

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

SPECIFICATION

SPEC. NO. : LM087-0
DATE : JAN.01.1998
SHEET NO. : 1/18

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.: LMA62_087_M

SPEC. NO.: LM087-0

APPROVED BY

EDITED ON : JAN.01.1998

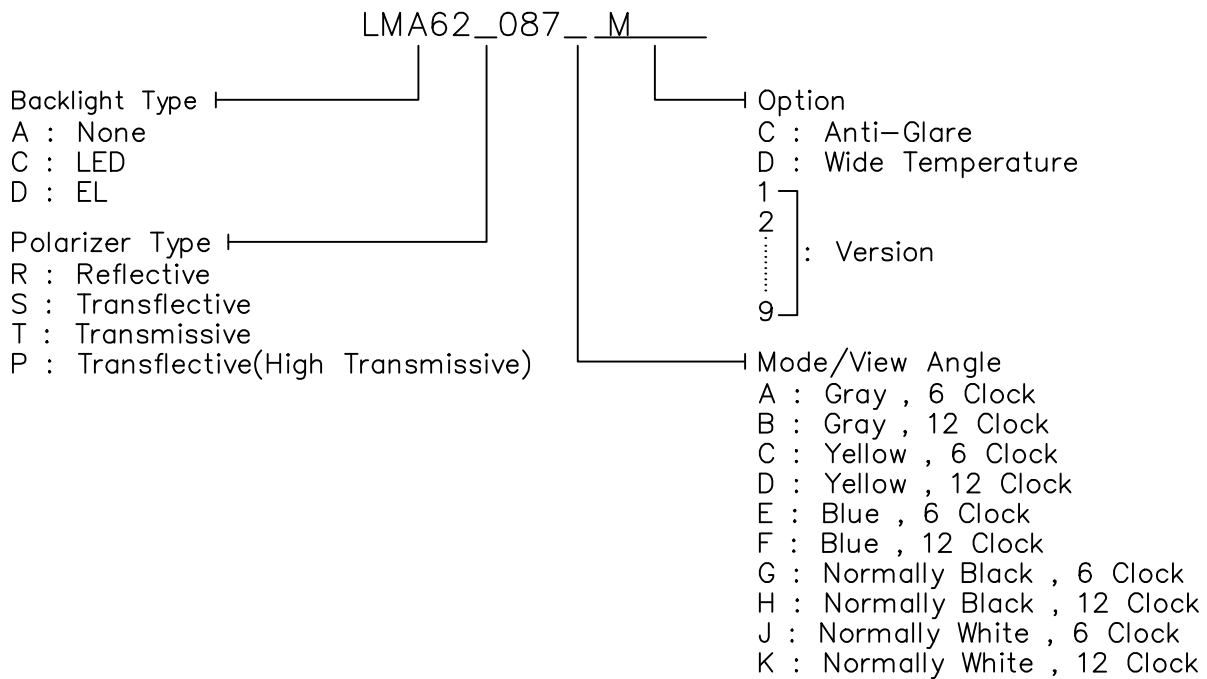
SALES MANAGER	DESIGN MANAGER	PERSON IN CHARGE

REV/DATE	R0/ 01.01.97'					APP	CHK	BY
----------	------------------	--	--	--	--	-----	-----	----

1. MECHANICAL DATA

- (1) Product No. LMA62_087_M
- (2) Module Size 64.8 (W)mm x 28.3 (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)
 Rear Polarizer: Reflective Transflective Transmissive
- (8) Viewing direction 6 O'clock 12 O'clock ____O'clock
- (9) Weight 10g

Note :



REV/DATE	R0/ 01.01.97'					APP	CHK	BY
----------	------------------	--	--	--	--	-----	-----	----

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.			
	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 < 48hrs, at 70°C will be < 120hrs

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

REV/DATE	R0/ 01.01.97'					APP	CHK	BY
----------	------------------	--	--	--	--	-----	-----	----

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
		0°C	5.4	5.8	6.2	
		25°C	5.2	5.6	6.0	
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

4.1 OPTICAL CHARACTERISTICS

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	3.0	4.0	30	40	20	30
	C	4.0	7.0	20	35	25	36
	J	-	-	-	-	-	-
S	A	-	-	-	-	-	-
	C	-	-	-	-	-	-
	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

REV/DATE	R0/ 01.01.97'					APP	CHK	BY
----------	------------------	--	--	--	--	-----	-----	----

4.2 OPTICAL CHARACTERISTICS

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	3.5	4.5	30	45	20	25
	C	5.0	9.0	45	75	25	40
	J	-	-	-	-	-	-
S	A	-	-	-	-	-	-
	C	-	-	-	-	-	-
	J	-	-	-	-	-	-
NOTE		NOTE 6		NOTE 5			

