

# NAN YA PLASTICS CORPORATION

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SPECIFICATION OF  
LCD MODULE  
PRODUCT NO.: LT\_79\_298\_4K\_

SPEC. NO.: LM298-4- 

CUSTOMER
APPROVED BY

LCD DEPARTMENT  
ELECTRONIC MATERIALS DIVISION  
NAN YA PLASTICS CORPORATION  
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EDITED ON : AUGUST.23 ,2001

DESIGN MANAGER	DESIGN CHECK	DESIGNER
		C.Y.JAN





## 2. ABSOLUTE MAXIMUM RATINGS

### (1) ELECTRICAL ABSOLUTE RATINGS

VSS=0V

ITEM	SYMBOL	MIN	MAX	UNIT	COMMENT
Power Supply for Logic	VDD	-0.3	7.0	V	Note 1
Power Supply For LC	VH	-0.3	+25.0	V	Note 1
	VM	VL-0.3	VH+0.3	V	Note 1
	VL	-20.0	+0.3	V	Note 1
Static Electricity	-	-	-	-	Note 3

Note 1. All voltage values are referred to GND=0V

Note 2. DISP-OFF, FLM ,CL1 ,CL2 ,D0~D3

Note 3. Make certain you are GROUNDED when handling LCM

### (2) ENVIRONMENTAL ABSOLUTE MAXIMUM RATINGS

ITEM	OPERATING		STORAGE	
	MIN.	MAX.	MIN.	MAX.
Ambient Temperature	-20	70	-30	80
Humidity(Without Condensation)	Note 2,4		Note 3,4	

Note 1 LCM should be grounded during handling LCM.

Note 2  $T_a \leq 70^\circ\text{C}$  : 75%RH max

$T_a > 70^\circ\text{C}$  : Absolute humidity must be lower  
than the humidity of 75%RH at  $70^\circ\text{C}$

Note 3  $T_a$  at  $-30^\circ\text{C}$  will be < 48hrs, at  $80^\circ\text{C}$  will be < 120hrs

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

### 3. ELECTRICAL CHARACTERISTICS

( VDD= 3.3V ± 10% )

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Input Voltage	V <sub>IH</sub>	H level	0.8VDD	—	VDD	V
	V <sub>IL</sub>	L level	0	—	0.2VDD	V
Recommended LC Driving Voltage	V <sub>H</sub>	V <sub>O</sub> = 2.8V V <sub>M</sub> = 1.4V V <sub>I</sub> = 0.0V Duty= 1/240 -20°C   50°C	16.5	—	21.5	V
Power Supply Current	I <sub>DD</sub>	VDD= 3.3V VSS= 0V V <sub>H</sub> = 18.7V V <sub>O</sub> = 2.8V V <sub>M</sub> = 1.4V V <sub>I</sub> = 0.0V V <sub>L</sub> = -15.9V FLM=70Hz PATTERN : □ ■ □ ■ □ ■ ■ □ ■ □ ■ □	—	0.1	0.15	mA
	I <sub>VH</sub>		—	0.06	0.09	
	I <sub>VO</sub>		—	1.1	1.65	
	I <sub>VM</sub>		—	0.0	0.0	
	I <sub>V1</sub>		—	1.1	1.65	
	I <sub>VL</sub>		—	0.04	0.06	
EL Power Supply Current	I <sub>EL</sub>	V <sub>EL(rms)</sub> =100VAC F =400HZ	—	8.0	12.0	mA
Surface Luminance	H298P	—	ALL ON	—	0.7	cd/m <sup>2</sup>
			ALL OFF	—	2.8	
	H298L	—	ALL ON	—	0.4	
			ALL OFF	—	2.6	

## 4.OPTICAL CHARACTERISTICS

AT  $V_{OP}$

ITEM MODE		Cr(Contrast Ratio)						$\theta$ (Viewing Angle)		$\phi$ (Viewing Angle)	
		0°C		25°C		50°C		25°C		25°C	
		MIN.	TYP.	MIN.	TYP.	MIN.	TYP.	MIN.	TYP.	MIN.	TYP.
H	P	6.5	7.5	7.5	8.5	6.0	7.0	-	38-37	-	36-40
H	L	12.0	13.0	12.0	13.0	8.0	9.0	-	55-37	-	37-37
Note		NOTE 6						NOTE 5			

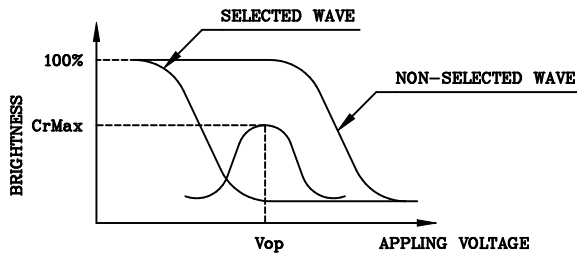
NOTE : H: TRANSFLECTIVE  
P NORMALLY WHITE,9 O'CLOCK  
L: NORMALLY WHITE,6 O'CLOCK

AT  $\phi=0^\circ \theta=0^\circ$

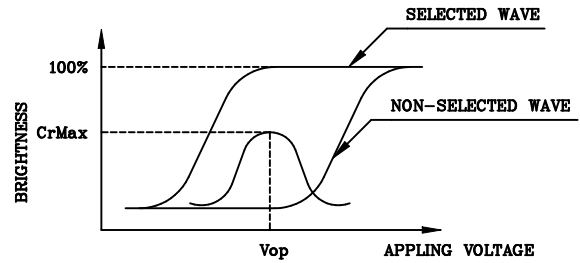
ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Response Time (rise)	Tr	-20°C	-	7700	-	ms	NOTE 2
		0°C	-	1200	-		
		25°C	-	290	-		
		50°C	-	160	-		
		75°C	-	80	-		
Response Time (fall)	Tf	-20°C	-	3200	-	ms	NOTE 2
		0°C	-	550	-		
		25°C	-	210	-		
		50°C	-	90	-		
		75°C	-	60	-		

(NOTE 1)

Definition of Operation Voltage(Vop)



(positive type)



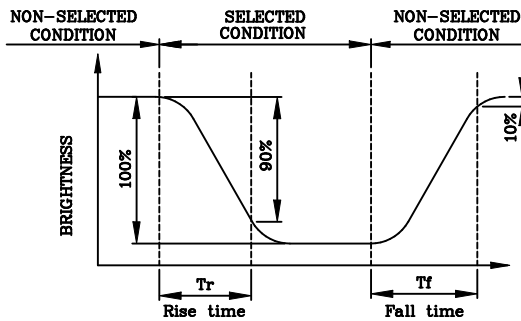
(negative type)

\*Conditions

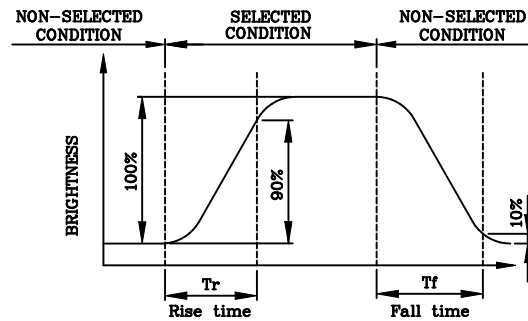
Viewing Angle : 0  
 Frame Frequency : 70Hz  
 Appling Waveform : 1/N duty 1/a bias

(NOTE 2)

Definition of Response Time(Tr,Tf)



(positive type)



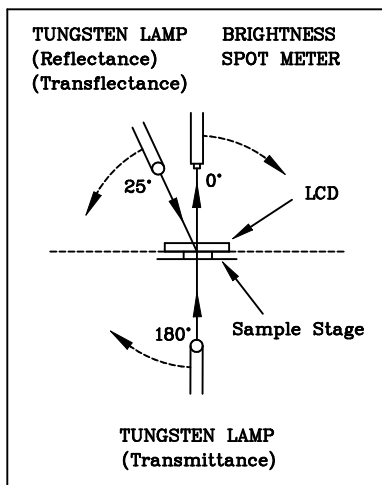
(negative type)

\*Conditions

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

(NOTE 3)

