

NAN YA PLASTICS CORP.
ELEC. MATERIALS DIV.
LCD DEPARTMENT

SPECIFICATION

SPEC. NO. : LM054-0
DATE : Nov. 4, 1997
SHEET NO. : 1/17

U.S. MARKETING ARM:

MARK PRODUCTS CORPORATION
800 N. EDGEWOOD AVENUE
WOOD DALE, IL 60191
TEL: 630-787-9089
FAX: 630-787-9015

SPECIFICATION OF
480x320 LCD MODULE
PRODUCT NO.: LTAEA_054____

SPEC. NO.: LM054-0

APPROVED BY

EDITED ON : Nov. 4, 1997

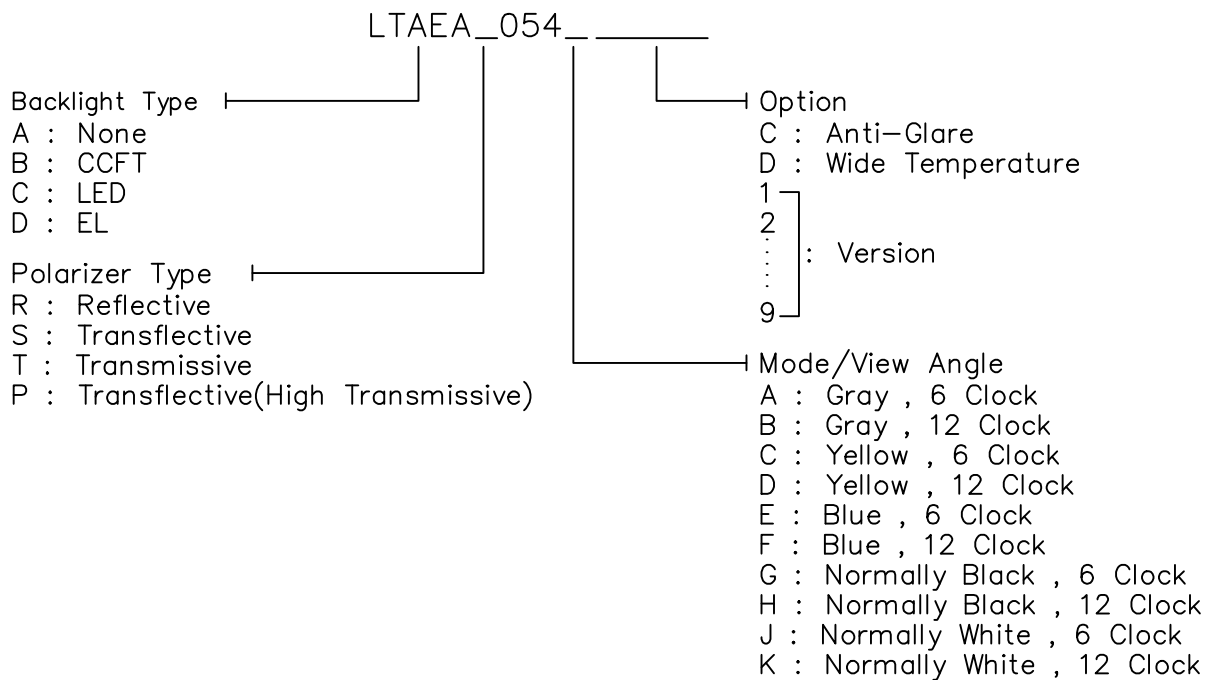
SALES MANAGER	DESIGN MANAGER	PERSON IN CHARGE

REV/DATE	RO/ 11.4.97					APP	CHK	BY
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1. MECHANICAL DATA

- (1) Product No. LTAEA_054_
- (2) Module Size 148.2 (W)mm x 101.5 (H)mm x MAX 6.0 (D)mm
- (3) Dot Size 0.22 (W)mm x 0.22 (H)mm
- (4) Dot Pitch 0.24 (W)mm x 0.24 (H)mm
- (5) Number of Dots 480 (W) x 320 (H)Dots
- (6) Duty 1/320
- (7) LCD Display Mode FSTN:Black and White (Normally White/Positive Image)
- (8) Viewing direction 6 O'clock 12 O'clock ___ O'clock
- (9) Weight 56g

Note :



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2. ABSOLUTE MAXIMUM RATINGS

(1) ELECTRICAL ABSOLUTE RATINGS

VSS=0V

ITEM	SYMBOL	MIN	MAX	UNIT	COMMENT
Power Supply for Logic	VDD-VSS	-0.3	6.5	V	
Input Voltage	VI	-0.3	VDD	V	
Power Supply for LCD	VEE-VSS	-0.3	38.0	V	
Static Electricity	-	-	-	-	NOTE 1

NOTE 1 LCM should be grounded during handling LCM.