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

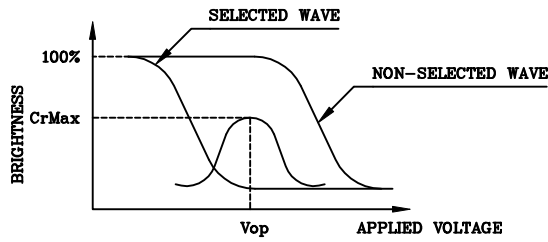
ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Response Time (rise)	Tr	-20°C	-	1100	2200	ms	NOTE 2
		0°C	-	450	900		
		25°C	-	150	300		
		50°C	-	90	180		
		70°C	-	60	120		
Response Time (fall)	Tf	-20°C	-	1800	2900	ms	NOTE 2
		0°C	-	280	730		
		25°C	-	100	250		
		50°C	-	70	160		
		70°C	-	60	130		

NOTE :

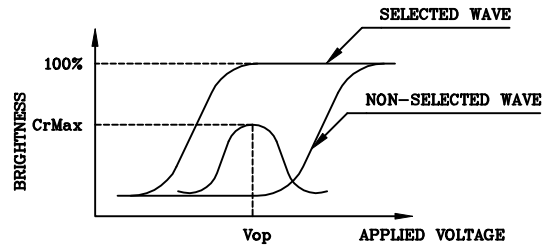
- R: REFLECTIVE
- S: TRANSFLECTIVE
- A: GRAY
- C: YELLOW
- J: NORMALLY WHITE

(NOTE 1)

Definition of Operation Voltage(Vop)



(positive type)



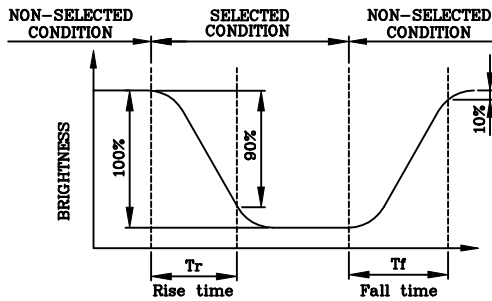
(negative type)

*Conditions

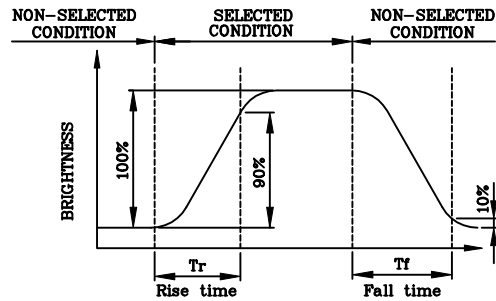
Viewing Angle : 0
 Frame Frequency : 70Hz
 Applied Waveform : 1/N duty, 1/a bias

(NOTE 2)

Definition of Response Time(Tr,Tf)



(positive type)



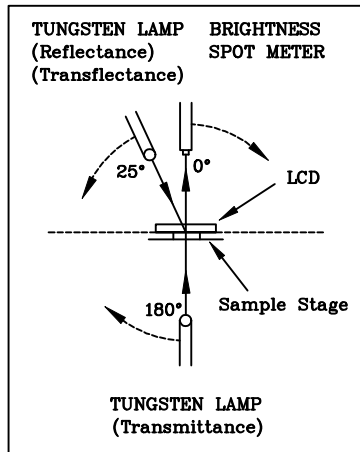
(negative type)

*Conditions

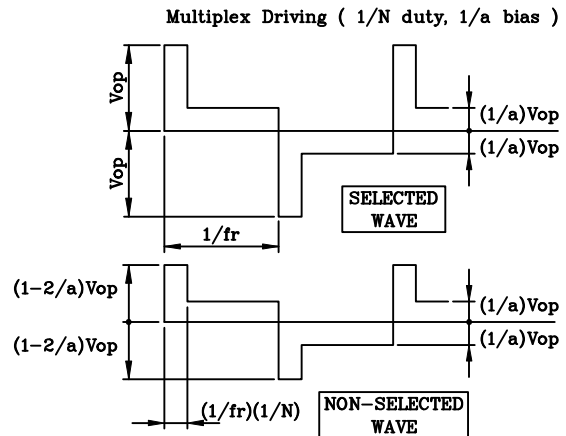
Operating Voltage : Vop
 Viewing Angle (θ,φ) : (0,0)
 Frame Frequency : 70Hz
 Applied Waveform : 1/N duty, 1/a bias

(NOTE 3)