Description of Measuring Equipment and Driving Waveforms



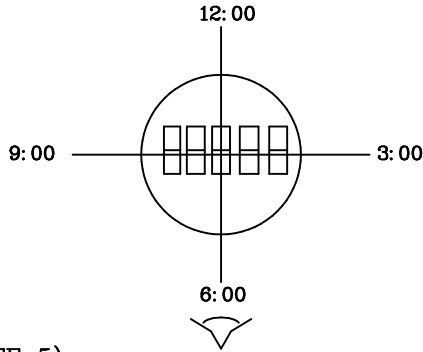
CONST.  
 TEMP.  
 CHAMBER

The voltage relationship of each signal is as follow  
 Multiplex Driving (1/N duty 1/a bias)

Segment voltage	Segment Waveform	Common Waveform	Common voltage
V0 VM V1			VH VM VL
	Normally display period	Off-display period	

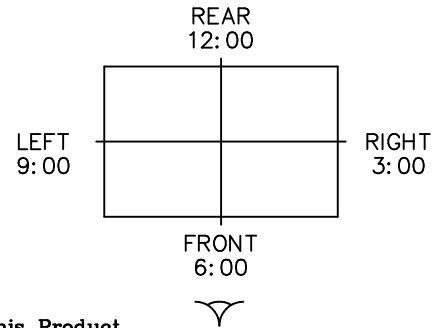
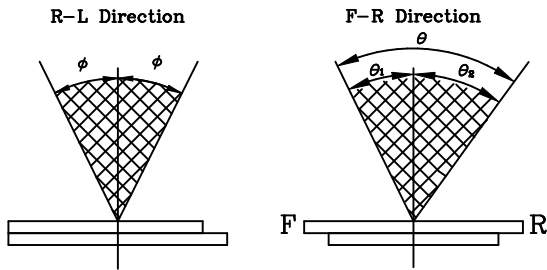
(NOTE 4)

Definition of Viewing Direction



(NOTE 5)

Definition of Viewing Angle



\*For This Product  
 The Viewing Direction Is 6 O'clock  
 So  $\theta_1 > \theta_2$

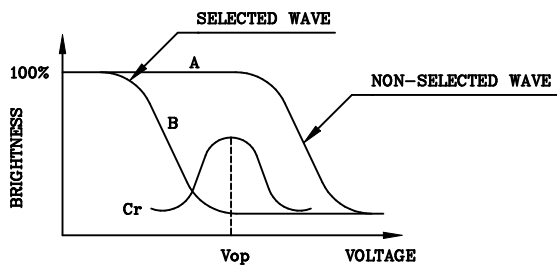
$$\theta = \theta_1 + \theta_2$$

\*Conditions

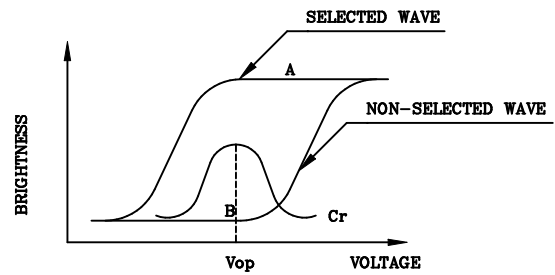
Operating Voltage :  $V_{op}$   
 Frame Frequency : 70Hz  
 Applying Waveform : 1/N duty 1/a bias  
 Contrast Ratio : larger than 2

(NOTE 6)

Definition of Contrast Ratio (Cr)



(positive type)



(negative type)

