

NAN YA PLASTICS CORP. ELEC. MATERIALS DIV. LCD DEPARTMENT	SPECIFICATION	SPEC. NO. : LM095-0 DATE : DEC.26.1997 SHEET NO. : 1/18
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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
 122x32 LCD MODULE
 PRODUCT NO.: LMC62_095_M

SPEC. NO.: LM095-0

APPROVED BY

EDITED ON : DEC.26.1997

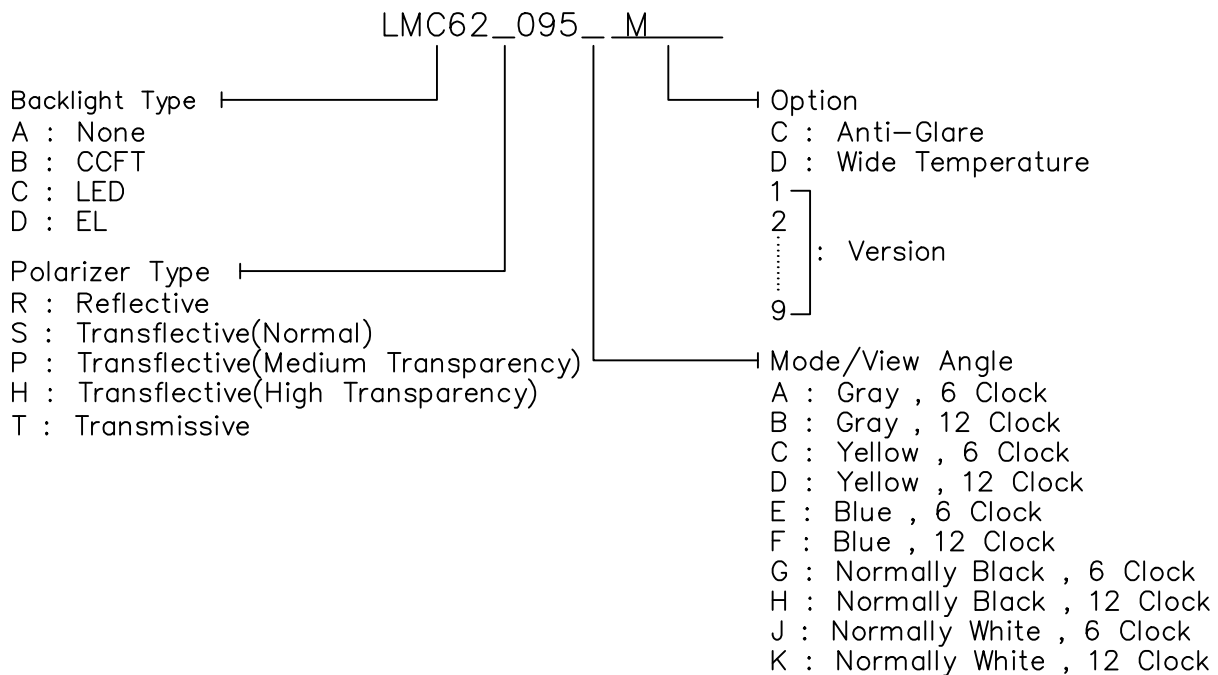
SALES MANAGER	DESIGN MANAGER	PERSON IN CHARGE

REV/DATE	RO/ 12.26.97					APP	CHK	BY
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1. MECHANICAL DATA

- (1) Product No. LMC62_095_M
- (2) Module Size 65.4 (W)mm x 29.0 (H)mm x MAX 5.7 (D)mm
- (3) Dot Size 0.36 (W)mm x 0.41 (H)mm
- (4) Dot Pitch 0.40 (W)mm x 0.45 (H)mm
- (5) Number of Dots 122 (W) x 32 (H)Dots
- (6) Duty 1/32
- (7) LCD Display Mode
 STN: Gray Mode Yellow Mode Blue Mode
 FSTN: Black and White(Normally White/Positive Image)
 Black and White(Normally Black/Negative Image)
- (8) Viewing direction
 Rear Polarizer: Reflective Transflective Transmissive
 6 O'clock 12 O'clock ____O'clock
- (9) Backlight LED
- (10) Weight 12.5g

Note :



2. ABSOLUTE MAXIMUM RATINGS

(1) ELECTRICAL ABSOLUTE RATINGS

VSS=0V

ITEM	SYMBOL	MIN	MAX	UNIT	COMMENT
Power Supply for Logic	VDD-VSS	0	7.0	V	
Input Voltage	VI	0	VDD	V	
Static Electricity	-	-	-	-	NOTE 1

NOTE 1 LCM should be grounded during handling LCM.