Description of Measuring Equipment and Driving Waveforms

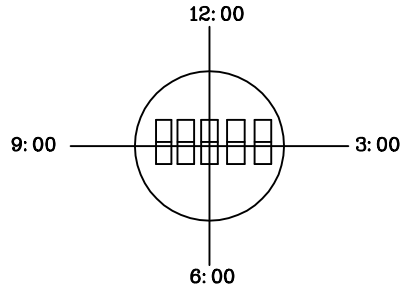


CONST.
 TEMP.
 CHAMBER



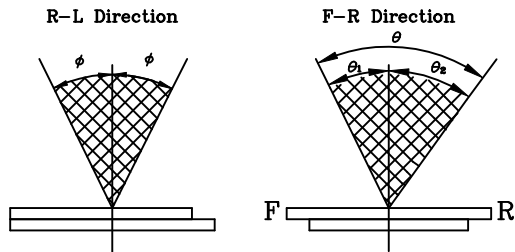
(NOTE 4)

Definition of Viewing Direction



(NOTE 5)

Definition of Viewing Angle



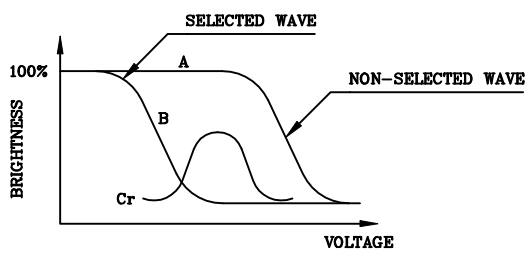
$$\theta = \theta_1 + \theta_2$$

*Conditions

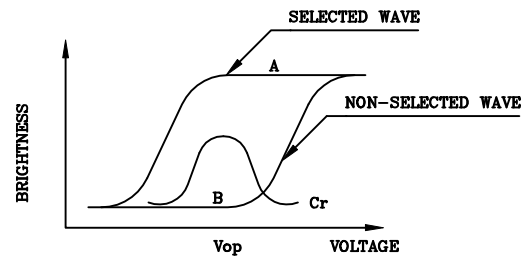
Operating Voltage : V_{op}
 Frame Frequency : 70Hz
 Applied Waveform : 1/N duty, 1/a bias
 Contrast Ratio : larger than 2

(NOTE 6)

Definition of Contrast Ratio (Cr)



(positive type)



(negative type)