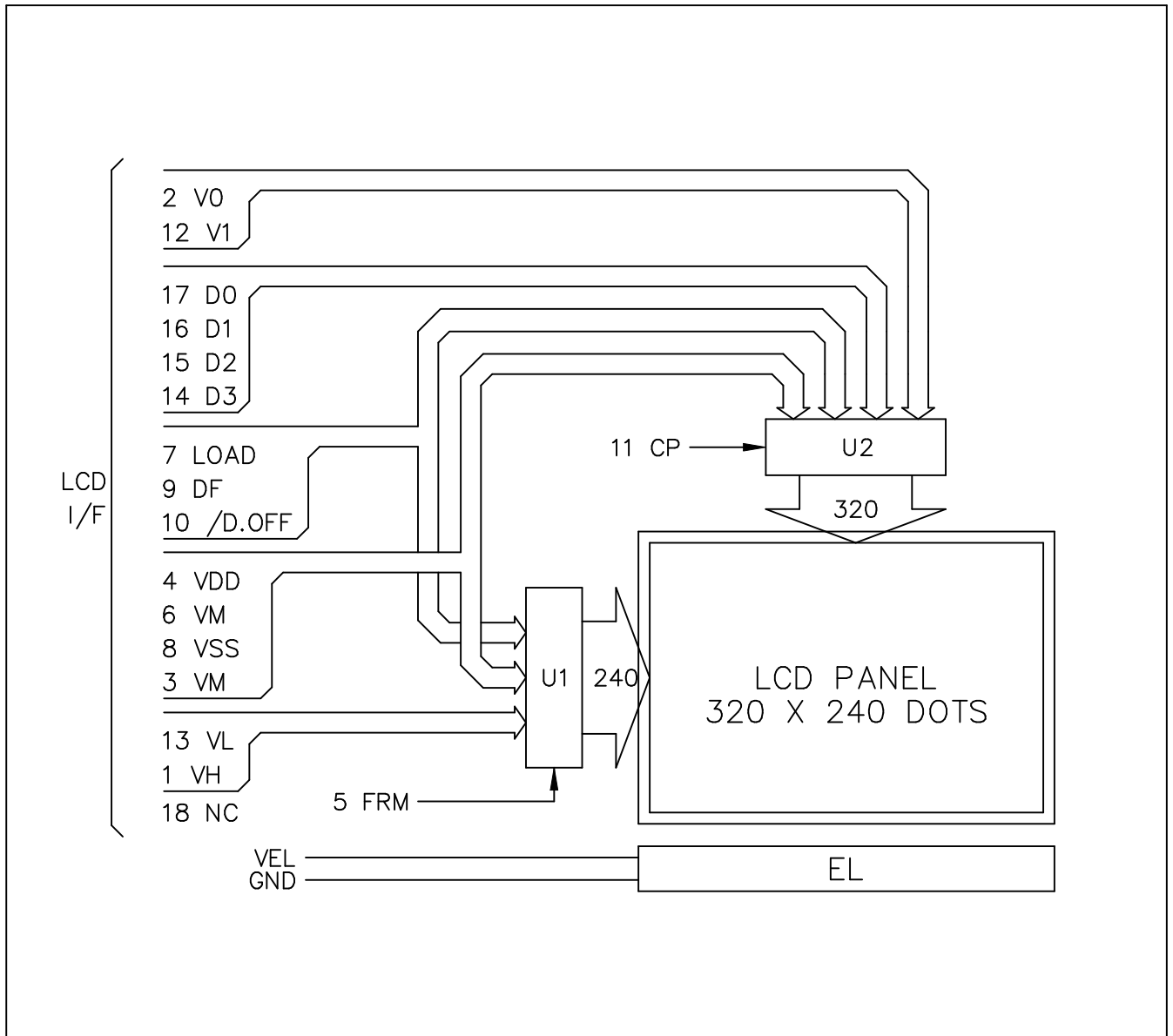
$$\text{Contrast Ratio : } Cr = A/B$$

\*Conditions

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



## 5. BLOCK DIAGRAM

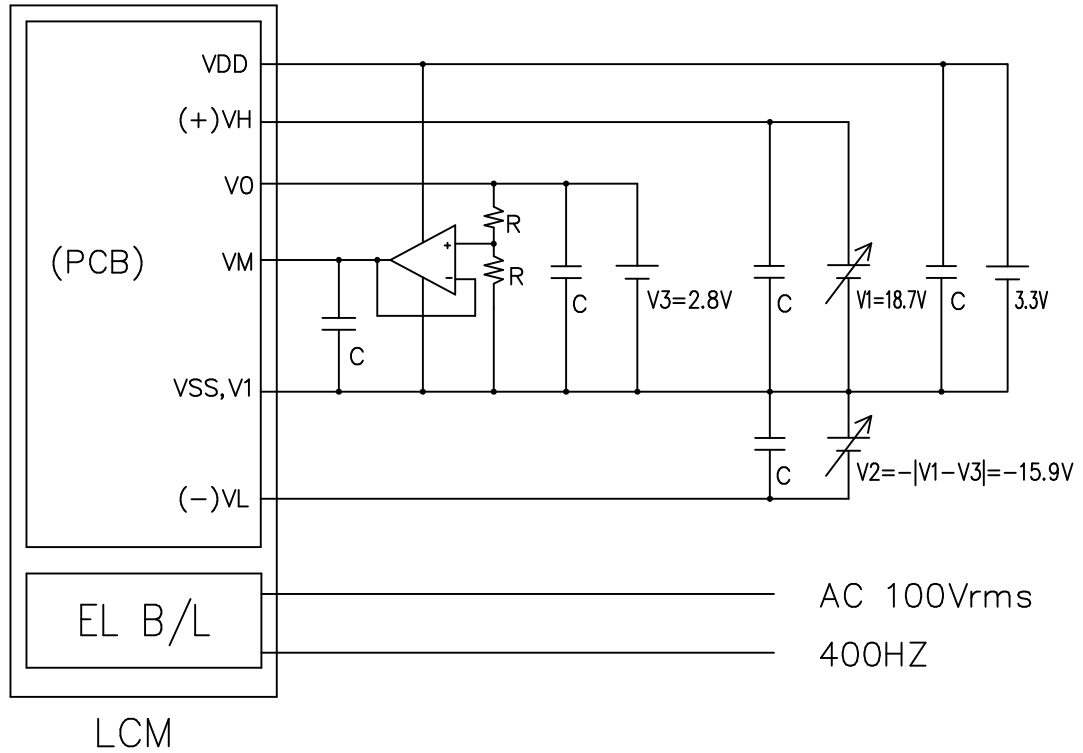


## 6. INTERNAL PIN CONNECTION

LCD

Pin No.	Symbol	Function
1	VH	LCD Selected level power supply for Common
2	V0	LCD Selected level power supply for Segment
3	VM	LCD Non-Selected level power supply for Common and Segment
4	VDD	Power supply for logic (+3.3V)
5	FRM	Frame start signal (Data signal of the shift register of the common driver)
6	VM	LCD Non-Selected level power supply for Common and Segment
7	LOAD	1)Latch pulse of display data 2)Shift clock for common driver
8	VSS	GND
9	DF	Switch signal to convert LCD drive waveform into AC
10	/D.OFF	H : Display ON, L : Display OFF
11	CP	Clock pulse for segment shift register
12	V1	LCD Selected level power supply for Segment
13	VL	LCD Selected level power supply for Common
14	D3	Input data signal
15	D2	Input data signal
16	D1	Input data signal
17	D0	Input data signal
18	N.C.	No connectoin

## 7. POWER SUPPLY



The voltage relationship of each signal is as follow:

Segment voltage	Segment Waveform	Common Waveform	Common voltage
V0 VM V1			VH VM GND VL
	Normally display period	Off-display period	
	Off-display period	Normally display period	

VH : SELECTED LEVEL (Common)  
VL : SELECTED LEVEL (Common)  
V0 : SELECTED LEVEL (Segment)  
V1 : SELECTED LEVEL (Segment)  
VM : NON-SELECTED LEVEL (Common,Segment)

1) VH,V0,VM,V1 and VL are power supply voltage for LCD.  
(VH>V0>VM>V1>VL)

2) Liquid Crystal Driving Voltage  $V_{op} = V_H - V_1 = V_0 - V_L$  , Bias =  $\frac{V_M - V_1}{V_H - V_1}$

3) C=3.3uF 25V ,R=100KΩ .

# 8. TIMING CHARACTERISTICS

## 8-1 INTERFACE TIMING

@ VDD=3.3V±10%, Ta=-20~70 °C

Item	Symbol	Test condition	Min.	Typ.	Max.	Unit
Clock Cycle	tC	Fig.a	500	-	-	ns
SCP Pulse Width	tSWH,tSWL	Fig.a	240	-	-	ns
Data Set Up Time	tDSU	Fig.a , Fig.b	240	-	-	ns
Data Hold Time	tDHD	Fig.a , Fig.b	240	-	-	ns
SCP Rise/Fall Time	tr,tf	Fig.a , Fig.b	-	-	50	ns
LP Rise Time	tLRP	Fig.a	240	-	-	ns
LP Fall Time	tLFP	Fig.a	240	-	-	ns
LP Pulse Width	tLW	Fig.a	240	-	-	ns
SCP To LP Delay Time	tSL	Fig.a	50	-	-	ns
LP To SCP Delay Time	tLS	Fig.a	100	-	-	ns
LP "H" Pulse Width	tCWH	Fig.b	40	-	-	ns
LP "L" Pluse Width	tCWL	Fig.b	170	-	-	ns

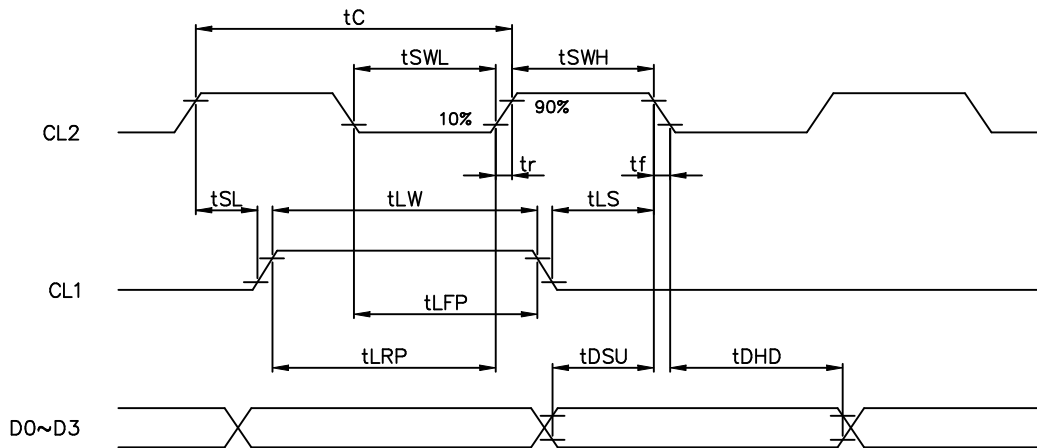


Fig . a Interface timing (SEGMENT)

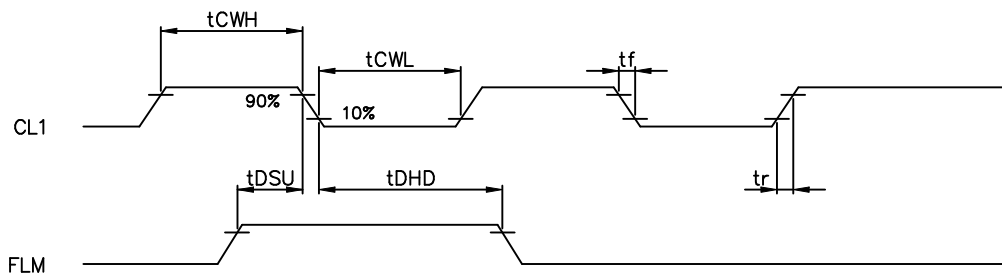
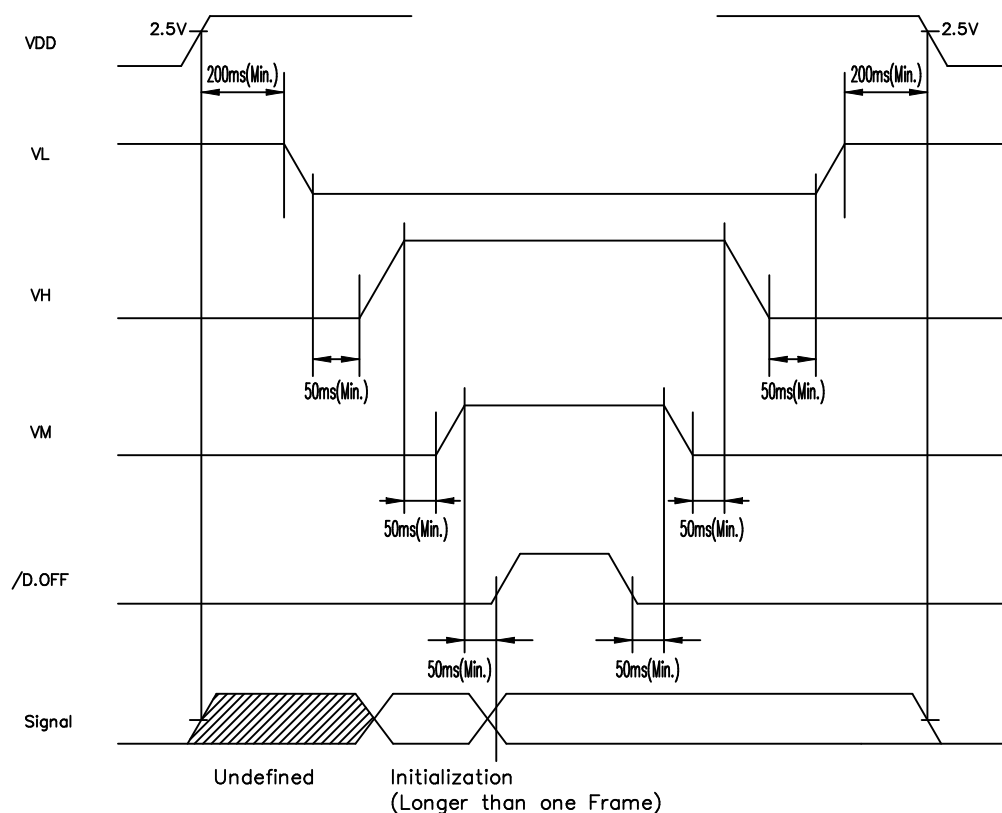