(2) ENVIRONMENTAL ABSOLUTE MAXIMUM RATINGS

ITEM	NORMAL TEMP.				WIDE TEMP.			
	OPERATING		STORAGE		OPERATING		STORAGE	
	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.
Ambient Temperature	0	50	-20	70	-20	70	-30	80
Humidity (Without Condensation)	Note 1,3		Note 2,3		Note 3,4		Note 3,5	

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 < 48hrs, at 70°C will be < 120hrs

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

Note 4 $T_a \leq 70^\circ\text{C}$: 75%RH max
 $T_a > 70^\circ\text{C}$: Absolute humidity must be lower
 than the humidity of 75%RH at 70°C

Note 5 T_a at -30°C will be < 48hrs, at 80°C will be < 120hrs

3. ELECTRICAL CHARACTERISTICS

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Supply Voltage for Logic	VDD	25°C	2.7	3.0	4.5	V
Input Voltage	VIH	H level	0.8VDD	-	VDD	V
	VIO	L level	0	-	0.2VDD	
Recommended LC Driving Voltage (Normal TEMP. LCM)	VDD-VLCD	0°C	5.4	5.8	6.2	V
		25°C	5.2	5.6	6.0	
		50°C	4.8	5.2	5.6	
Recommended LC Driving Voltage (Wide TEMP. LCM)	VDD-VLCD	-20°C	7.2	7.7	8.2	V
		0°C	7.1	7.6	8.1	
		25°C	7.0	7.5	8.0	
		50°C	6.6	7.1	7.6	
		70°C	6.3	6.7	7.1	
Power Supply Current	IDD	VDD = 3.0V VLCD = -2.7V 25°C	-	-	0.6	mA
LED Forward Voltage	VF	IF = 100 mA	1.7	2.1	2.5	V
LED Forward Current	IF	VF = 2.1 V	-	100	200	mA

4. OPTICAL CHARACTERISTICS

4.1 Optical Char. of Normal Temp. Mode

At Vop

ITEM MODE		Cr (Contrast Ratio)		θ (Viewing Angle)		ϕ (Viewing Angle)	
		25°C		25°C		25°C	
		MIN.	TYP.	MIN.	TYP.	MIN.	TYP.
R	A	—	—	—	—	—	—
	C	—	—	—	—	—	—
	J	—	—	—	—	—	—
S	A	2.5	3.5	25	35	15	20
	C	3.5	6.0	20	30	20	30
	J	—	—	—	—	—	—
NOTE		NOTE 6		NOTE 5			

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

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Response Time (rise)	Tr	0°C	—	450	900	ms	NOTE 2
		25°C	—	110	220		
		50°C	—	60	120		
Response Time (fall)	Tf	0°C	—	550	1000	ms	NOTE 2
		25°C	—	190	300		
		50°C	—	100	160		

NOTE :

R: REFLECTIVE
S: TRANSFLECTIVE
A: GRAY
C: YELLOW
J: NORMALLY WHITE

4.2 Optical Char. of Wide Temp. Mode

At Vop

ITEM MODE		Cr (Contrast Ratio)		θ (Viewing Angle)		ϕ (Viewing Angle)	
		25°C		25°C		25°C	
		MIN.	TYP.	MIN.	TYP.	MIN.	TYP.
R	A	—	—	—	—	—	—
	C	—	—	—	—	—	—
	J	—	—	—	—	—	—
S	A	3.0	4.0	25	40	15	25
	C	4.0	8.0	40	70	25	35
	J	—	—	—	—	—	—
NOTE		NOTE 6		NOTE 5			

