NAN YA PLASTICS CORPORATION

SPECIFICATION OF
LCD MODULE
PRODUCT NO.: LTD79H298L17GK

SPEC. NO.: LM298-17- △0

CUSTOMER
APPROVED BY

LCD DEPARTMENT
ELECTRONIC MATERIALS DIVISION
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EDITED ON : JULY.13 ,2000

DESIGN MANAGER	DESIGN CHECK	DESIGNER
		SEAN HU

RECORDS OF REVISION

SPEC. : LM298-17

DATE	REVISED NO.	REF. PAGE	SUMMARY	DESIGN	CHECK
07.13,2000	0	22	First Issue	SEAN HU	

NAN YA PLASTICS CORP. ELEC. MATERIALS DIV. LCD DEPARTMENT	SPECIFICATION	SPEC. NO. : LM298-17 DATE : July.13, 2000 SHEET NO. : 1

1. MECHANICAL DATA

(1) Product No.	LTD79H298L17GK	
(2) Module Size	73.28 (W)mm X 93.8 (H)mm X MAX 7.5 (D)mm	
(3) Dot Size	0.225 (W)mm X 0.225 (H)mm	
(4) Dot Pitch	0.24 (W)mm X 0.24 (H)mm	
(5) Number of Dots	240 (W) X 320 (H) Dots	
(6) Duty	1/240	
(7) LCD Display Mode	FSTN: Black and White(Normally White,Paper White /Positive Image)	
	Rear Polarizer: Transflective(High Transparency)	
(8) Viewing Direction	6 O'clock	
(9) Backlight	EL B/L	
(10) Weight	Approx.: 63g	
(11) Controller	Excluded	
(12) DC/DC Converter	Excluded	
(13) EL B/L inverter Ckt	Included	
(14) Touch Panel	Included	

Note :

LTD79H298L17GK

Back Light
- A : Without Backlight
- B : CCFT Backlight
- C : LED Backlight
- D : EL Backlight

Option
- G : Green(Blue Green) Backlight
- K : High Contrast Ratio LC
- 17 : Module Version Number

Reflective/Transmissive
- R : Reflective
- S : Transflective(Normal)
- P : Transflective(Medium Transparency)
- H : Transflective(High Transparency)
- T : Transmission
- Z : Transflective

Mode/View Angle
- A: Gray , 6 O'clock
- B: Gray , 12 O'clock
- C: Yellow , 6 O'clock
- D: Yellow , 12 O'clock
- E: Blue , 6 O'clock
- F: Blue , 12 O'clock
- G: Normally Black , 6 O'clock
- H: Normally Black , 12 O'clock
- J: Normally White , 6 O'clock
- K: Normally White , 12 O'clock
- L: Normally White , 6 O'clock

REV/DATE	R0/ 07.13,2000							BY SEAN HU

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	VEE	−0.3	+22.9	V	Note 1
Static Electricity	−	−	−	−	Note 3

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

Note 2. $\overline{\text{DISP-OFF}}$, FRM ,LOAD ,CP ,D0~D3

Note 3. Make certains 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 Ta ≦ 70°C : 75%RH max

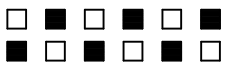
Ta > 70°C : Absolute humidity must be lower than the humidity of 75%RH at 70°C

Note 3 Ta at −30°C will be < 48hrs, at 80°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		VIH	H level		0.8VDD	–	VDD	V
		VIL	L level		0	–	0.2VDD	V
Recommended LC Driving Voltage		VEE	Duty= 1/240	-20°C	21.6	21.9	22.2	V
				0°C	19.7	20	20.3	
				25°C	18.3	18.6	18.9	
				50°C	16.5	16.8	17.1	
				70°C	15.1	15.4	15.7	
Power Supply Current		IDD	VDD= 3.3V VSS= 0V Bias=1/13 VEE=18.6V FLM=70Hz PATTERN : 		–	1.6	2.4	mA
		IEE			–	0.1	0.5	mA
EL Power Supply Current		I_{EL}	V_{EL} =3.3V V_{ELG} =0V BLE =3.3V		–	16.4	25	mA
Surface Luminance	H298L	–	ALL ON		–	0.1	–	cd/m²
			ALL OFF		–	0.5	–	

4.OPTICAL CHARACTERISTICS

(For Normal Temperature Mode LCM)

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.
H	L	–	13.0	–	13.0	–	9.0	–	54–38	–	39–38
Note		NOTE 6						NOTE 5			

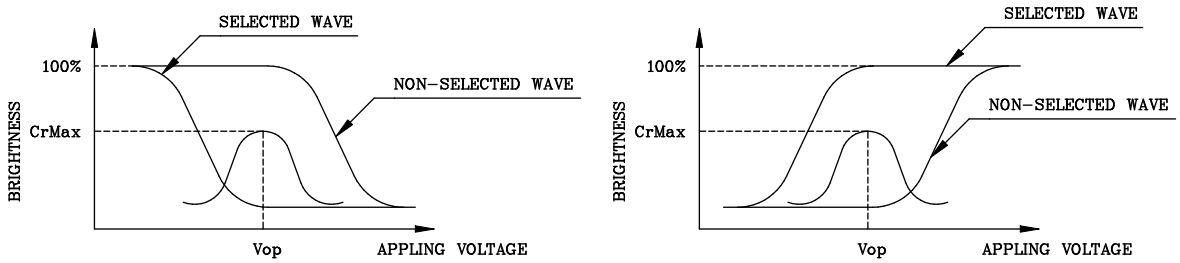
NOTE : H: TRANSFLECTIVE
L: NORMALLY WHITE,6 O'CLOCK