Fig . b Interface timing (COMMON)

## 8-2 POWER ON/OFF TIMING



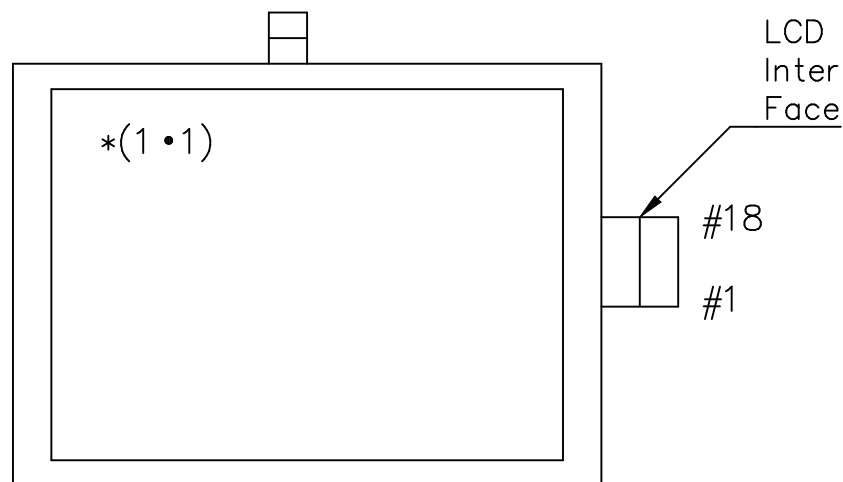
POWER ON

POWER OFF

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

8-3 DISPLAY PATTERN

	Column1	Column2	Column3	Column4	Column320
Row 1	1•1	1•2	1•3	1•4	1•320
Row 2	2•1	2•2	2•3		
Row 3	3•1	3•3			
	D0: (1•4)↘(1•8) .....(240•320) D1: (1•3)↘(1•7) .....(240•319) D2: (1•2)↘(1•6) .....(240•318) D3: (1•1)↘(1•5) .....(240•317)				
Row 240	240•1				240•320



## 9. RELIABILITY TEST

NO	ITEM	CONDITION			STANDARD	NOTE
1	High Temp. Storage	70°C	120HR		Appearance without defect	
2	Low Temp. Storage	-25°C	120HR		Appearance without defect	
3	High Temp. & High Humi. Storage	40°C 90%RH	120HR		Appearance without defect	
4	Thermal Shock	-20°C, 30min → 25°C.5min → 70°C, 30min → 25°C.5min (1cycle)			Appearance without defect	5 cycles

Inspection Provision

1.Purpose

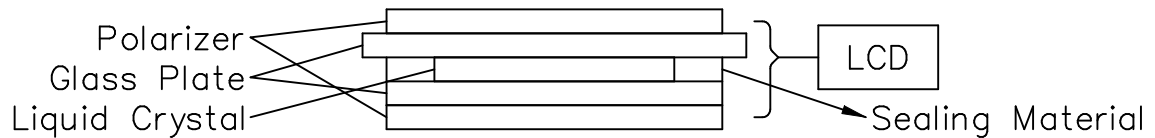
The NAN YA inspection provision provides outgoing inspection provision and its expected quality level based on our outgoing inspection of NAN YA LCD produces.

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 Provision

Outgoing inspection is according to the product inspection manual (per 1-1 , 1-2 & 1-3).

4-1 Inspection Method

MIL-STD-105D 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		

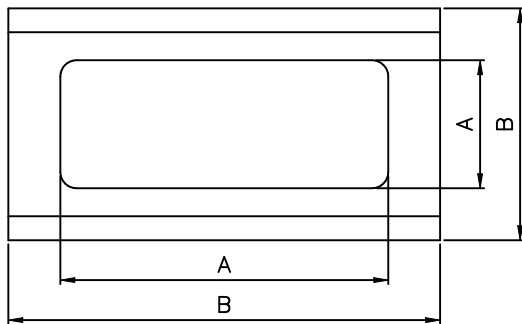


	Dimensions	External from Dimensions	0.4	
Minor Defect	Inside the glass	Black spots	0.65	faults which appear to pose almost no obstacle to the practicality, effective use, and operation.
	Polarizing plate	Scratches, foreign Matter, air bubbles, and peeling		
	Dots	Pinhole, deformation		
	Color tone	Color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

4-3 Inspection Provisions

\*Viewing Area Definition

Fig. 1



A : Zone Viewing Area  
B : Zone Glass Plate Out Line

\*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 a sample to be 30cm to 50cm.

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

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)

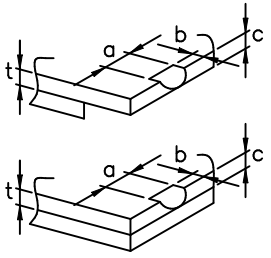
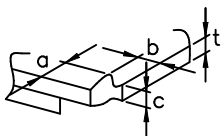
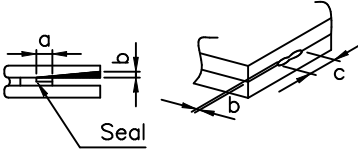
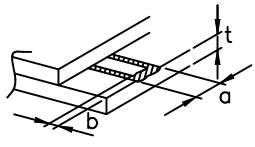
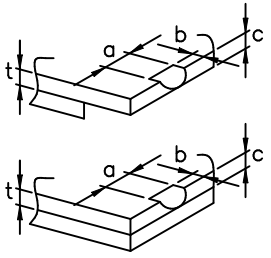
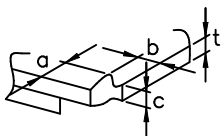
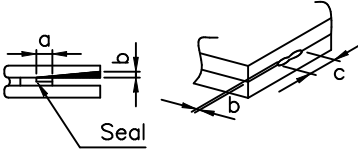
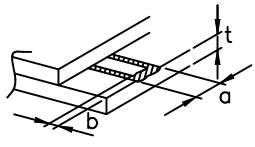
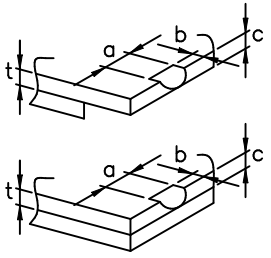
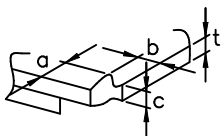
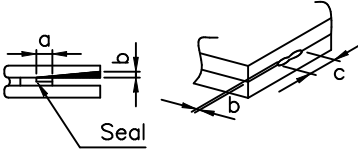
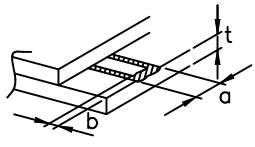
5.Specification for quality check  
 5-1 Electrical characteristics