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

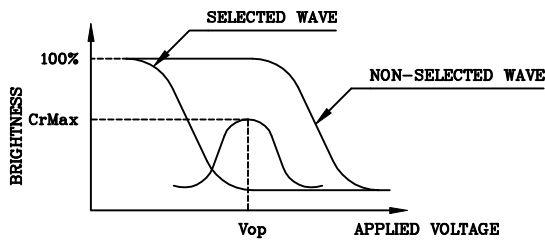
ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Response Time (rise)	Tr	0°C	—	1100	2200	ms	NOTE 2
		0°C	—	450	900		
		25°C	—	150	300		
		50°C	—	90	180		
		50°C	—	60	120		
Response Time (fall)	Tf	0°C	—	1800	2900	ms	NOTE 2
		0°C	—	280	730		
		25°C	—	100	250		
		50°C	—	70	160		
		50°C	—	60	120		

NOTE :

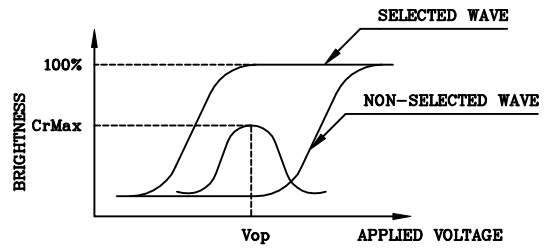
R: REFLECTIVE
S: TRANSFLECTIVE
A: GRAY
C: YELLOW
J: NORMALLY WHITE

(NOTE 1)

Definition of Operation Voltage(Vop)



(positive type)



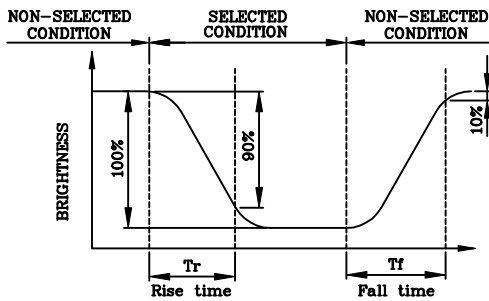
(negative type)

*Conditions

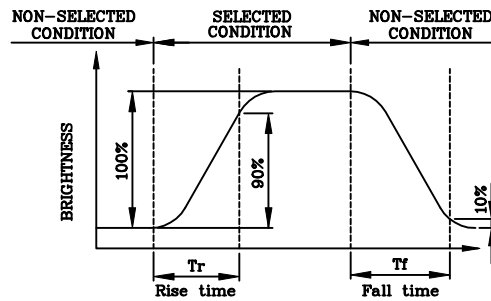
Viewing Angle : 0
Frame Frequency : 70Hz
Applied Waveform : 1/N duty, 1/a bias

(NOTE 2)

Definition of Response Time(Tr,Tf)



(positive type)



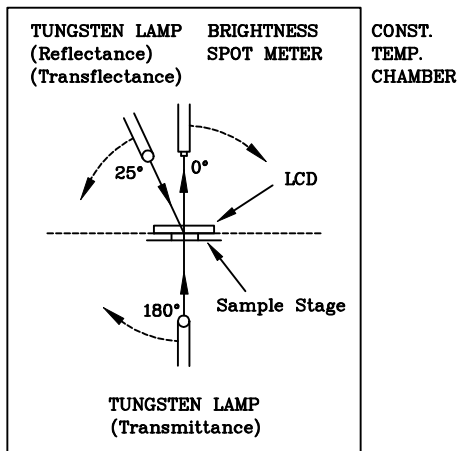
(negative type)

*Conditions

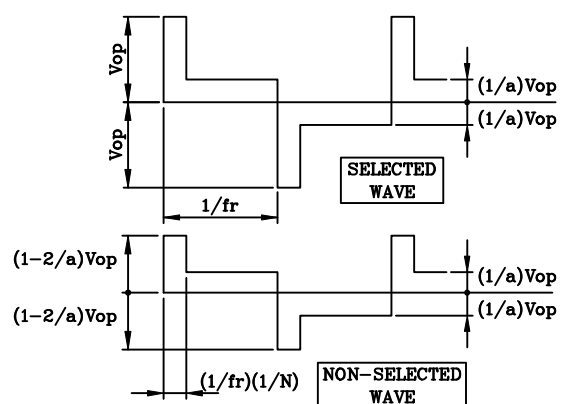
Operating Voltage : Vop
Viewing Angle (θ,φ) : (0,0)
Frame Frequency : 70Hz
Applied Waveform : 1/N duty, 1/a bias