(2) ENVIRONMENTAL ABSOLUTE MAXIMUM RATINGS

ITEM	NORMAL TEMP.			
	OPERATING		STORAGE	
	MIN.	MAX.	MIN.	MAX.
Ambien Temperature	0	50	-20	70
Humidity (Without Condensation)	Note 1,3		Note 2,3	

NOTE 1 $T_a \leq 50^\circ\text{C}$: 85% RH max

$T_a > 50^\circ\text{C}$: Absolute humidity must be lower

than the humidity of 85% RH at 50°C

NOTE 2 T_a at -20°C will be $< 48\text{hrs}$, at 70°C will be $< 120\text{hrs}$

NOTE 3 Background color changes slightly depending on ambient temperature.
This phenomenon is reversible.

3. ELECTRICAL CHARACTERISTICS

VDD=5V±10%

ITEM	SYMBOL	CONDITION		MIN.	TYP.	MAX.	UNIT
Input Voltage	VIH	H level		0.8VDD	-	VDD	V
	VIO	L level		0	-	0.2VDD	V
Recommeded LC Driving Voltage	VEE	1/320 Duty	0°C	-	28.8	30.0	V
			25°C	25.9	26.8	27.5	
		1/17.6 Bias	50°C	23.5	24.3	-	
Power Supply Current	IDD	VDD = 5.0V		-	2.0	-	mA
	IEE	VEE = 27.0V		-	3.0	-	mA

4.OPTICAL CHARACTERISTICS

AT Vop

ITEM MODE		Cr(Contrast Ratio)		θ (Viewing Angle)		ϕ (Viewing Angle)	
		25℃		25℃		25℃	
		MIN.	TYP.	MIN.	TYP.	MIN.	TYP.
R	J	3	5.5	30	50	20	30
NOTE		NOTE6		NOTE5			

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

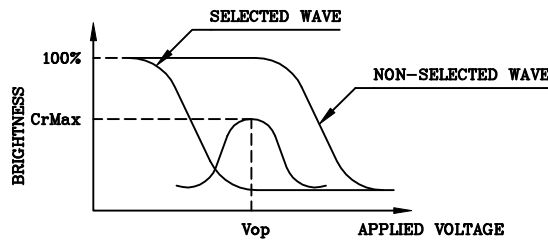
ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Response Time (rise)	Tr	0℃	-	500	1000	ms	NOTE 2
		25℃	-	150	300		
		50℃	-	85	170		
Response Time (fall)	Tf	0℃	-	700	1400	ms	NOTE 2
		25℃	-	280	500		
		50℃	-	120	240		

note:

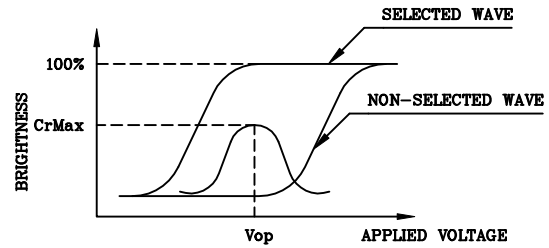
R: REFLECTIVE
 J: NORMALLY WHITE

(NOTE 1)

Definition of Operation Voltage(Vop)



(positive type)



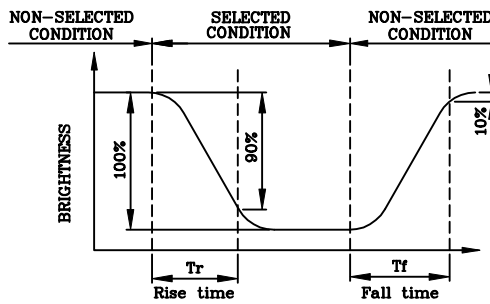
(negative type)

*Conditions

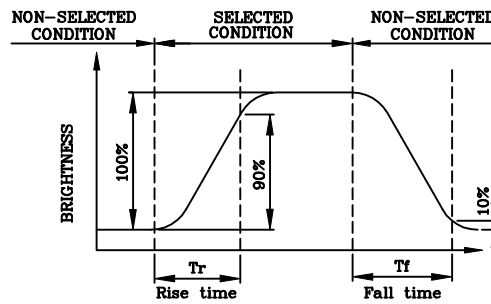
Viewing Angle : 0
Frame Frequency : 70Hz
Applied Waveform : 1/N duty, 1/a bias

(NOTE 2)

Definition of Response Time(Tr,Tf)



(positive type)