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

5-2 External Appearance Defect

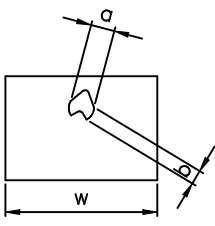
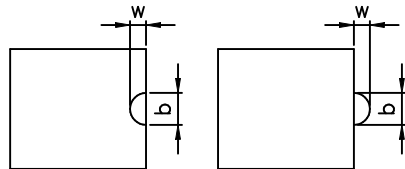
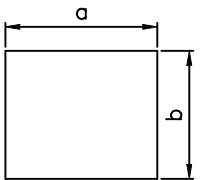
NO.	Item	Criterion																		
1.	Black spots, foreign matter, and white spots (Including light leakage due to pinholes of polarizing plates, etc.)	<p>(1)-1-Spots</p> <table border="1" data-bbox="711 477 1356 763"> <thead> <tr> <th>Average Diameter(mm):D</th> <th>Number of pieces permitted</th> </tr> </thead> <tbody> <tr> <td><math>D \leq 0.1</math></td> <td>Ignore</td> </tr> <tr> <td><math>0.1 &lt; D \leq 0.2</math></td> <td>5</td> </tr> <tr> <td><math>0.2 &lt; D \leq 0.3</math></td> <td>2</td> </tr> <tr> <td><math>0.3 &lt; D</math></td> <td>0</td> </tr> </tbody> </table> <p>Number of total pieces is set to within 5 pieces.</p> <p>Note that when there are 2 pieces or more, they are not to be concentrated. Set as: Average diameter = (Long diameter + Short diameter)/2</p> <p>(1)-2-Blurred Spots(At lighting condition)</p> <table border="1" data-bbox="711 1187 1356 1426"> <thead> <tr> <th>Average Diameter(mm):D</th> <th>Number of pieces permitted</th> </tr> </thead> <tbody> <tr> <td><math>D \leq 0.3</math></td> <td>Ignore</td> </tr> <tr> <td><math>0.3 &lt; D \leq 0.75</math></td> <td>5</td> </tr> <tr> <td><math>0.75 &lt; D</math></td> <td>0</td> </tr> </tbody> </table> <p>Number of total pieces is set to within 5 pieces.</p> <p>Note that when there are 2 pieces or more, they are not to be concentrated. Set as: Average diameter = (Long diameter + Short diameter)/2</p>	Average Diameter(mm):D	Number of pieces permitted	$D \leq 0.1$	Ignore	$0.1 < D \leq 0.2$	5	$0.2 < D \leq 0.3$	2	$0.3 < D$	0	Average Diameter(mm):D	Number of pieces permitted	$D \leq 0.3$	Ignore	$0.3 < D \leq 0.75$	5	$0.75 < D$	0
Average Diameter(mm):D	Number of pieces permitted																			
$D \leq 0.1$	Ignore																			
$0.1 < D \leq 0.2$	5																			
$0.2 < D \leq 0.3$	2																			
$0.3 < D$	0																			
Average Diameter(mm):D	Number of pieces permitted																			
$D \leq 0.3$	Ignore																			
$0.3 < D \leq 0.75$	5																			
$0.75 < D$	0																			

<p>1. Black spots, foreign matter, and white spots (Including light leakage due to pinholes of polarizing plates, etc.)</p>	<p>(1)-1 Spots(At non lighting condition)</p> <table border="1" data-bbox="710 425 1452 712"> <thead> <tr> <th>Width(mm): W</th> <th>Length(mm):L</th> <th>Number of pieces permitted</th> </tr> </thead> <tbody> <tr> <td><math>W \leq 0.03</math></td> <td>Ignore</td> <td>Ignore</td> </tr> <tr> <td><math>0.03 &lt; W \leq 0.08</math></td> <td><math>L \leq 4</math></td> <td>2</td> </tr> <tr> <td><math>0.08 &lt; W \leq 0.1</math></td> <td><math>L \leq 1</math></td> <td>1</td> </tr> </tbody> </table> <p>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.</p> <p>(1)-2 Spots(At lighting condition)</p> <table border="1" data-bbox="710 1019 1452 1305"> <thead> <tr> <th>Width(mm): W</th> <th>Length(mm):L</th> <th>Number of pieces permitted</th> </tr> </thead> <tbody> <tr> <td><math>W \leq 0.03</math></td> <td>Ignore</td> <td>Ignore</td> </tr> <tr> <td><math>0.03 &lt; W \leq 0.08</math></td> <td><math>L \leq 3</math></td> <td>6</td> </tr> <tr> <td><math>0.08 &lt; W</math></td> <td><math>3 &lt; L</math></td> <td>None</td> </tr> </tbody> </table> <p>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.</p>	Width(mm): W	Length(mm):L	Number of pieces permitted	$W \leq 0.03$	Ignore	Ignore	$0.03 < W \leq 0.08$	$L \leq 4$	2	$0.08 < W \leq 0.1$	$L \leq 1$	1	Width(mm): W	Length(mm):L	Number of pieces permitted	$W \leq 0.03$	Ignore	Ignore	$0.03 < W \leq 0.08$	$L \leq 3$	6	$0.08 < W$	$3 < L$	None
Width(mm): W	Length(mm):L	Number of pieces permitted																							
$W \leq 0.03$	Ignore	Ignore																							
$0.03 < W \leq 0.08$	$L \leq 4$	2																							
$0.08 < W \leq 0.1$	$L \leq 1$	1																							
Width(mm): W	Length(mm):L	Number of pieces permitted																							
$W \leq 0.03$	Ignore	Ignore																							
$0.03 < W \leq 0.08$	$L \leq 3$	6																							
$0.08 < W$	$3 < L$	None																							
<p>2. Scratches(Glass, reflection plates, and polarizing plates)</p>	<p>In accordance with black spots. (At non lighting condition)</p>																								
<p>3. Color irregular</p>	<p>Not remarkable color irregular.</p>																								

<p>4. Air bubbles polarizing plates, and reflection plates</p>	<table border="1" data-bbox="710 376 1225 667"> <tr> <th data-bbox="710 376 970 521">Average Diameter (mm):D</th> <th data-bbox="970 376 1225 521">Number of pieces permitted</th> <th data-bbox="1225 376 1476 667" rowspan="2">Average diameter = (Long diameter + Short diameter)/2</th> </tr> <tr> <td data-bbox="710 521 970 667">D ≤ 0.3 0.3 &lt; D</td> <td data-bbox="970 521 1225 667">Ignore 0</td> </tr> </table> <p data-bbox="710 683 1476 779">Note that when there are 4 pieces or more, they are not to be concentrated.</p>		Average Diameter (mm):D	Number of pieces permitted	Average diameter = (Long diameter + Short diameter)/2	D ≤ 0.3 0.3 < D	Ignore 0					
Average Diameter (mm):D	Number of pieces permitted	Average diameter = (Long diameter + Short diameter)/2										
D ≤ 0.3 0.3 < D	Ignore 0											
<p>5. Cracks</p>	<table border="1" data-bbox="662 779 1476 1964"> <tr> <td data-bbox="662 779 1066 1169"> <p>(1)General crack</p>  </td> <td data-bbox="1066 779 1476 1169"> <p>a ≤ 5 b ≤ 2 c ≤ t</p> <p>Where, a and b are ignored when less than or equal 0.5. The numbers of pieces are set at up to 5 pieces.</p> </td> </tr> <tr> <td data-bbox="662 1169 1066 1361"> <p>(2)Corner crack</p>  </td> <td data-bbox="1066 1169 1476 1361"> <p>a ≤ 2.5 b ≤ 2.5 c ≤ t a + b ≤ 4</p> </td> </tr> <tr> <td data-bbox="662 1361 1066 1630"> <p>(3)Seal portion crack</p>  </td> <td data-bbox="1066 1361 1476 1630"> <p>a ≤ The seal width × 1/3 b ≤ t × 2/3 c ≤ 5</p> <p>The numbers of pieces are set at up to 5 pieces.</p> </td> </tr> <tr> <td data-bbox="662 1630 1066 1870"> <p>(4)ITO Pin crack</p>  </td> <td data-bbox="1066 1630 1476 1870"> <p>a ≤ 5 b ≤ 1/3 pin length c ≤ t</p> </td> </tr> <tr> <td data-bbox="662 1870 1066 1964"> <p>(5)Progressive cracks</p> </td> <td data-bbox="1066 1870 1476 1964"> <p>All taken to be unacceptable.</p> </td> </tr> </table>		<p>(1)General crack</p> 	<p>a ≤ 5 b ≤ 2 c ≤ t</p> <p>Where, a and b are ignored when less than or equal 0.5. The numbers of pieces are set at up to 5 pieces.</p>	<p>(2)Corner crack</p> 	<p>a ≤ 2.5 b ≤ 2.5 c ≤ t a + b ≤ 4</p>	<p>(3)Seal portion crack</p> 	<p>a ≤ The seal width × 1/3 b ≤ t × 2/3 c ≤ 5</p> <p>The numbers of pieces are set at up to 5 pieces.</p>	<p>(4)ITO Pin crack</p> 	<p>a ≤ 5 b ≤ 1/3 pin length c ≤ t</p>	<p>(5)Progressive cracks</p>	<p>All taken to be unacceptable.</p>
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<p>(2)Corner crack</p> 	<p>a ≤ 2.5 b ≤ 2.5 c ≤ t a + b ≤ 4</p>											
<p>(3)Seal portion crack</p> 	<p>a ≤ The seal width × 1/3 b ≤ t × 2/3 c ≤ 5</p> <p>The numbers of pieces are set at up to 5 pieces.</p>											
<p>(4)ITO Pin crack</p> 	<p>a ≤ 5 b ≤ 1/3 pin length c ≤ t</p>											
<p>(5)Progressive cracks</p>	<p>All taken to be unacceptable.</p>											