(NOTE 3)

Description of Measuring Equipment and Driving Waveforms

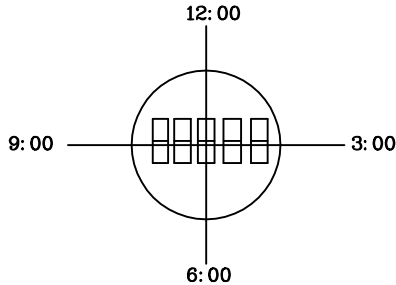


Multiplex Driving (1/N duty, 1/a bias)



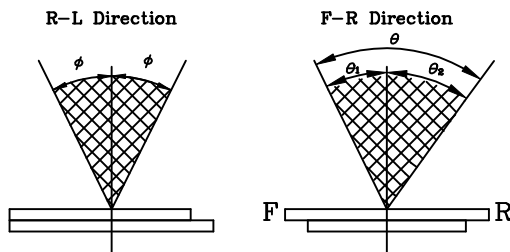
(NOTE 4)

Definition of Viewing Direction



(NOTE 5)

Definition of Viewing Angle



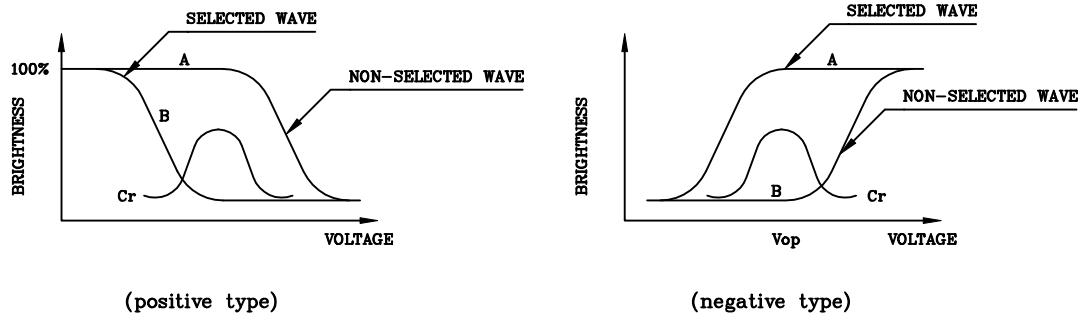
$$\theta = \theta_1 + \theta_2$$

*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)

