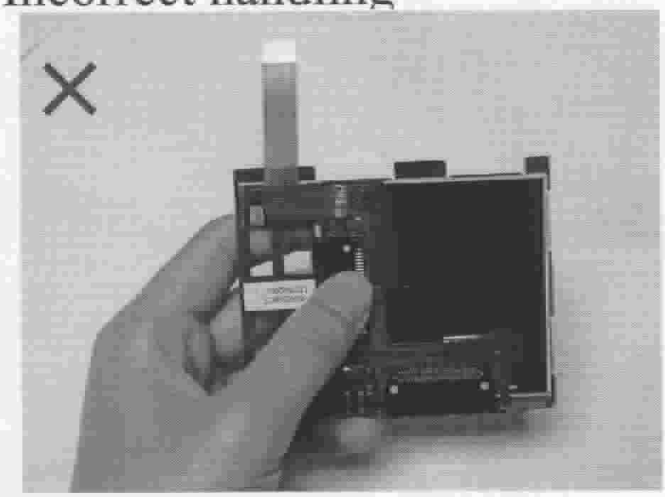
Correct handling



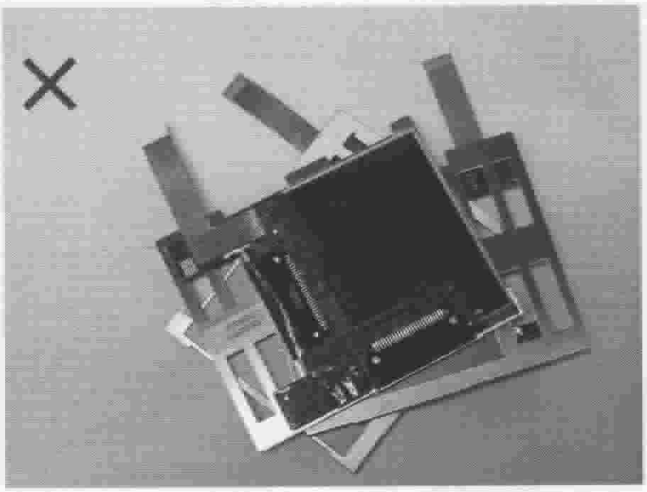


As above picture, please handle with glove by LCM edges and full EOS/ESD protection.

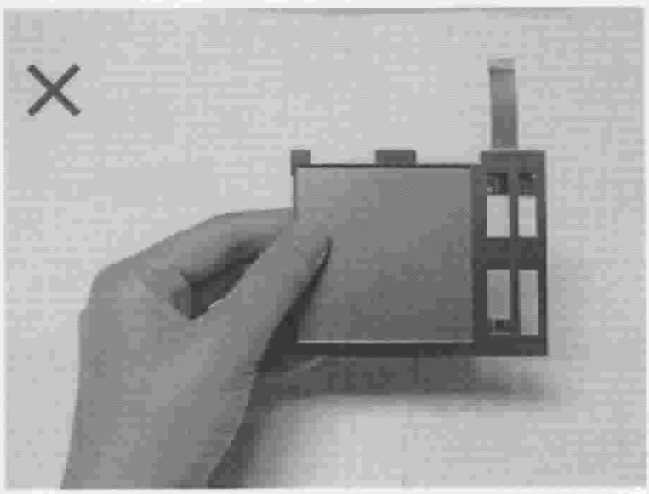
Incorrect handling



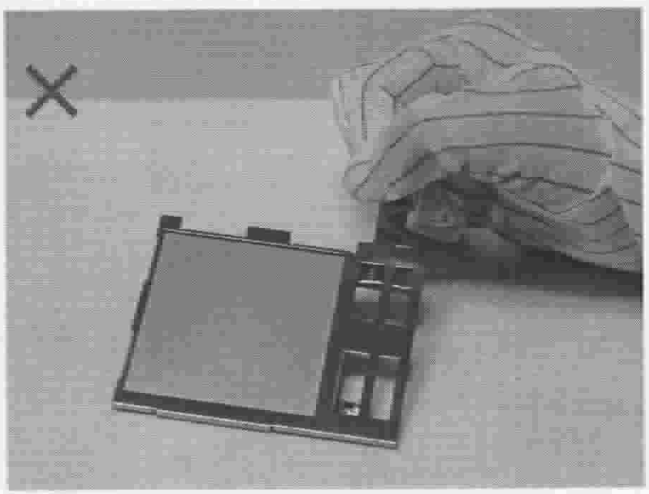
Please don't touch IC directly.



Please don't put one on another LCM.



Please don't hold the surface of LCM.