AT ø=0° θ=0°

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Response Time (rise)	Tr	0℃	–	1200	–	ms	NOTE 2
		25℃	–	290	–		
		50℃	–	160	–		
Response Time (fall)	Tf	0℃	–	550	–	ms	NOTE 2
		25℃	–	210	–		
		50℃	–	90	–		

(NOTE 1)

Definition of Operation Voltage(Vop)



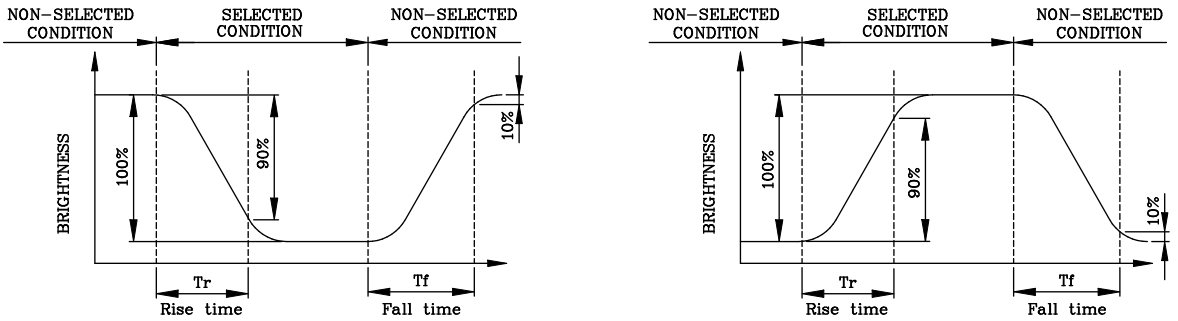
(positive type) (negative type)

*Conditions

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

(NOTE 2)

Definition of Response Time(Tr,Tf)



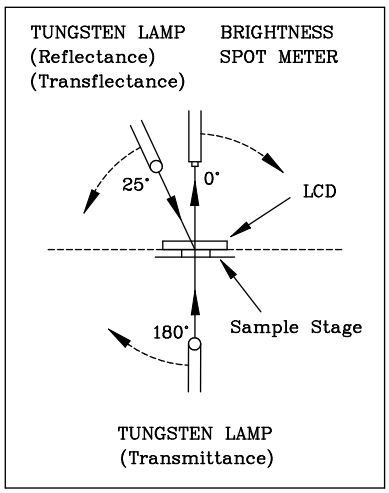
(positive type) (negative type)

*Conditions

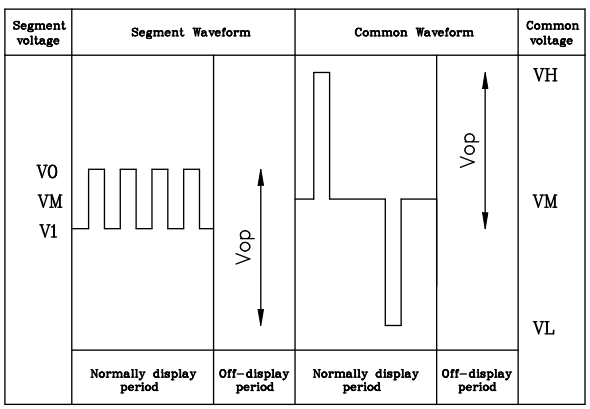
Operating Voltage : Vop
Viewing Angle (θ,ϕ) : (0,0)
Frame Frequency : 70Hz
Appling Waveform : I/N duty 1/a bias

(NOTE 3)

Description of Measuring Equipment and Driving Waveforms

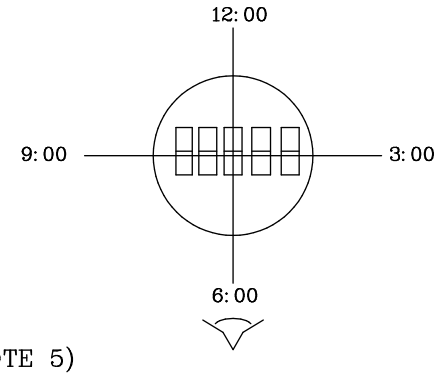


The voltage relationship of each signal is as follow
Multiplex Driving (1/N duty 1/a bias)



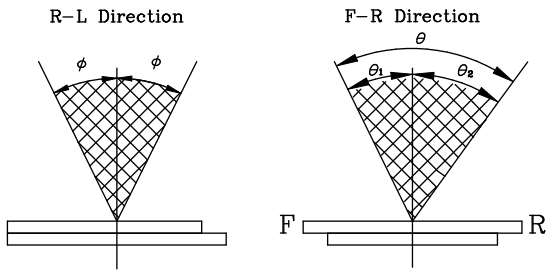
(NOTE 4)