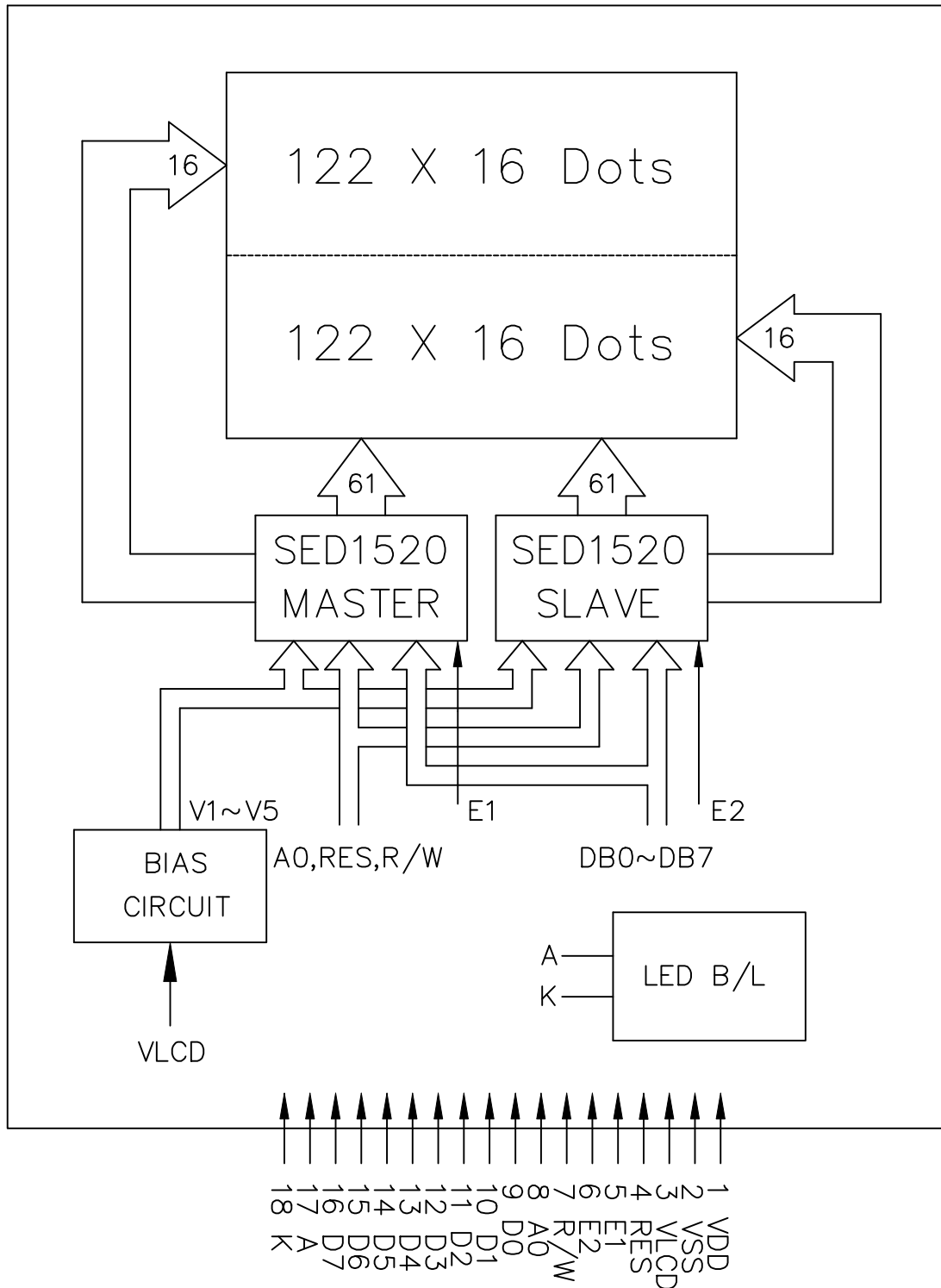


$$\text{Contrast Ratio : } Cr = A/B$$

*Conditions

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

5. BLOCK DIAGRAM

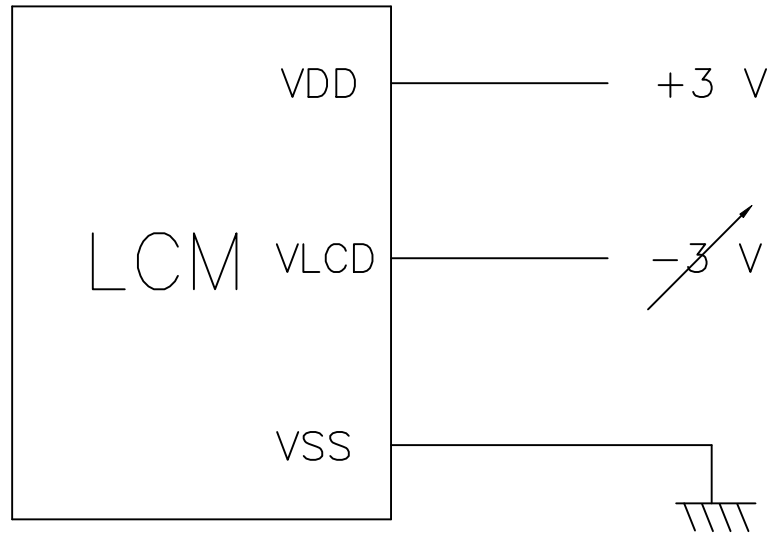


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6. INTERNAL PIN CONNECTION

Pin No.	Symbol	Level	Function
1	VDD	-	Power Supply (+3V)
2	VSS	-	Power Supply (0V)
3	VLCD	-	LCD Driving Voltage
4	RES	H/L	Resets The System
5	E1	H/L	Chip Enable for IC(Master)
6	E2	H/L	Chip Enable for IC(Slave)
7	R/W	H/L	Read/Write Select Signal
8	A0	H/L	Control/Data Selection
9	D0	H/L	Data Bus
10	D1	H/L	
11	D2	H/L	
12	D3	H/L	
13	D4	H/L	
14	D5	H/L	
15	D6	H/L	
16	D7	H/L	
17	A	-	Anode of LED B/L
18	K	-	Cathode of LED B/L