6.	Outer dimensions	Should be with in the tolerance.
7.	Newton ring	Orbicular of interference fringes. To be non. In case of doubtful judgenemt, agreement shall be reachment.
8.	Soldering	Should be no defective soldering such as shorting, loose terminal cold solder, peeling of printed circuit board pattern, improper mouting position, etc.

5-3 Dot Appearance Defect

NO.	Item	Criteria
1.	Plinhole	 <p>Dot display a and b are each <math>\leq 0.2\text{mm}</math> The overall total is taken be with in 10 units. Note that they are not to be concentrated.</p>
2.	Missing	 <p>Dot display a and b are each <math>\leq 0.2\text{mm}</math> The overall total is taken to be with in 10 units.</p>
3.	Thick and thin display	 <p>Taken to be within <math>\pm 1.5\%</math> of display character width(a) and height(b).</p>

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 with a soft cloth soaked with a cleaning naphtha solvent.

• STORAGE

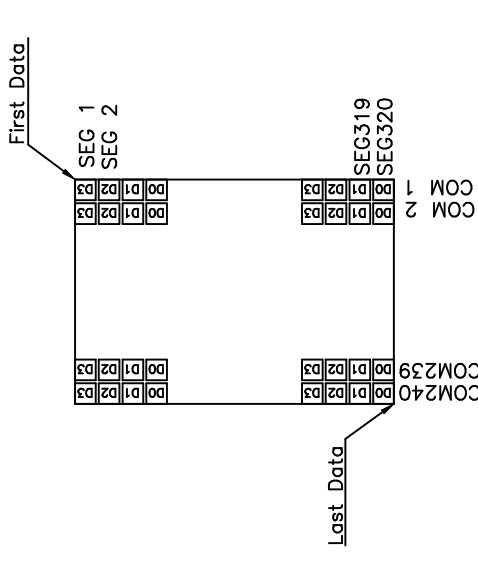
- 1.Store the panel or module in a dark place where the temperature is  $25^{\circ}\text{C}\pm 5^{\circ}\text{C}$  and the humidity is below 65% RH.
- 2.Do not place the module near organics solvents or corrosive gases.
- 3.Do not crush, shake, or jolt the module.

• TERMS OF WARRANT

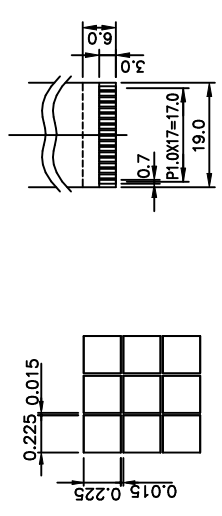
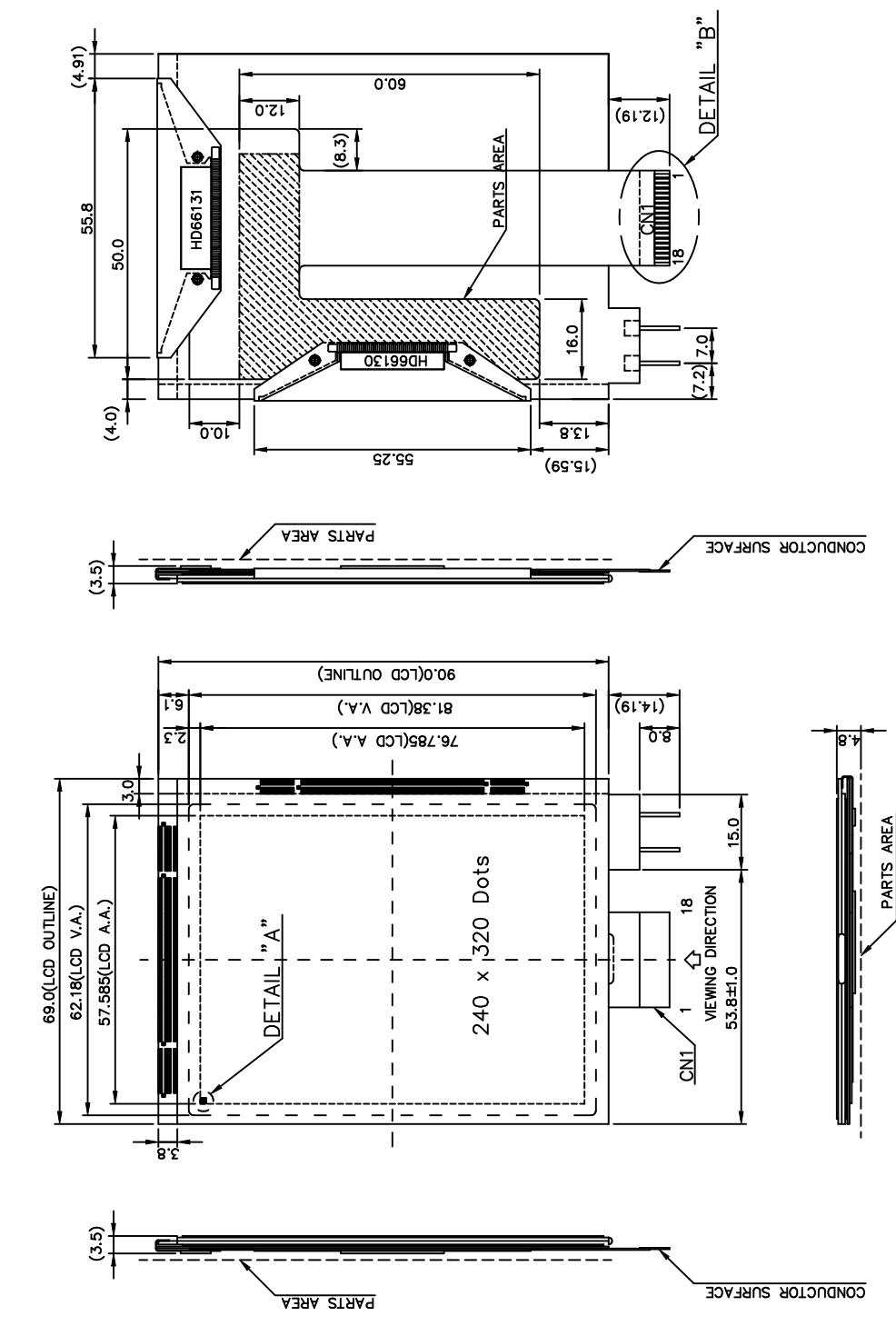
- 1.Acceptance inspection period  
The period is within one month after the arrival of contracted commodity at the buyer's factory site.
- 2.Applicable warrant period  
The period is within twelve months since the date of shipping out under normal using and storage conditions.

• THE OPERATING LIFE TIME OF BACK LIGHT

EL : 2000hrs for AC 100Vrms, 400Hz, 20°C, 60%RH  
(Operating life time is defined as follows : The final brightness is at 50% of original brightness.)