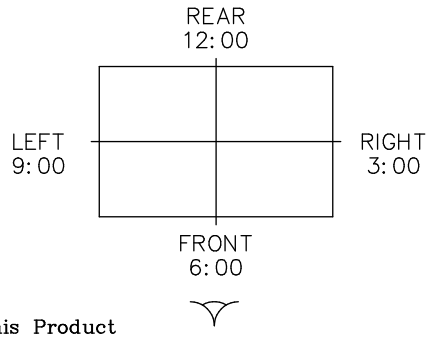
Definition of Viewing Direction



(NOTE 5)

Definition of Viewing Angle





*For This Product

The Viewing Direction Is 6 O'clock

So $\theta_1 > \theta_2$

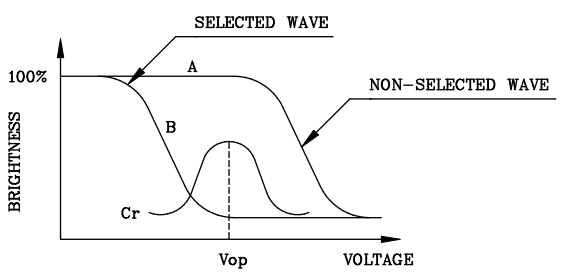
$$\theta = \theta_1 + \theta_2$$

*Conditions

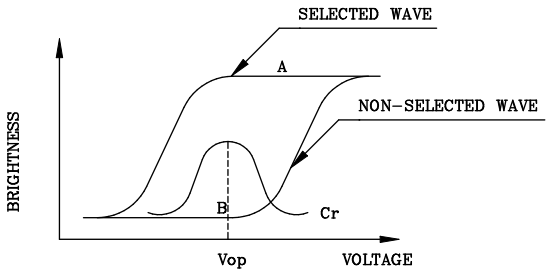
Operating Voltage : Vop
Frame Frequency : 70Hz
Appling Waveform : 1/N duty 1/a bias
Contrast Ratio : larger than 2

(NOTE 6)

Definition of Contrast Ratio (Cr)



(positive type)



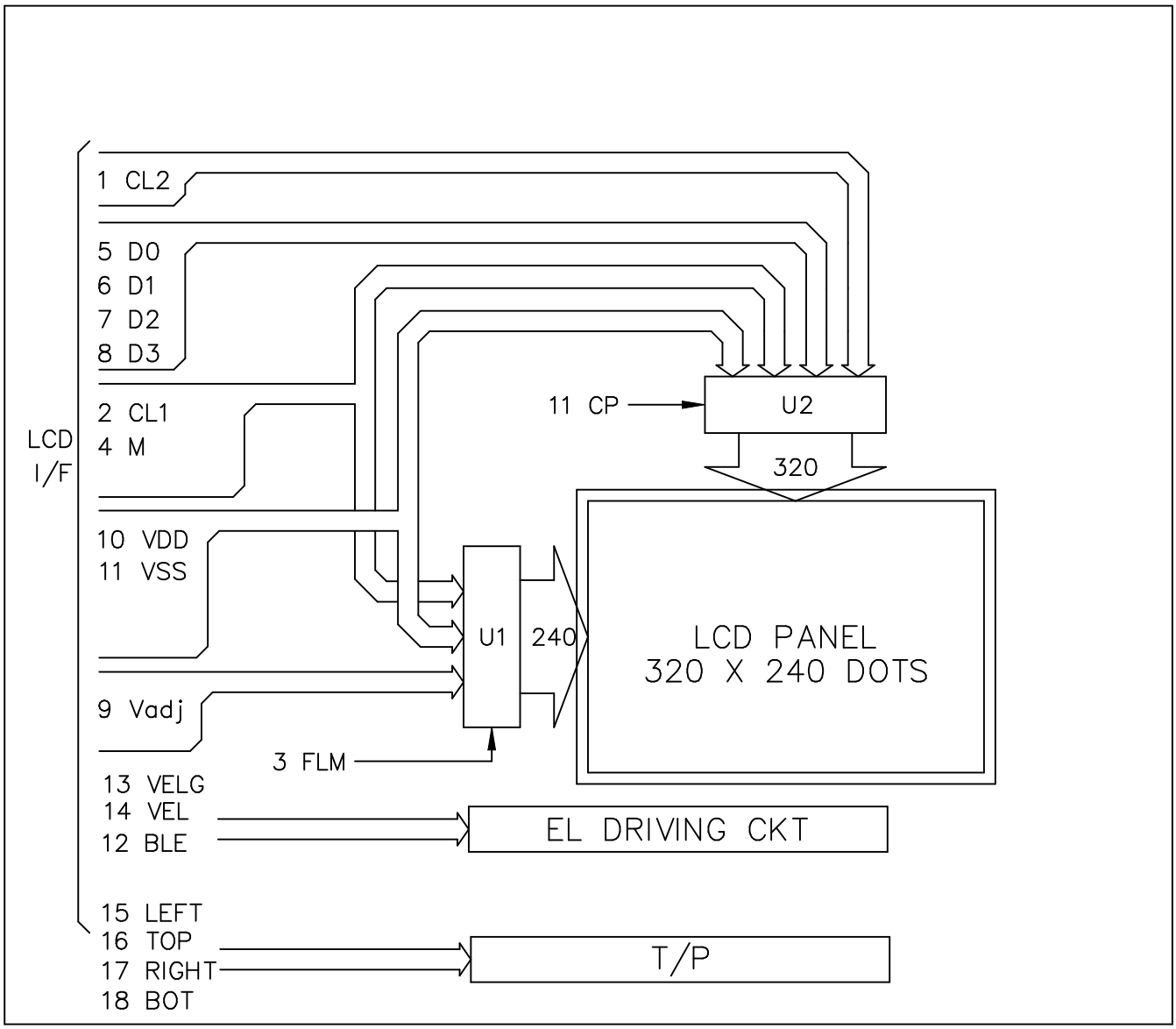
(negative type)