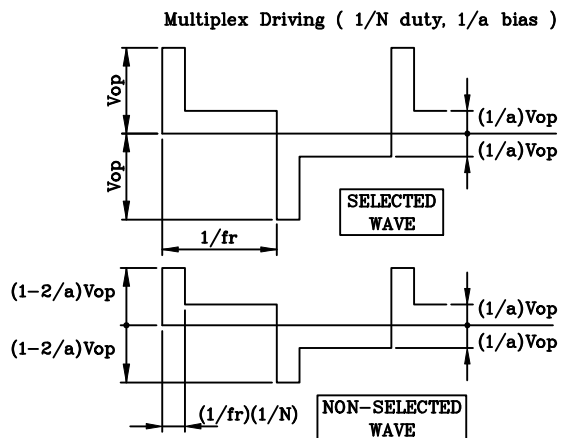
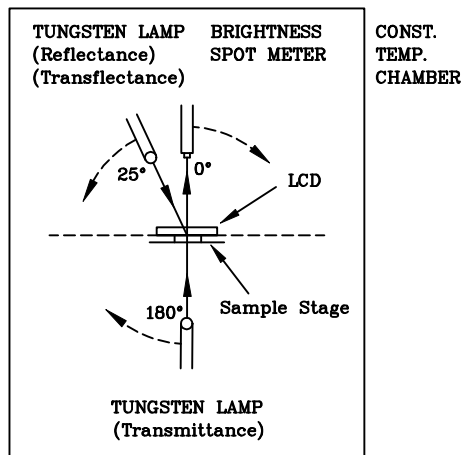
(negative type)

*Conditions

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

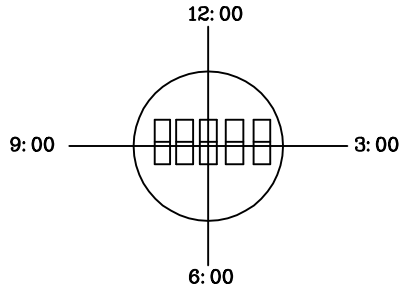
(NOTE 3)

Description of Measuring Equipment and Driving Waveforms



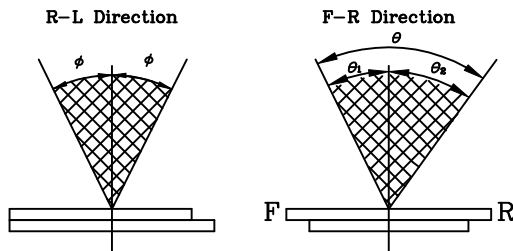
(NOTE 4)

Definition of Viewing Direction



(NOTE 5)

Definition of Viewing Angle



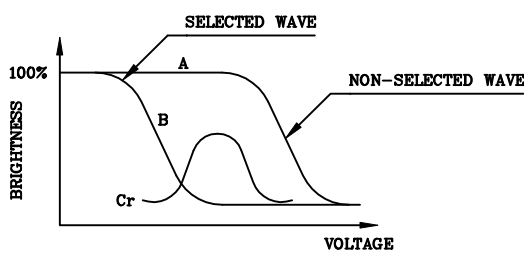
$$\theta = \theta_1 + \theta_2$$

*Conditions

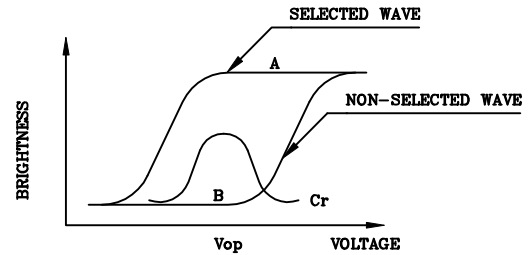
Operating Voltage : V_{op}
 Frame Frequency : 70Hz
 Applied Waveform : 1/N duty, 1/a bias
 Contrast Ratio : larger than 2

(NOTE 6)

Definition of Contrast Ratio (Cr)



(positive type)



(negative type)