7. POWER SUPPLY



8. TIMING CHARACTERISTICS

8-1. INTERFACE TIMING

VDD=2.7~4.5V, T_a=-20~70°C

Item	Symbol	Test condition	Min.	Typ.	Max.	Unit
System cycle time (Note 1)	t _{CYC}	Fig.a , Fig.b	2000	-	-	ns
Address setup time	t _{AW}	Fig.a , Fig.b	40	-	-	ns
Address hold time	t _{AH}	Fig.a , Fig.b	20	-	-	ns
Data setup time	t _{DS}	Fig.b	160	-	-	ns
Data hold time	t _{DH}	Fig.b	20	-	-	ns
Output disable time	t _{OH}	Fig.a	20	-	120	ns
Access time	t _{ACC}	Fig.a	-	-	180	ns
Enable pulse width (Read)	t _{EWR}	Fig.a	200	-	-	ns
Enable pulse width (Write)	t _{EWV}	Fig.b	160	-	-	ns
Rise and fall time	t _r ,t _f	Fig.a , Fig.b	-	-	15	ns

Note: 1.t_{CYC} is the cycle time of $\overline{CS}^*E=H$, not the cycle time of E.

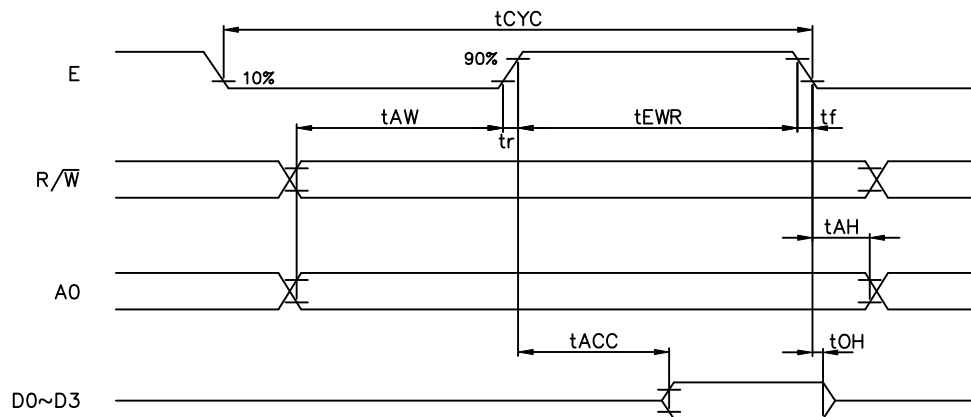


Fig . a Interface timing (Read)