Contrast Ratio : Cr=A/B

*Conditions

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

5. BLOCK DIAGRAM



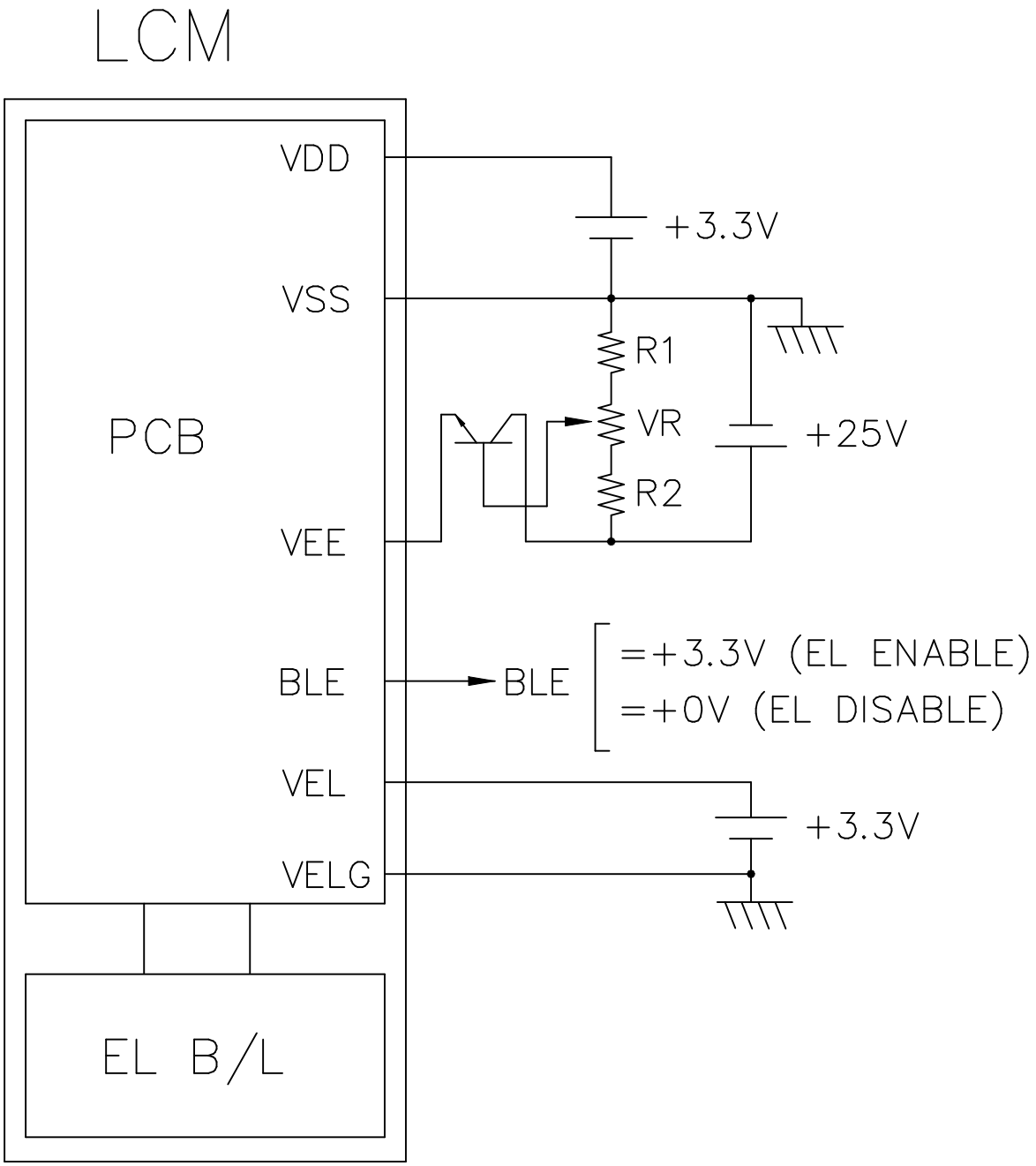
6. INTERNAL PIN CONNECTION

CN1

Pin No.	Symbol	Level	Function
1	CL2	H/L	Data Shift Clock Signal
2	CL1	H/L	Data Latch Clock Signal
3	FLM	H/L	Frame Signal
4	M	H/L	Alternate Signal
5	D0	H/L	Display Data
6	D1	H/L	
7	D2	H/L	
8	D3	H/L	
9	VEE	–	Power Supply for LCD (+V)
10	VDD	–	Power Supply for Logic
11	VSS	–	Power Supply (0V)
12	BLE	H/L	H: EL Enable ; L: EL Disable
13	VELG	–	Power Supply for EL (GND,0V)
14	VEL	–	Power Supply for EL (+)
15	LEFT	–	No Connection
16	TOP	–	
17	RIGHT	–	
18	BOT	–	