**DATA SEQUENCE**



**DETAIL "A"**  
(SCALE 1:30)

**DETAIL "B"**  
(SCALE 1:1)

NOTE :  
 1. Resolution : 240x320 DOTS FSTN  
 2. Backlight : EL B/L (White)  
 3. Hitachi HI-FAS low power  
 TCP IC HD66130/131

**TOLERANCE LIST(S)**

DIMENSION	TOLERANCE
L ≤ 6	±0.25
6 < L ≤ 18	±0.3
18 < L ≤ 50	±0.4
50 < L ≤ 125	±0.5
125 < L	±0.6

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

LTD79H298P4KT

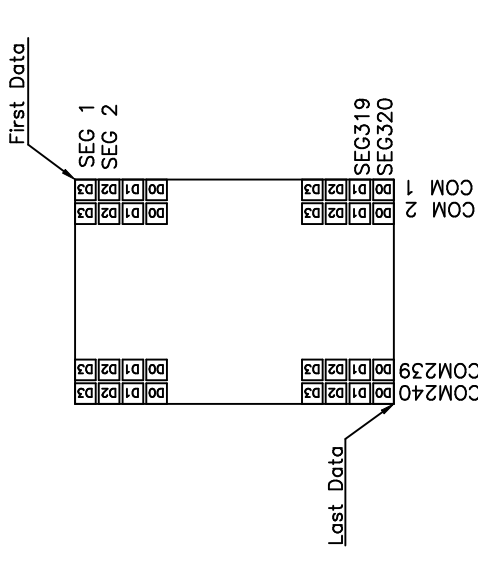
NAME	DATE	THIRD ANGLE P.
APPROVE		
CHECK		
DESIGN	C. J. CHEN	SCALE
DRAWN	C. J. CHEN	UNIT
		1/1
		mm

REV. NO.	DESCRIPTION	DATE	DESIGN	CHECK	APPROVE
1					
2					
3					
4					
5					
6					
7					
8					
9					

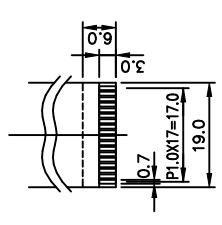
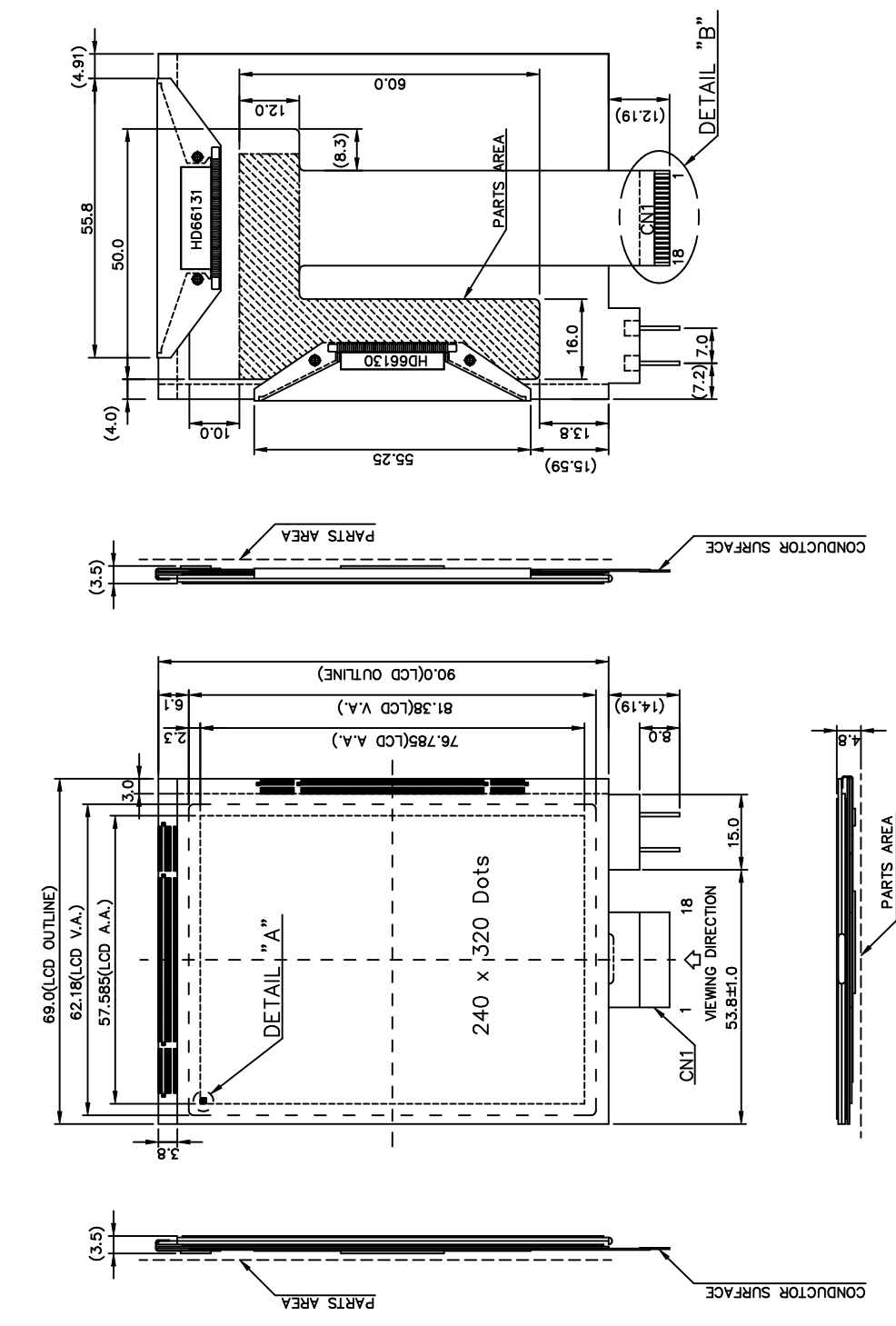
PIN NO.	SYMBOL	FUNCTION	PIN NO.	SYMBOL	FUNCTION
1	VH	LCD DRIVE LEVEL POWER SUPPLY	10	DISPOFF	H-DISPLAY ON/L-DISPLAY OFF
2	VO	LCD DRIVE LEVEL POWER SUPPLY	11	CP	CLOCK PULSE FOR SEGMENT SHIFT REGISTER
3	VM	LCD DRIVE LEVEL POWER SUPPLY	12	V1	LCD DRIVE LEVEL POWER SUPPLY
4	VDD	POWER SUPPLY FOR LOGIC(+3.3V)	13	VL	LCD DRIVE LEVEL POWER SUPPLY
5	FRM	FRAME START SIGNAL	14	D3	INPUT DATA SIGNAL
6	VM	LCD DRIVE LEVEL POWER SUPPLY	15	D2	INPUT DATA SIGNAL
7	LOAD	LATCH PULSE OF DISPLAY DATA	16	D1	INPUT DATA SIGNAL
8	VSS	GND	17	D0	INPUT DATA SIGNAL
9	DF	SWITCH SIGNAL TO CONVERT LCD DRIVE WAVEFORM INTO AC	18	NC	NO CONNECTION

CN1 : PITCH 1.0mm WIDTH 19.0mm

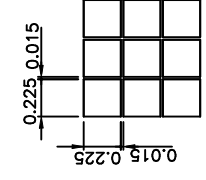




**DATA SEQUENCE**



**DETAIL "B"**  
(SCALE 1:1)



**DETAIL "A"**  
(SCALE 1:30)

NOTE :  
 1. Resolution : 240x320 DOTS FSTN  
 2. Backlight : EL B/L (White)  
 3. Hitachi HI-FAS low power  
 TCP IC HD66130/131

**TOLERANCE LIST(S)**

DIMENSION	TOLERANCE
L ≤ 6	±0.25
6 < L ≤ 18	±0.3
18 < L ≤ 50	±0.4
50 < L ≤ 125	±0.5
125 < L	±0.6

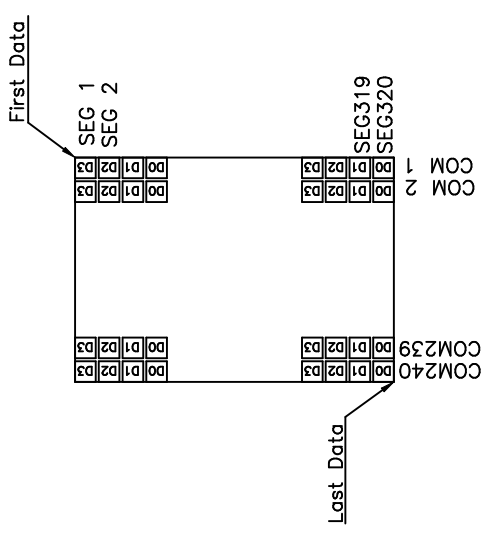
**南亞塑膠工業股份有限公司**  
 NAN YA PLASTICS CORPORATION  
**製品圖**