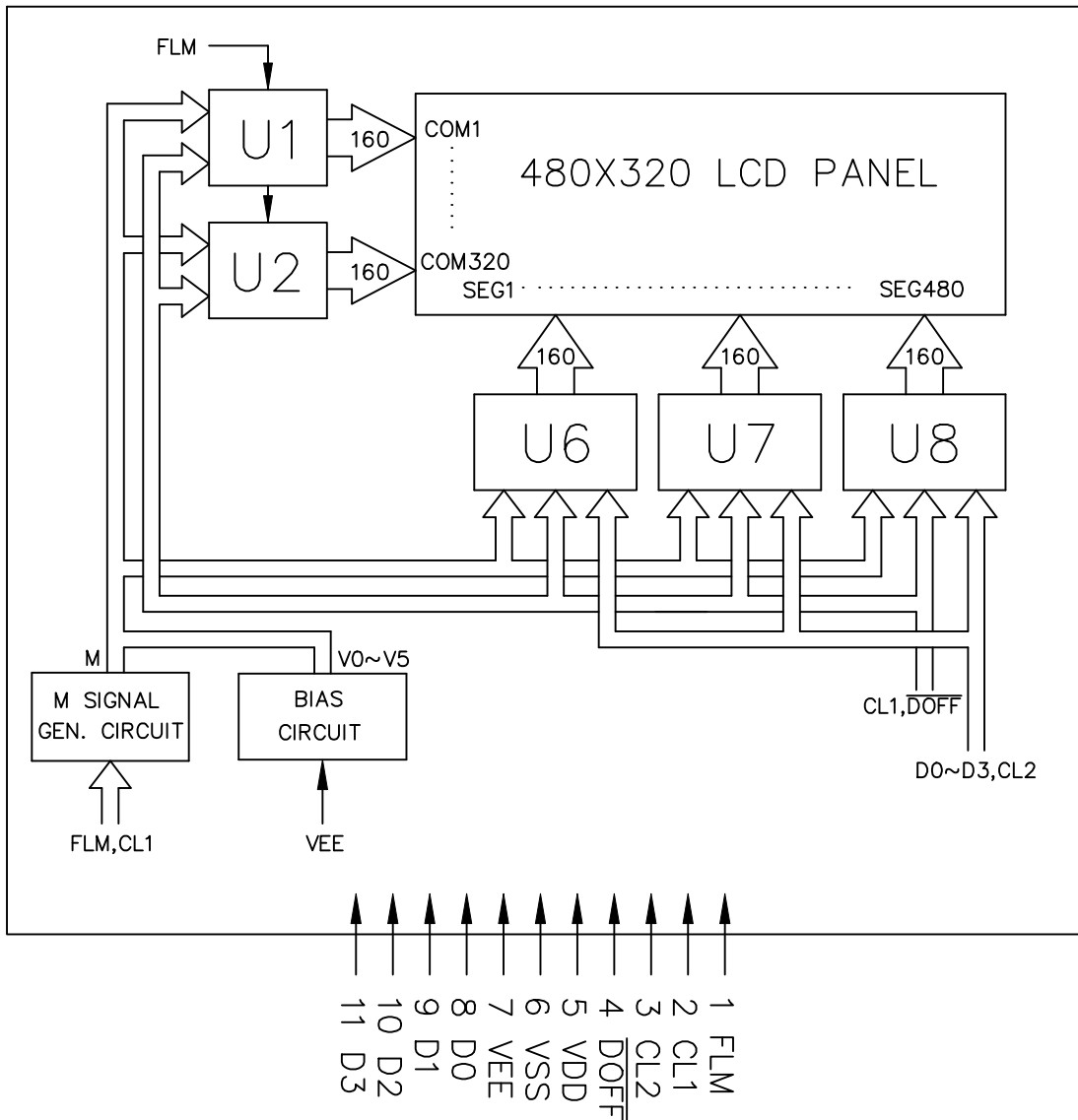
Contrast Ratio : $Cr = A/B$

*Conditions

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

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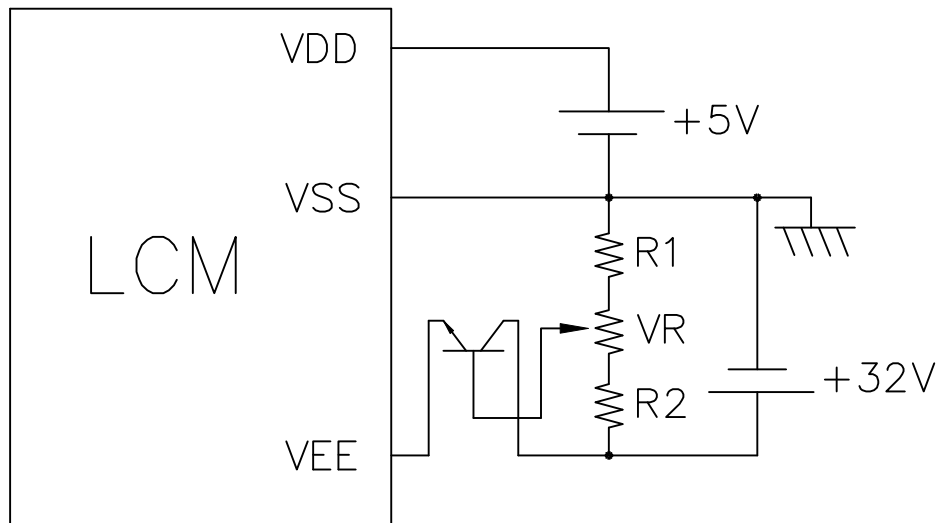
5. BLOCK DIAGRAM



6. INTERNAL PIN CONNECTION

Pin No.	Symbol	Level	Function	
1	FLM	H/L	FRAME SIGNAL	
2	CL1	H/L	DATA LATCH SIGNAL	
3	CL2	H/L	DATA SHIFT SIGNAL	
4	$\overline{\text{DOFF}}$	H/L	DISPLAY OFF CONTROL	
5	VDD	-	+5V	POWER SUPPLY
6	VSS	-	0V	
7	VEE	-	LCD DRIVING VOLTAGE	
8	D0	H/L	DATA BUS LINE	
9	D1	H/L		
10	D2	H/L		
11	D3	H/L		