USED CABLE(CN1) :
FFC,N18,PITCH=1.0mm,THICKNESS=0.3mm
MATING CONNECTOR :
MOLEX 52207-1890 or COMPATIABLE

7. POWER SUPPLY



$R1+VR+R2=10\sim20K\Omega$

8. TIMING CHARACTERISTICS

8-1 INTERFACE TIMING

@ VDD=3.3V±10%, Ta=-20~70 ℃

Item	Symbol	Test condition	Min.	Typ.	Max.	Unit
CL2 Clock Cycle	tCYC2	Fig.a	152	–	–	ns
CL2 HIGH-LEVEL Width	tCWH2	Fig.a	65	–	–	ns
CL2 LOW-LEVEL Width	tCWL2	Fig.a	65	–	–	ns
Data Set Up Time	tDS2	Fig.a	50	–	–	ns
Data Hold Time	tDH2	Fig.a	50	–	–	ns
CL2 Rise/Fall Time	tr2,tf2	Fig.a	–	–	30	ns
Clock Set Up Time	tSCL	Fig.a	80	–	–	ns
Clock Hold Time	tHCL	Fig.a	80	–	–	ns
M Set Up Time	tMS	Fig.a	20	–	–	ns
M Hold Time	tMH	Fig.a	20	–	–	ns

@ VDD=3.3V±10%, Ta=-20~70 ℃

Item	Symbol	Test condition	Min.	Typ.	Max.	Unit
CL1 Clock Cycle	tCYC1	Fig.b	400	–	–	ns
CL1 HIGH-LEVEL Width	tCWH1	Fig.b	25	–	–	ns
CL1 LOW-LEVEL Width	tCWL1	Fig.b	370	–	–	ns
Data Set Up Time	tDS1	Fig.b	100	–	–	ns
Data Hold Time	tDH1	Fig.b	10	–	–	ns
CL1 Rise/Fall Time	tr1,tf1	Fig.b	–	–	30	ns

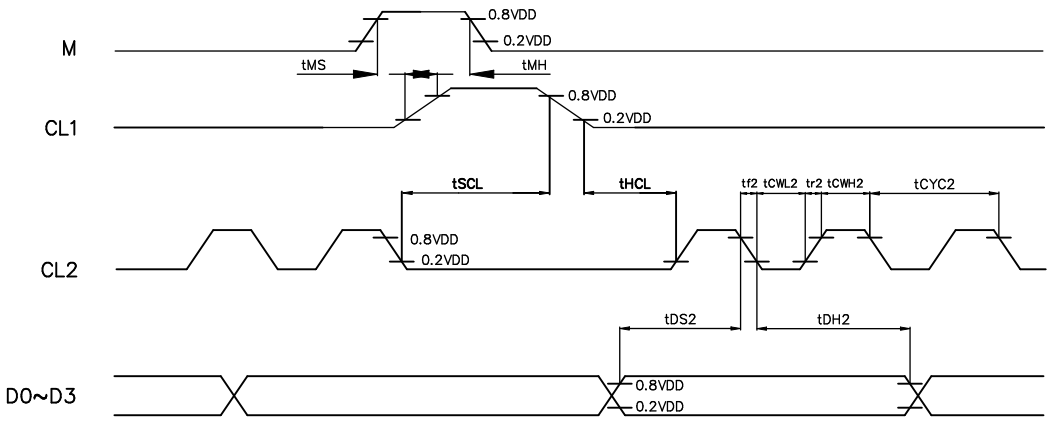


Fig . a Interface timing (SEGMENT)