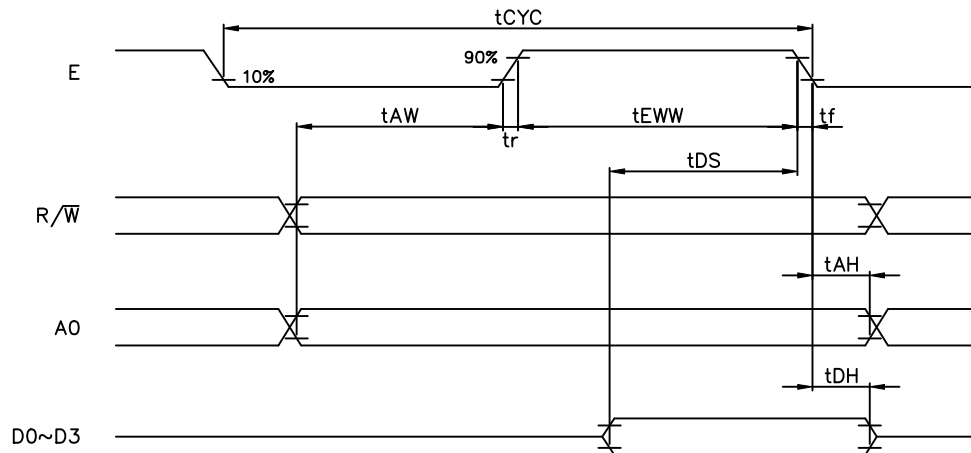
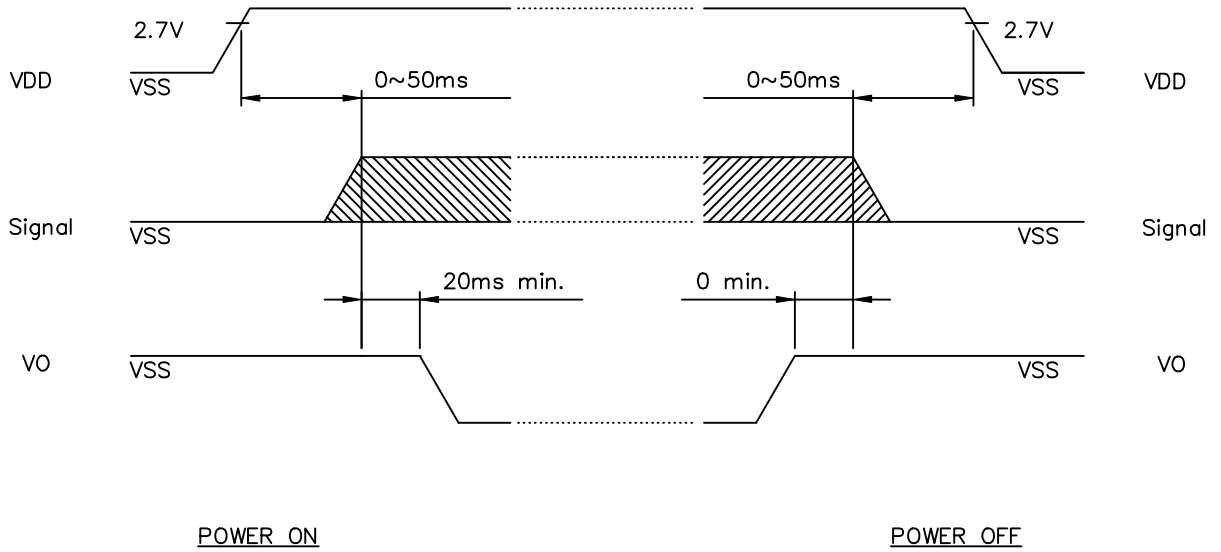


Fig . b Interface timing (Write)

8-2. POWER ON/OFF TIMING



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

9.DISPLAY PATTERN

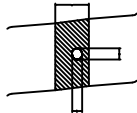
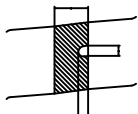
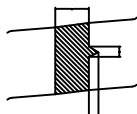
Page	DATA	Com NO.	Driver
0	D0 ⋮ D7	1 ↓ 16	Master
1	D0 ⋮ D7		
2	D0 ⋮ D7	17 ↓ 32	Slave
3	D0 ⋮ D7		
Column Addr.	ADC=0	00H → 3C	00H → 3C
Seg NO.		1 → 61	62 → 122
Driver		Master	Slave

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	$(a+b)/2 \leq 0.15$ mm MAXIMUM NUMBER:IGNORED $0.15 < (a+b)/2 \leq 0.20$ MAXIMUM NUMBER:10													
6.	DOT DEFECT	$(a+b)/2 \leq 0.20$ mm MAXIMUM NUMBER:IGNORED $0.20 < (a+b)/2 \leq 0.30$ MAXIMUM NUMBER:5 x = WIDTH	 												
7.	CONTRAST IRREGULARITY (SPOT)	DIAMETER SPEC.	NO. OF DEFECT*												
		$a \leq 0.50$ mm $0.50 < a \leq 0.75$ $0.75 < a \leq 1.00$ $1.00 < a$	NEGLECT 5 3 NONE												
8.	DOT WIDTH	DESIGN WIDTH±15%													
9.	COLOR TONE AND UNIFORMITY	OBVIOUS UNEVEN COLOR IS NOT PERMITTED													

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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.