7. POWER SUPPLY



$$R1 + VR + R2 = 10 \sim 20K \Omega$$

8. TIMING CHARACTERISTICS

8-1. INTERFACE TIMING

VDD=4.5~5.5V

Item	Symbol	Test condition	Min.	Typ.	Max.	Unit
Clock Cycle	tC	Fig.a	125	-	-	ns
SCP Pulse Width	tSWH,tSWL	Fig.a	50	-	-	ns
Data Set Up Time	tDSU	Fig.a , Fig.b	80	-	-	ns
Data Hold Time	tDHD	Fig.a , Fig.b	50	-	-	ns
SCP Rise/Fall Time	tr,tf	Fig.a , Fig.b	-	-	50	ns
LP Rise Time	tLRP	Fig.a	50	-	-	ns
LP Fall Time	tLFP	Fig.a	50	-	-	ns
LP Pulse Width	tLW	Fig.a	45	-	-	ns
SCP To LP Delay Time	tSL	Fig.a	40	-	-	ns
LP To SCP Delay Time	tLS	Fig.a	40	-	-	ns
LP "H" Pulse Width	tCWH	Fig.b	30	-	-	ns
LP "L" Pluse Width	tCWL	Fig.b	195	-	-	ns

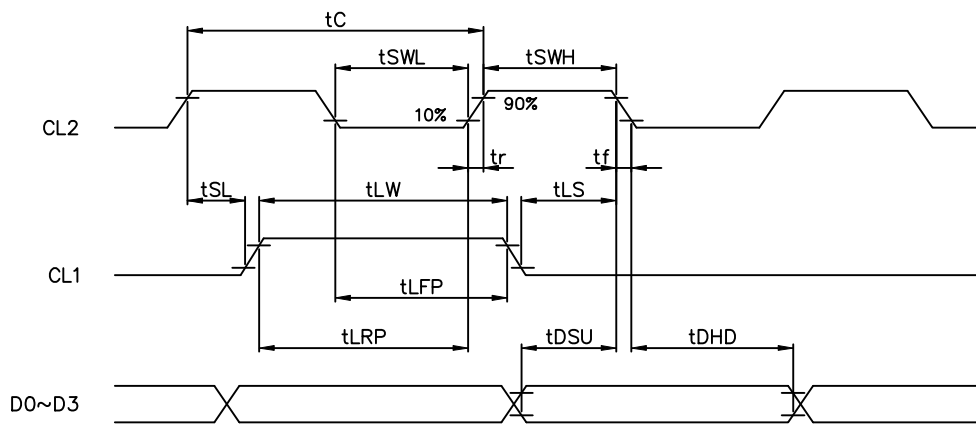


Fig . a Interface timing (SEGMENT)

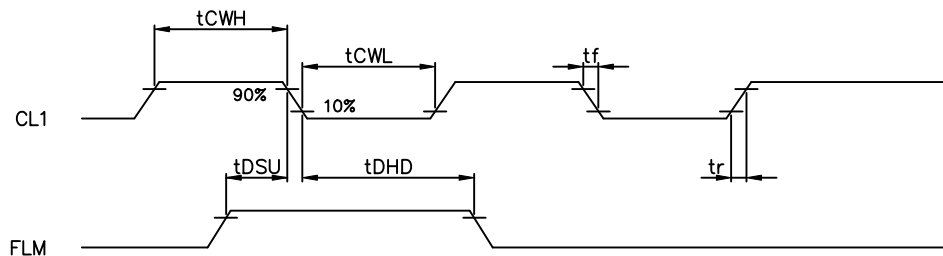
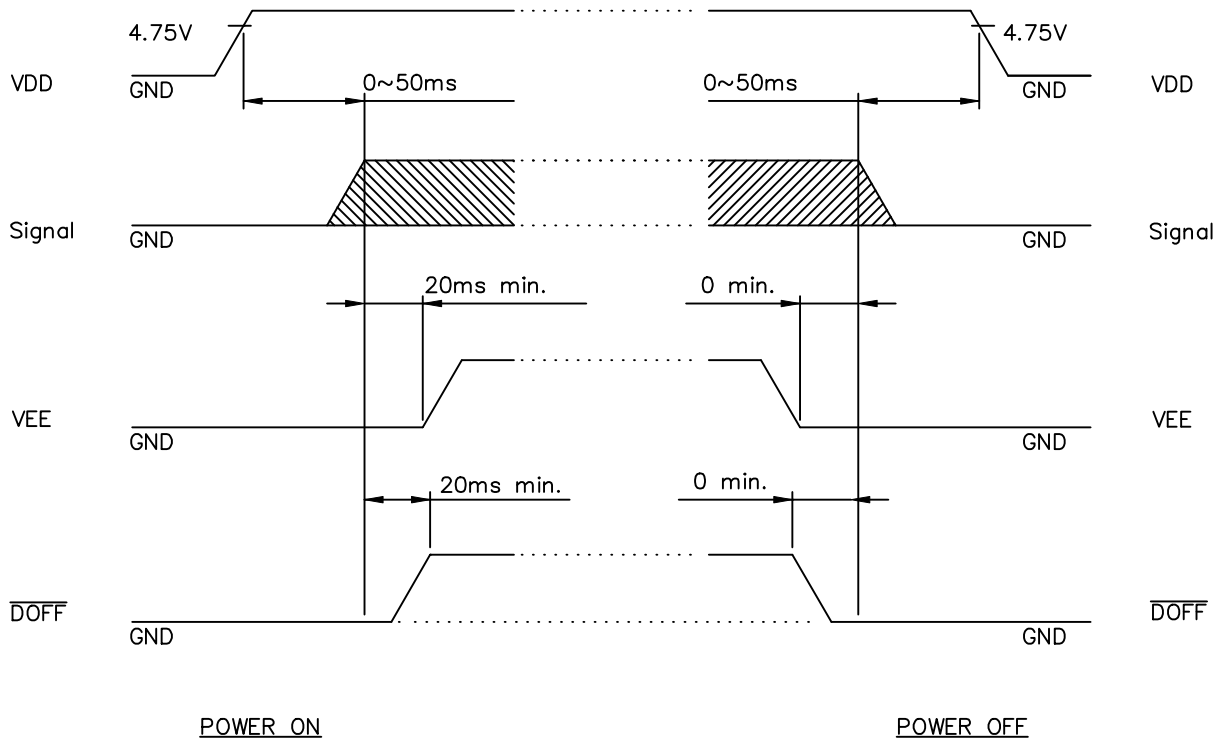