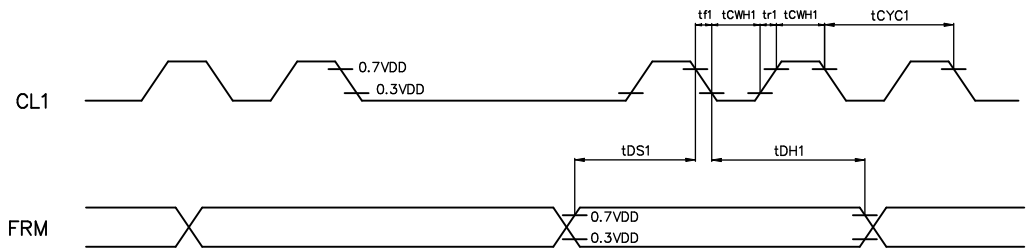
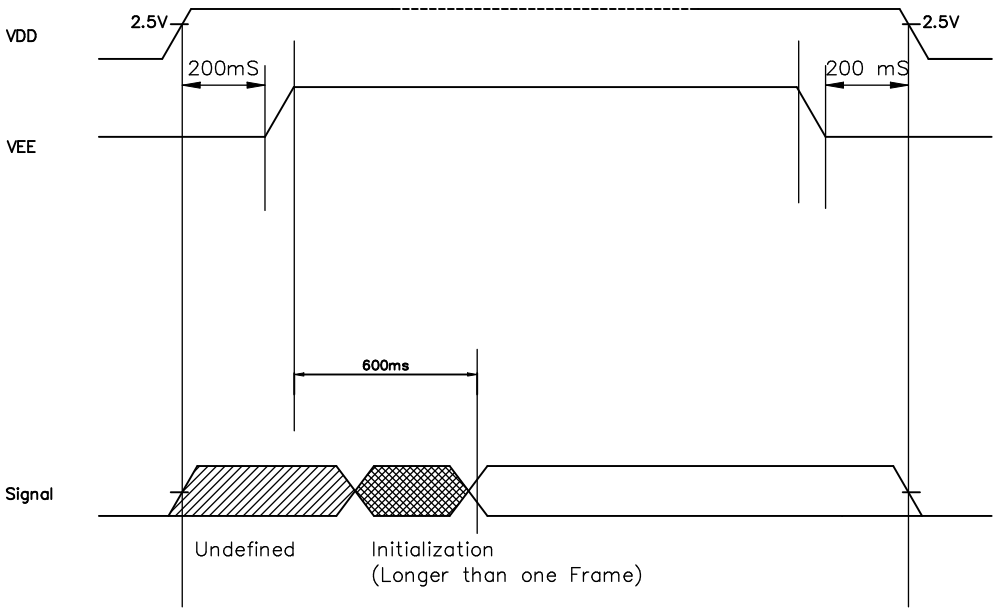


Fig . b Interface timing (COMMON)