LTD79H298L4KT

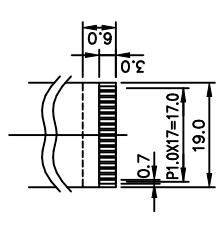
APPROVE	NAME	DATE	THIRD ANGLE P.
CHECK			
DESIGN	C. J. CHEN	89.03.09	SCALE
DRAWN	C. J. CHEN	89.03.09	1/1
DWG NO.	M2198B/D14A		

CN1 : PITCH 1.0mm WIDTH 19.0mm

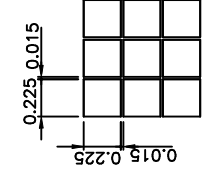
PIN NO.	SYMBOL	FUNCTION	PIN NO.	SYMBOL	FUNCTION
1	VH	LCD DRIVE LEVEL POWER SUPPLY	10	DISPOFF	H-DISPLAY ON/L-DISPLAY OFF
2	VO	LCD DRIVE LEVEL POWER SUPPLY	11	CP	CLOCK PULSE FOR SEGMENT SHIFT REGISTER
3	VM	LCD DRIVE LEVEL POWER SUPPLY	12	V1	LCD DRIVE LEVEL POWER SUPPLY
4	VDD	POWER SUPPLY FOR LOGIC(+3.3V)	13	VL	LCD DRIVE LEVEL POWER SUPPLY
5	FRM	FRAME START SIGNAL	14	D3	INPUT DATA SIGNAL
6	VM	LCD DRIVE LEVEL POWER SUPPLY	15	D2	INPUT DATA SIGNAL
7	LOAD	LATCH PULSE OF DISPLAY DATA	16	D1	INPUT DATA SIGNAL
8	VSS	GND	17	D0	INPUT DATA SIGNAL
9	DF	SWITCH SIGNAL TO CONVERT LCD DRIVE WAVEFORM INTO AC	18	NC	NO CONNECTION



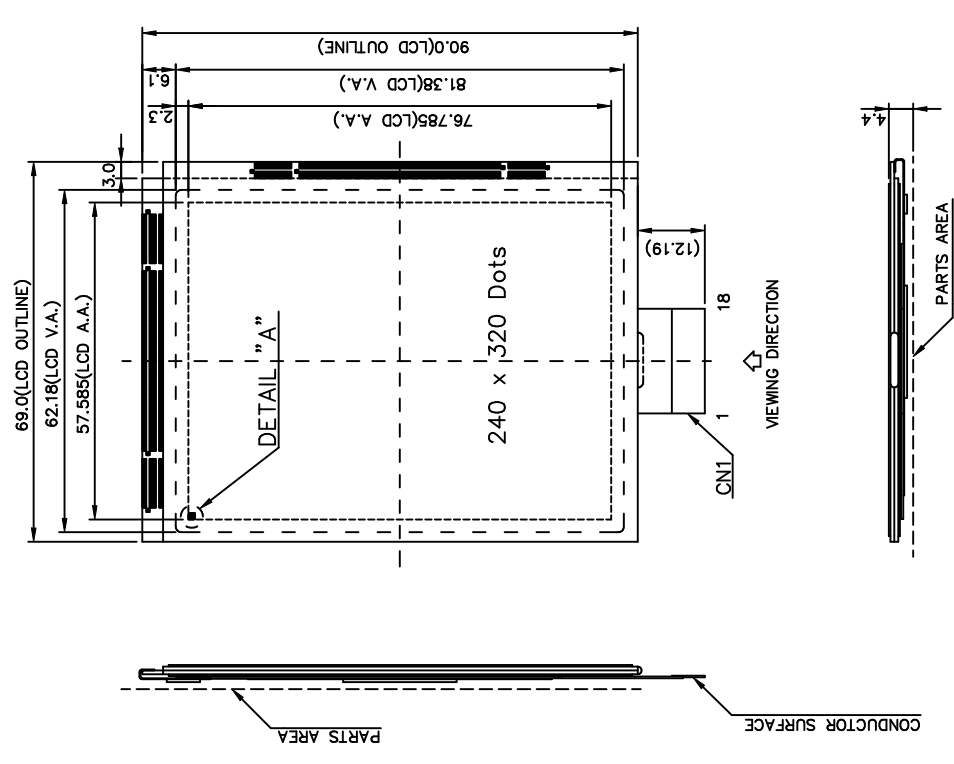
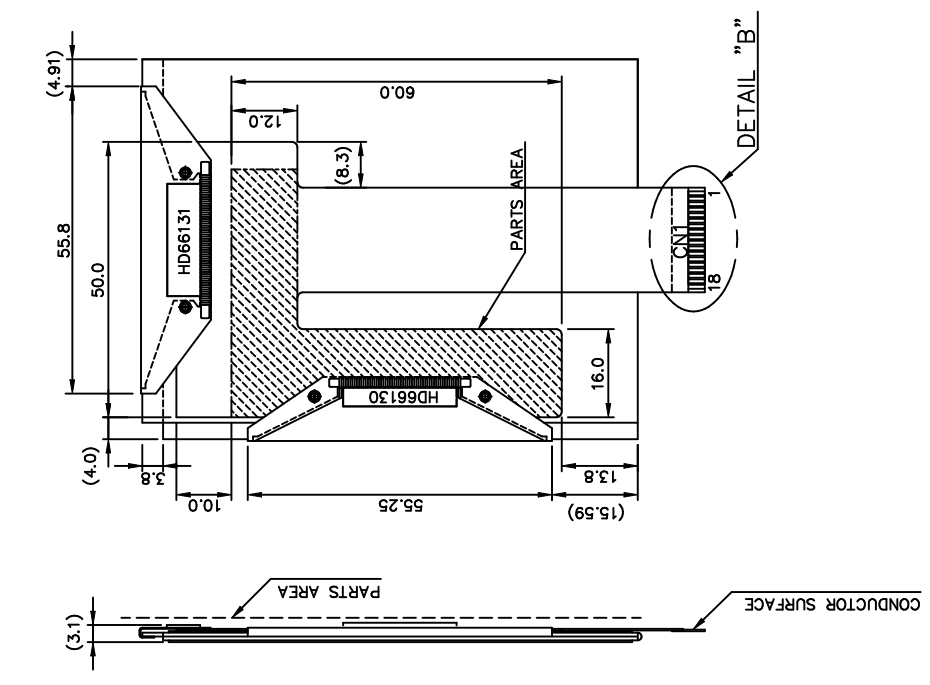
**DATA SEQUENCE**



**DETAIL "B"**  
(SCALE 1:1)



**DETAIL "A"**  
(SCALE 1:30)



NOTE :  
1. Resolution : 240x320 DOTS FSTN  
2. Hitachi HI-FAS low power  
TCP IC HD66130/131

**TOLERANCE LIST(S)**

DIMENSION	TOLERANCE
L ≤ 6	±0.25
6 < L ≤ 18	±0.3
18 < L ≤ 50	±0.4
50 < L ≤ 125	±0.5
125 < L	±0.6

**南亞塑膠工業股份有限公司**  
NAN YA PLASTICS CORPORATION  
**製品圖**  
LTA79R298J4KT  
DATE: \_\_\_\_\_ THIRD ANGLE P.  
APPROVE: \_\_\_\_\_  
CHECK: \_\_\_\_\_  
DESIGN: C. J. CHEN 89.03.09 SCALE: 1/1 UNIT: mm  
DRAWN: C. J. CHEN 89.03.09  
DWG NO. M2198-D14A

CN1 : PITCH 1.0mm WIDTH 19.0mm

PIN NO.	SYMBOL	FUNCTION	PIN NO.	SYMBOL	FUNCTION
1	VH	LCD DRIVE LEVEL POWER SUPPLY	10	DISPOFF	H-DISPLAY ON/L-DISPLAY OFF
2	VO	LCD DRIVE LEVEL POWER SUPPLY	11	CP	CLOCK PULSE FOR SEGMENT SHIFT REGISTER
3	VM	LCD DRIVE LEVEL POWER SUPPLY	12	V1	LCD DRIVE LEVEL POWER SUPPLY
4	VDD	POWER SUPPLY FOR LOGIC(+3.3V)	13	VL	LCD DRIVE LEVEL POWER SUPPLY
5	FRM	FRAME START SIGNAL	14	D3	INPUT DATA SIGNAL
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