Fig . b Interface timing (COMMON)

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8-2 POWER ON/OFF TIMING



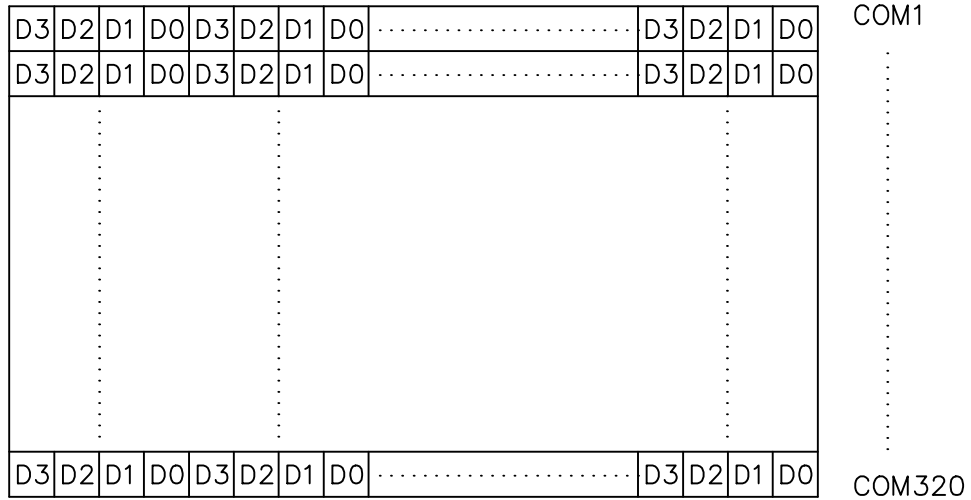
The missing pixels may occur when the LCM is driven beyond above power interface timing sequence.

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9.DISPLAY PATTERN

First Data of Each Row

Last Data of Each Row



SEG1 SEG480

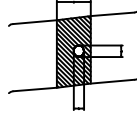
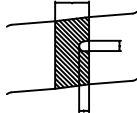
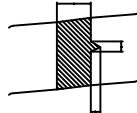
480 X 320 Dots Matrix

10. RELIABILITY TEST

NO	ITEM	CONDITION			STANDARD	NOTE
1	High Temp. Storage	70°C	120HR		Appearance without defect	
2	Low Temp. Storage	-20°C	120HR		Appearance without defect	
3	High Temp. & High Humidity Storage	40°C 90%RH	120HR		Appearance without defect	
4	Thermal Shock	-20°C,30min → 25°C,5min → 60°C,30min → 25°C,5min (= 1 cycle)			Appearance without defect	5 cycles