8-2 POWER ON/OFF TIMING

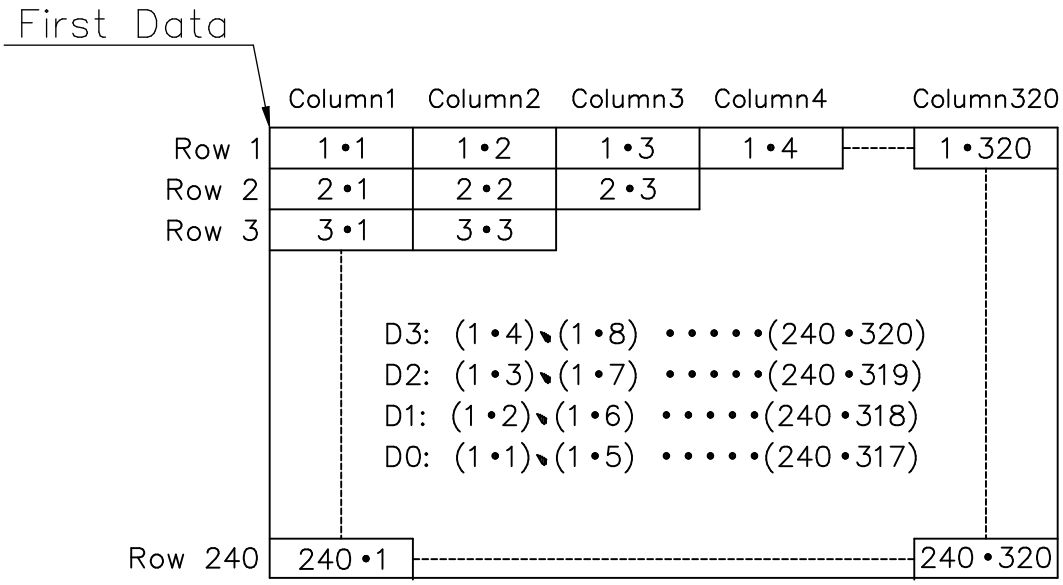


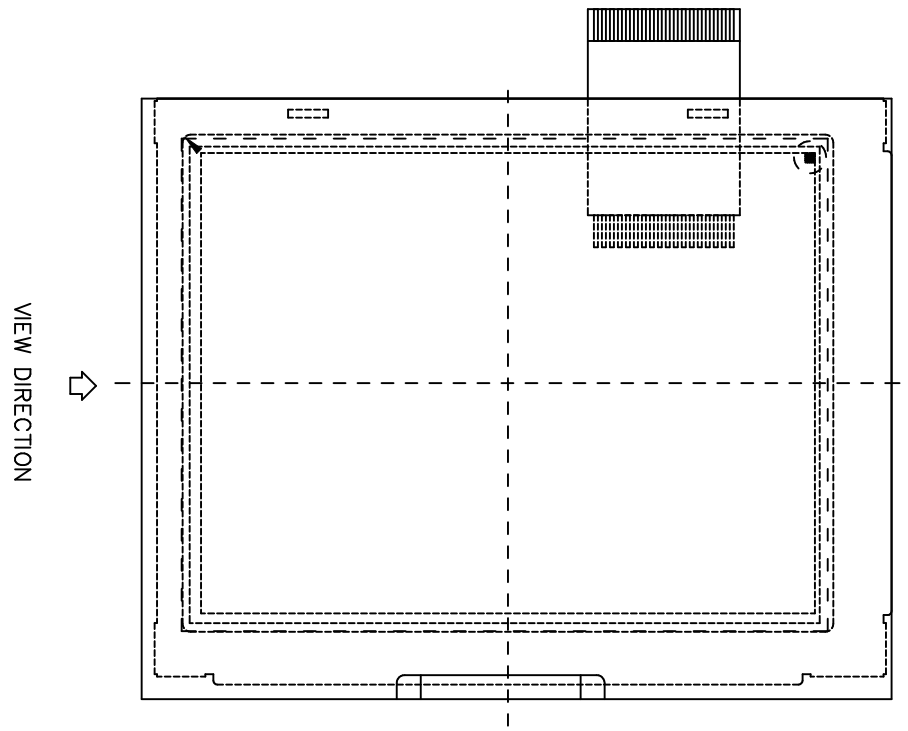
POWER ON

POWER OFF

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

8-3 DISPLAY PATTERN





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

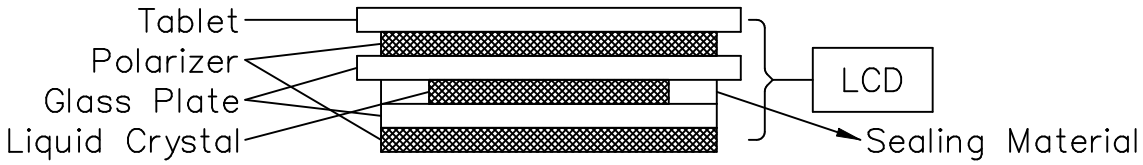
The NAN YA inspection provision provides outgoing inspection provision and its expected quality level based on our outgoing inspection of NAN YA LCD produces.

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

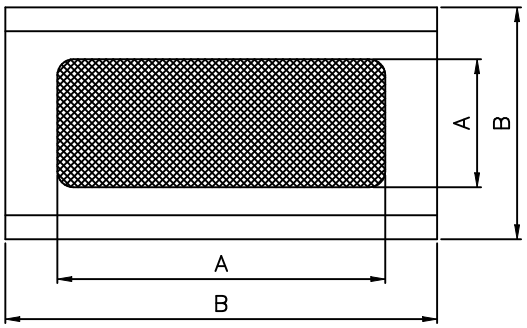
	Item		AQL(%)	Remarks
Major Defect	Dots	Opens Shorts Erroneous operation	0.4	faults which substantially lower the practicality and the initial purpose difficult to achieve.
	Solder appearance	Shorts Loose		
	Cracks	Display surface cracks		
	Tablet contact resistance			
	Tablet input load			

	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.

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	Not allowable
5.	Response time	Within Specified value
6.	Tablet contact resistance	Within Specified value
7.	Tablet input load	Within Specified value
8.	Tablet lineality	Within Specified value
9.	EL backlight turn on/off	Within Specified value

5-2 External Appearance Defect

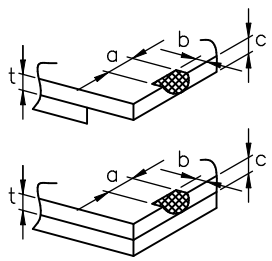
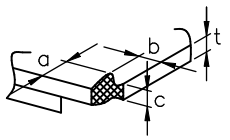
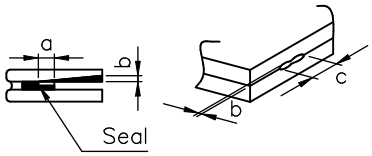
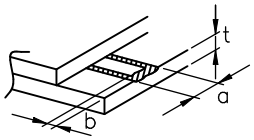
<table>
<tr><th>NO.</th><th>Item</th><th>Criterion</th></tr>
<tr><td>1.</td><td>Black spots, foreign matter, and white spots (Including light leakage due to pinholes of polarizing plates, etc.)</td><td>
(1)-1-Spots
<table>
<tr><th>Average Diameter(mm): D</th><th>Number of pieces permitted</th></tr>
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

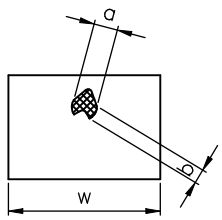
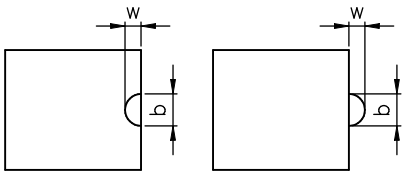
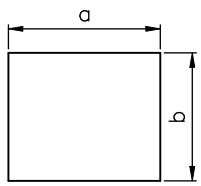
Note that when there are 2 pieces or more, they are not to be concentrated.
Set as: Average diameter = (Long diameter + Short diameter)/2
</td></tr>
</table>

<table>
<tr><td>1.</td><td>Black spots, foreign matter, and white spots (Including light leakage due to pinholes of polarizing plates, etc.)</td><td>(1)-1 Spots(At non 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≦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 Spots(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 that or equal 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 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	 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.