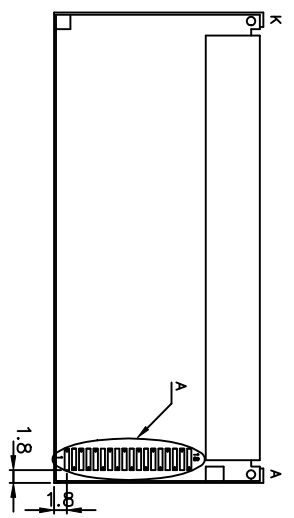
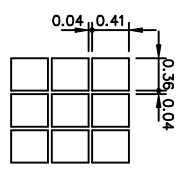
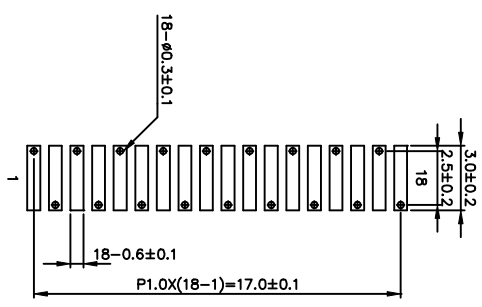
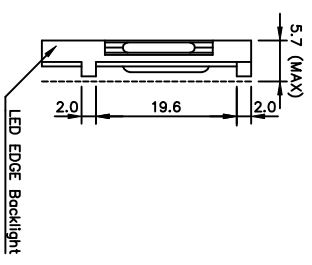
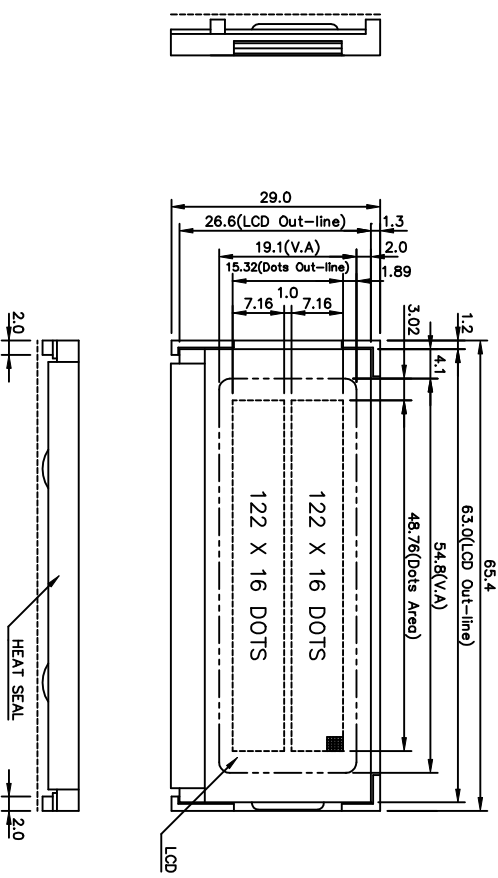
- HANDLING
 - 1.Prevent all contact with static electricity, which can damage the CMOS ICs. The module is packaged in a static-shielding bag to prevent damage during shipment, warehousing and removal from the shipping carton.
 - 2.Do not remove the panel or frame from the module.
 - 3.The polarizing 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

REV/DATE	RO/ 12.26.97'					APP	CHK	BY
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NO.	SIGNAL
1	VDD
2	VSS
3	VLCD
4	RES
5	E1
6	E2
7	R/W
8	A0
9	D0
10	D1
11	D2
12	D3
13	D4
14	D5
15	D6
16	D7
17	A
18	K

NOTES :

1. RESOLUTION: 122 X 32
2. TOLERANCE NO SPECIFIED: ±0.5mm

產品編號	LMC62_095_M	南亞塑膠工業股份有限公司
NAME	NAN YA PLASTICS CORPORATION	
DATE		
TITLE	製器圖	
APPROVE		
CHECK		
DESIGN		
DRAW		
MAY PING	87.01.01	
DWG-NO	MCAx095XM	Rev.A
UNIT	mm	
SCALE		
THIRD ANGLE PROJECT		