11. LCD PRODUCT QUALITY STANDARD

(1) DISPLAY APPEARANCE

NO	ITEM	C R I T E R I A													
1.	INCLUSIONS (BLACK SPOT, WHITE SPOT, DUST)	(1) ROUND TYPE													
		<table border="1"> <thead> <tr> <th>DIAMETER mm (a*)</th> <th>NO. OF DEFECT*</th> </tr> </thead> <tbody> <tr> <td>a ≦ 0.20</td> <td>NEGLECT</td> </tr> <tr> <td>0.20 < a ≦ 0.35</td> <td>5 MAX</td> </tr> <tr> <td>0.35 < a</td> <td>NONE</td> </tr> </tbody> </table>	DIAMETER mm (a*)	NO. OF DEFECT*	a ≦ 0.20	NEGLECT	0.20 < a ≦ 0.35	5 MAX	0.35 < a	NONE					
DIAMETER mm (a*)	NO. OF DEFECT*														
a ≦ 0.20	NEGLECT														
0.20 < a ≦ 0.35	5 MAX														
0.35 < a	NONE														
		(2) LINEAR TYPE													
		<table border="1"> <thead> <tr> <th>LENGTH mm(L)</th> <th>WIDTH mm(W)</th> <th>NO. OF DEFECT</th> </tr> </thead> <tbody> <tr> <td>N A</td> <td>W ≦ 0.03</td> <td>NEGLECT</td> </tr> <tr> <td>L ≦ 3</td> <td>0.03 < W ≦ 0.08</td> <td>6</td> </tr> <tr> <td>3 < L</td> <td>0.08 < W</td> <td>NONE</td> </tr> </tbody> </table>	LENGTH mm(L)	WIDTH mm(W)	NO. OF DEFECT	N A	W ≦ 0.03	NEGLECT	L ≦ 3	0.03 < W ≦ 0.08	6	3 < L	0.08 < W	NONE	
LENGTH mm(L)	WIDTH mm(W)	NO. OF DEFECT													
N A	W ≦ 0.03	NEGLECT													
L ≦ 3	0.03 < W ≦ 0.08	6													
3 < L	0.08 < W	NONE													
2.	SCRATCH	1. SCRATCH ON PROTECTIVE FILM IS PERMITTED. 2. SCRATCH ON POLARIZER SHALL BE AS FOLLOW:													
		(1) ROUND TYPE													
		<table border="1"> <thead> <tr> <th>DIAMETER mm (a*)</th> <th>NO. OF DEFECT*</th> </tr> </thead> <tbody> <tr> <td>a ≦ 0.15</td> <td>NEGLECT</td> </tr> <tr> <td>0.15 < a ≦ 0.20</td> <td>2 MAX</td> </tr> <tr> <td>0.20 < a</td> <td>NONE</td> </tr> </tbody> </table>	DIAMETER mm (a*)	NO. OF DEFECT*	a ≦ 0.15	NEGLECT	0.15 < a ≦ 0.20	2 MAX	0.20 < a	NONE					
DIAMETER mm (a*)	NO. OF DEFECT*														
a ≦ 0.15	NEGLECT														
0.15 < a ≦ 0.20	2 MAX														
0.20 < a	NONE														
		(2) LINEAR TYPE BE JUDGED BY 1.-(2) LINEAR TYPE													
3.	DENT	DIAMETER < 1.5mm													
4.	BUBBLE	NOT EXCEEDING 0.5mm AVERAGE DIAMETER IS ACCEPTABLE BETWEEN GLASS AND POLARIZING FILM.													
5.	PIN HOLE	(a+b)/2 ≦ 0.15 mm MAXIMUM NUMBER: IGNORED													
		0.15 < (a+b)/2 ≦ 0.20 MAXIMUM NUMBER: 10													
6.	DOT DEFECT	(a+b)/2 ≦ 0.20 mm MAXIMUM NUMBER: IGNORED													
		0.20 < (a+b)/2 ≦ 0.30 MAXIMUM NUMBER: 5 x = WIDTH													
															
															
7.	CONTRAST IRREGULARITY (SPOT)	DIAMETER SPEC.													
		<table border="1"> <thead> <tr> <th>a</th> <th>NO. OF DEFECT*</th> </tr> </thead> <tbody> <tr> <td>a ≦ 0.50 mm</td> <td>NEGLECT</td> </tr> <tr> <td>0.50 < a ≦ 0.75</td> <td>5</td> </tr> <tr> <td>0.75 < a ≦ 1.00</td> <td>3</td> </tr> <tr> <td>1.00 < a</td> <td>NONE</td> </tr> </tbody> </table>	a	NO. OF DEFECT*	a ≦ 0.50 mm	NEGLECT	0.50 < a ≦ 0.75	5	0.75 < a ≦ 1.00	3	1.00 < a	NONE			
a	NO. OF DEFECT*														
a ≦ 0.50 mm	NEGLECT														
0.50 < a ≦ 0.75	5														
0.75 < a ≦ 1.00	3														
1.00 < a	NONE														
8.	DOT WIDTH	DESIGN WIDTH ± 15%													
9.	COLOR TONE AND UNIFORMITY	OBVIOUS UNEVEN COLOR IS NOT PERMITTED													

NAN YA PLASTICS CORP. ELEC. MATERIALS DIV. LCD DEPARTMENT	SPECIFICATION	SPEC. NO. : LM054-0 DATE : Nov. 4, 1997 SHEET NO. : 16/17
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(2) NOTE:

- SAFETY

- 1.If the LCD panel breaks, be careful not to allow 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.Prevent all contact with static electricity, which can damage the CMOS ICs. The module is packaged in a static-shielding bag to prevent damage during shipment, warehousing and removal from the shipping carton.
- 2.Do not remove the panel or frame from the module.
- 3.The polarizing plate on the front surface of the display is very fragile and easily scratched. The module is shipped with a protective liner which must be removed from the polarizing plate prior to assembly.
- 4.Do not wipe the polarizing plate with a dry cloth, as it may easily scratch the surface of polarizing plate.
- 5.Do not use ketonics solvent or aromatic solvent on the polarizing plate. Use a soft cloth soaked with plastic-lens cleaning solution.