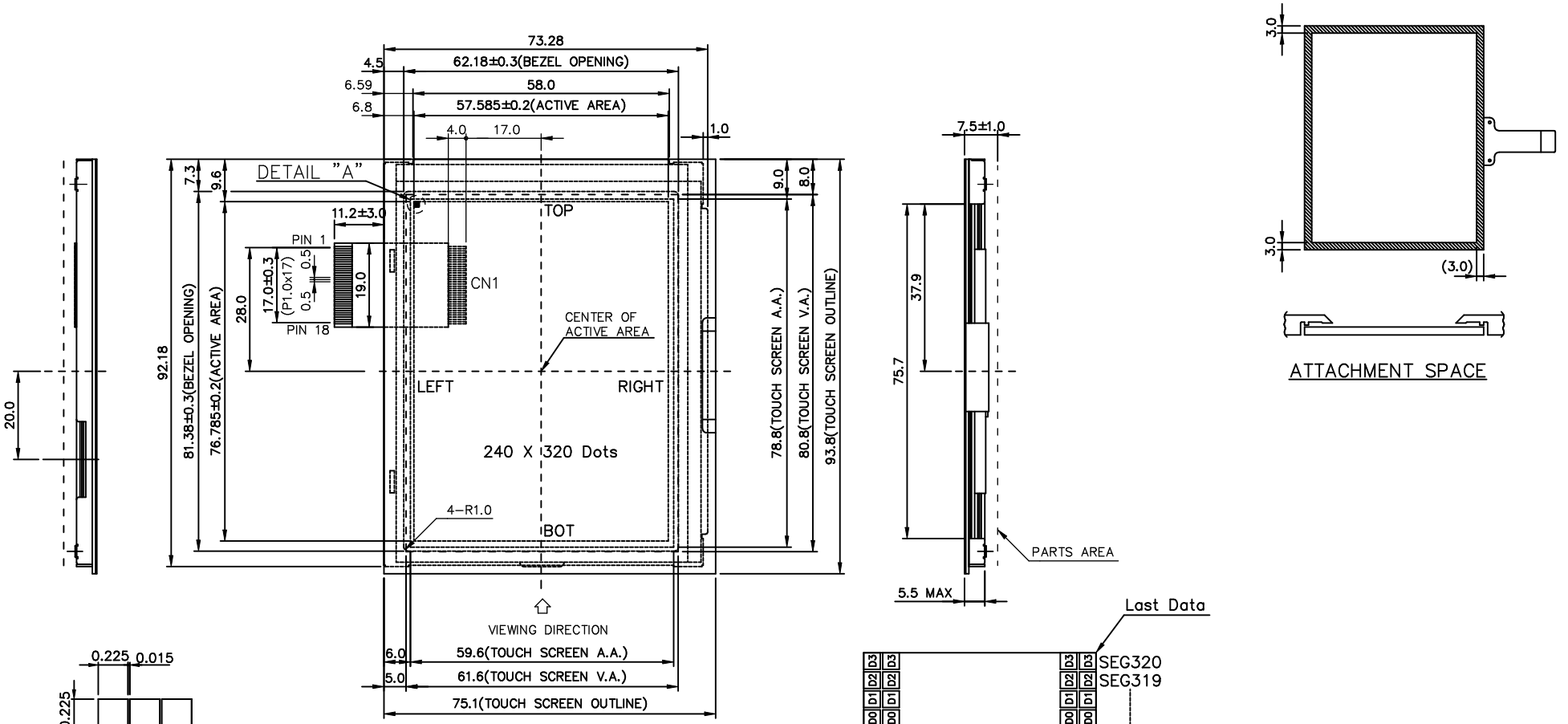
- HANDLING
  1. Avoid static electricity which can damage the CMOS LSI.
  2. Do not remove the panel or frame from the module.
  3. The polarizing plate of the display is very fragile. So, please handle it very carefully.
  4. Do not wipe the polarizing plate with a dry cloth, as it may easily scratch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

- THE OPERATING LIFE TIME OF BACK LIGHT

  EL : 2000HR at AC 65Vrms 250 Hz 20°C 60% RH



NOTE :
1. Resolution : 240x320 DOTS FSTN
2. Backlight : EL B/L (BLUE GREEN)
3. Hitachi HI-FAS low power
   TCP IC HD66130/137
4. FRAME MATERIAL : SPCC (0.3 mmt)

INTERFACE CONNECTION(CN1)

Pin No.	Symbol	Function	Pin No.	Symbol	Function
1	CL2	Data Shift Clock Signal	10	VDD	Power Supply for Logic (+)
2	CL1	Data Latch Signal	11	VSS	Power Supply for Logic (GND,0V)
3	FLM	First Line Marker	12	BLE	H:EL Enable L:EL Disable
4	M	Alternate Signal	13	VELG	Power Supply for EL(GND,0V)
5	D0	Display Data	14	VEL	Power Supply for EL(+)
6	D1		15	LEFT	Touch Panel Connection
7	D2		16	TOP	
8	D3		17	RIGHT	
9	Vadj	Contrast adjust voltage	18	BOT	

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

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

LTD79H298L17GKT

	NAME	DATE	THIRD ANGLE P.
APPROVE			
CHECK			
DESIGN	C. J. CHEN	89.03.20	SCALE / UNIT
DRAWN	C. J. CHEN	89.03.20	1/1 / mm

DWG NO. M298-D17A (1/1) 0