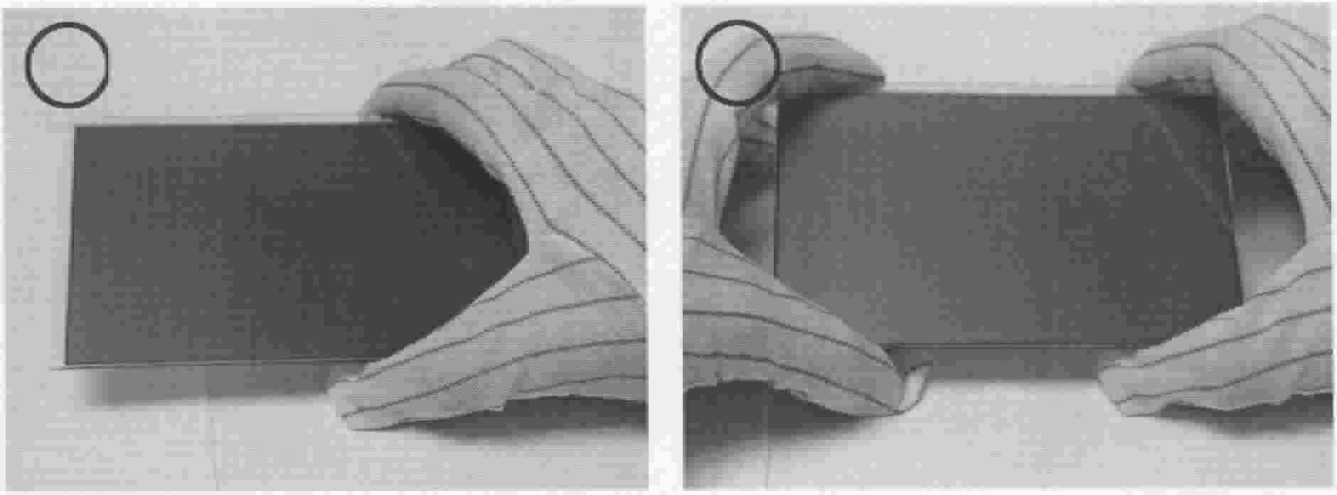


Please don't stretch interface of output.

THE NOTES OF LCD USING

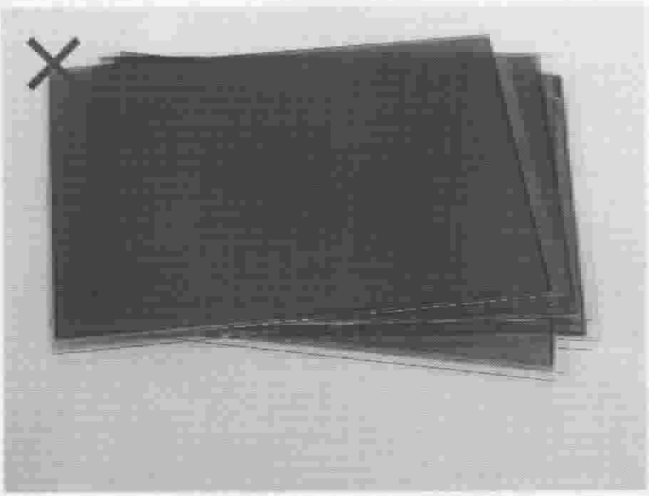
LCD is easy damage.
Please follow notes as bellows, and be careful of handling!

Correct handling

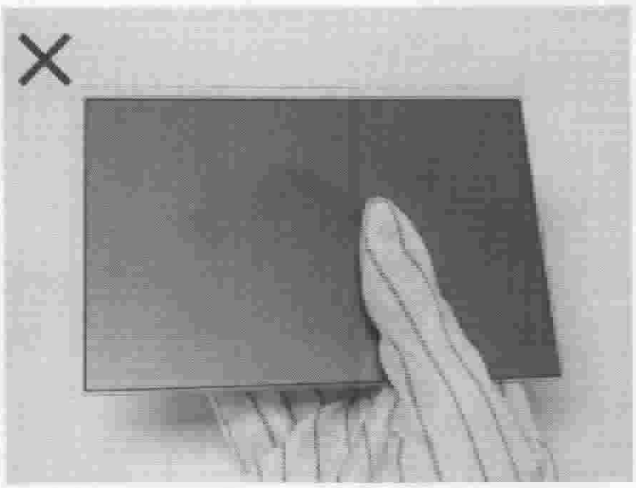


As above picture, please handle with glove by LCD edges and full EOS/ESD protection.

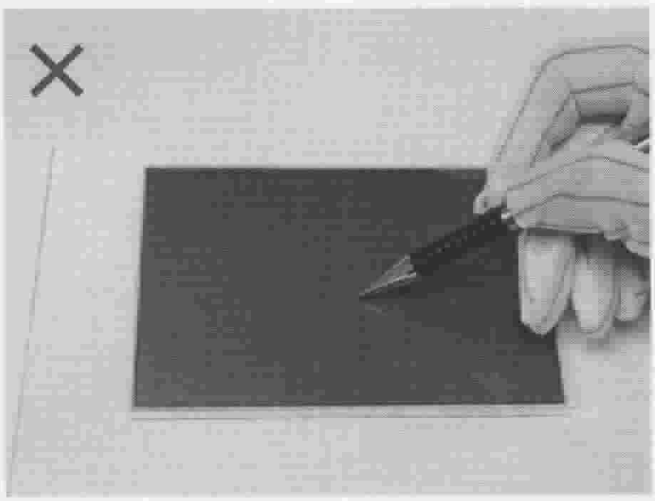
Incorrect handling



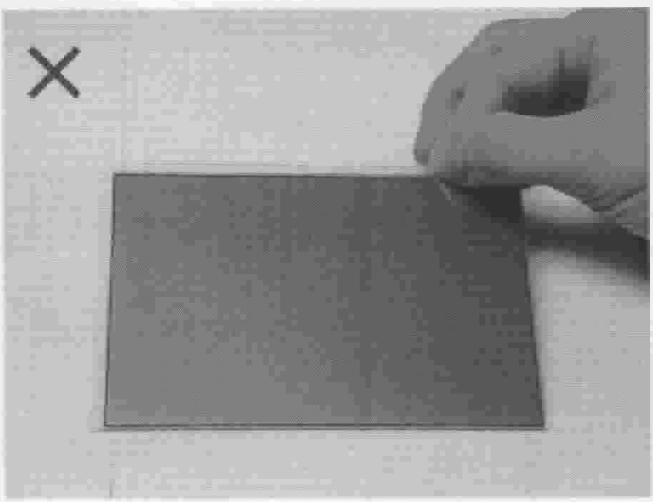
Please don't put one on another LCD.



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.