- 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.

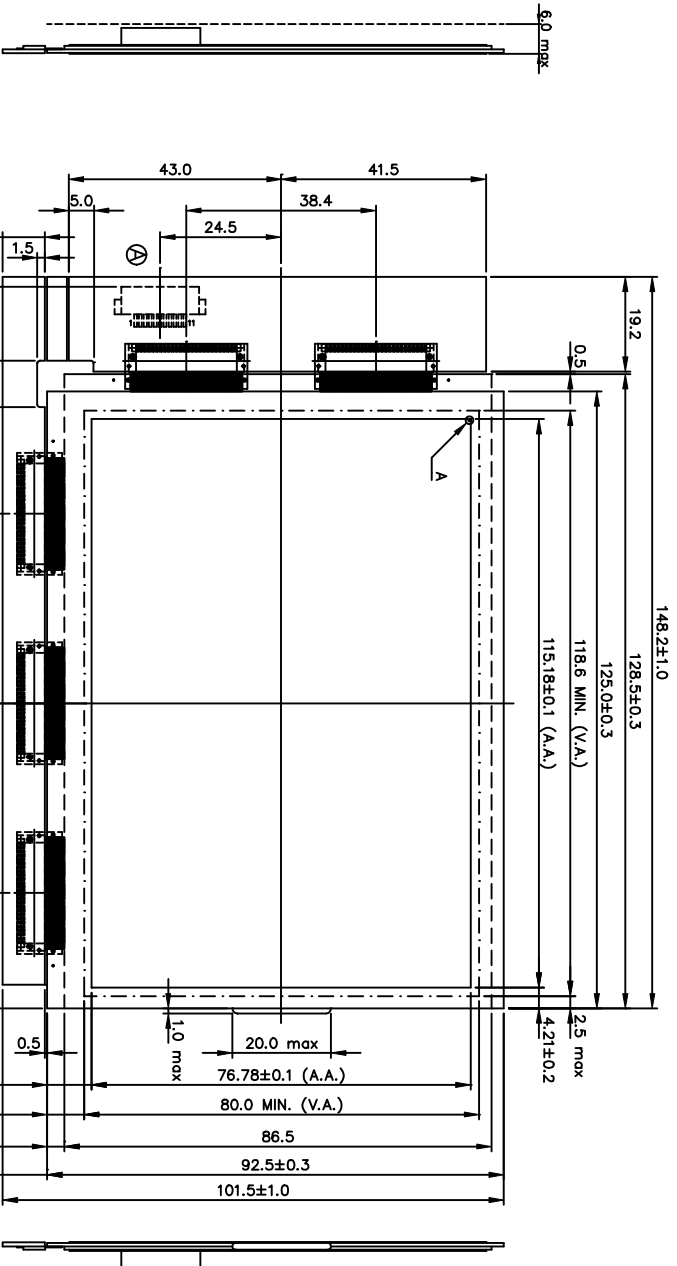
- TERMS OF WARRANTY

- 1.Acceptance inspection period
The inspection period is within one month after the arrival of the contracted goods at the buyer's factory site.
- 2.Applicable warranty period
The warranty period is within twelve months from the date of invoice under normal usage and storage conditions.

- TYPICAL OPERATING LIFETIME OF BACKLIGHT

- LED : 50,000HR
 EL : 5,000HR
 CCFT : 10,000HR

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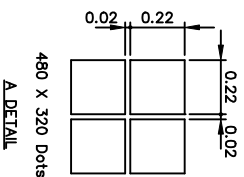


Ⓐ INTERFACE CONNECTOR
(11 pins, FPC/FPC P1.0mm)
SD-52207-1117 (MOLEX)

Pin No.	Symbol	Description
1	FLM	Frame Signal
2	CL1	Data Latch Signal
3	CL2	Data Shift Signal
4	DOFF	Display OFF Control
5	VDD	Power Supply (+5V)
6	VSS	Power Supply (GND)
7	VEE	LCD Driving Voltage
8	DO	Data Bus
9	D1	
10	D2	
11	D3	

NOTES:

- 1.RESOLUTION : 480 x 320 Dots
- 2.CONTROLLER : Without
- 3.DC/DC : Without
- 4.General Tolerance : ±0.5mm



產品編號	LTAEA_054_	南亞塑膠工業股份有限公司
NAME		南亞塑膠工業股份有限公司
DATE		南亞塑膠工業股份有限公司
TITLE		南亞塑膠工業股份有限公司
APPROVE		南亞塑膠工業股份有限公司
CHECK		南亞塑膠工業股份有限公司
DESIGN		南亞塑膠工業股份有限公司
DRAWN	MAY PING	86.11.4
DWG-NO	TA-X054X	Rev.A
UNIT	mm	
SCALE		