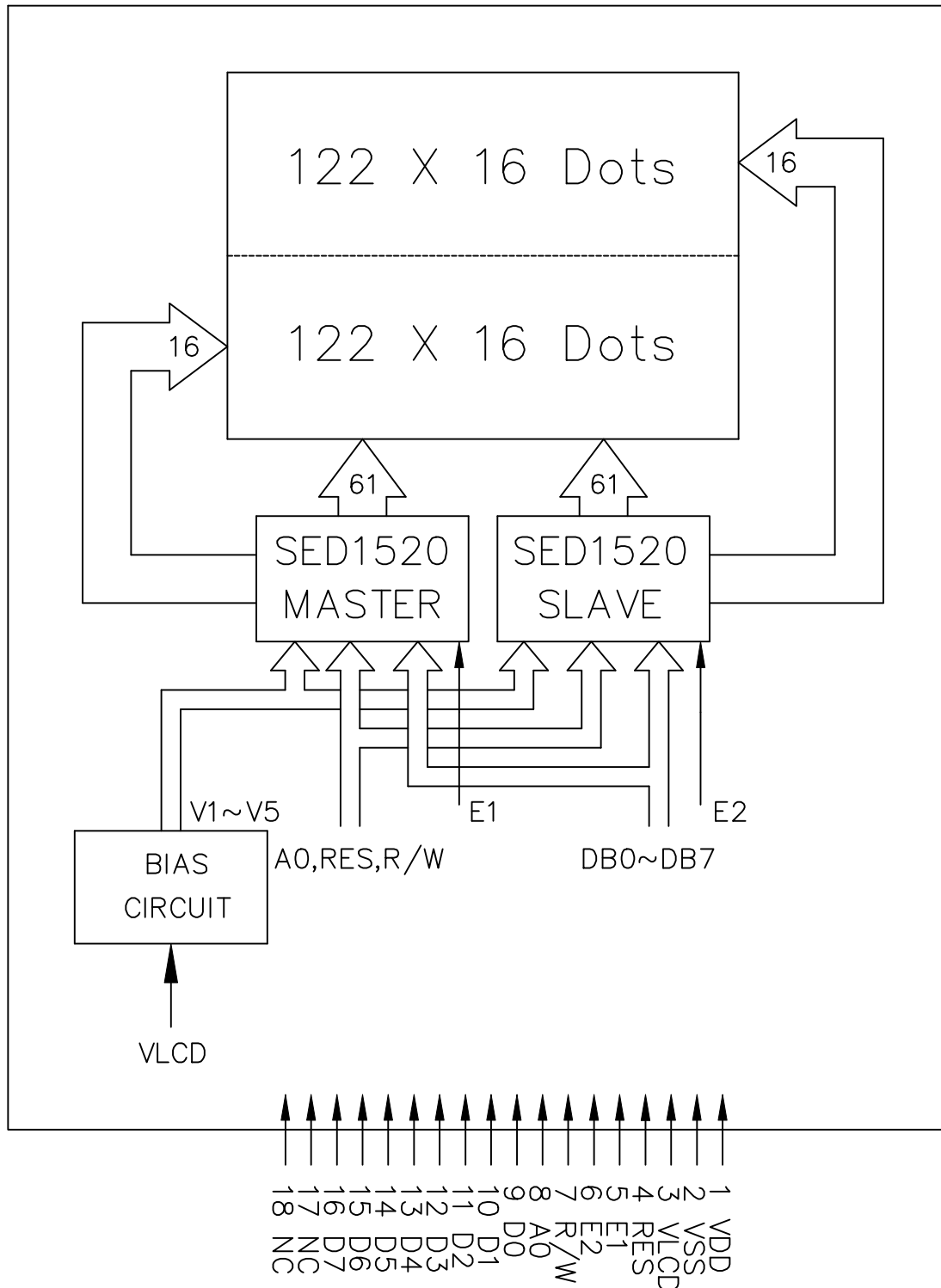
$$\text{Contrast Ratio : } Cr = A/B$$

*Conditions

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

REV/DATE	R0/ 01.01.97'					APP	CHK	BY
----------	------------------	--	--	--	--	-----	-----	----

5. BLOCK DIAGRAM

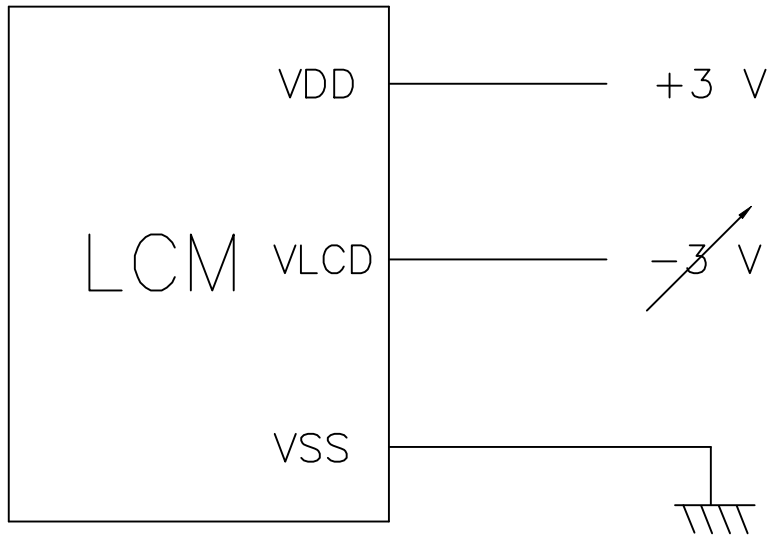


REV/DATE	R0/ 01.01.97'					APP	CHK	BY
----------	------------------	--	--	--	--	-----	-----	----

6. INTERNAL PIN CONNECTION

PinNo.	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	NC	-	No Connection
18	NC	-	No Connection

7. POWER SUPPLY



8. TIMING CHARACTERISTICS

8-1. INTERFACE TIMING

VDD=2.7~4.5V, Ta=-20~70°C

Item	Symbol	Test condition	Min.	Typ.	Max.	Unit
System cycle time (Note 1)	tCYC	Fig.a , Fig.b	2000	-	-	ns
Address setup time	tAW	Fig.a , Fig.b	40	-	-	ns
Address hold time	tAH	Fig.a , Fig.b	20	-	-	ns
Data setup time	tDS	Fig.b	160	-	-	ns
Data hold time	tDH	Fig.b	20	-	-	ns
Output disable time	tOH	Fig.a	20	-	120	ns
Access time	tACC	Fig.a	-	-	180	ns
Enable pulse width (Read)	tEWR	Fig.a	200	-	-	ns
Enable pulse width (Write)	tEWW	Fig.b	160	-	-	ns
Rise and fall time	tr,tf	Fig.a , Fig.b	-	-	15	ns

Note: 1.tCYC6 is the cycle time of $\overline{CS}^*E=H$, not the cycle time of E.

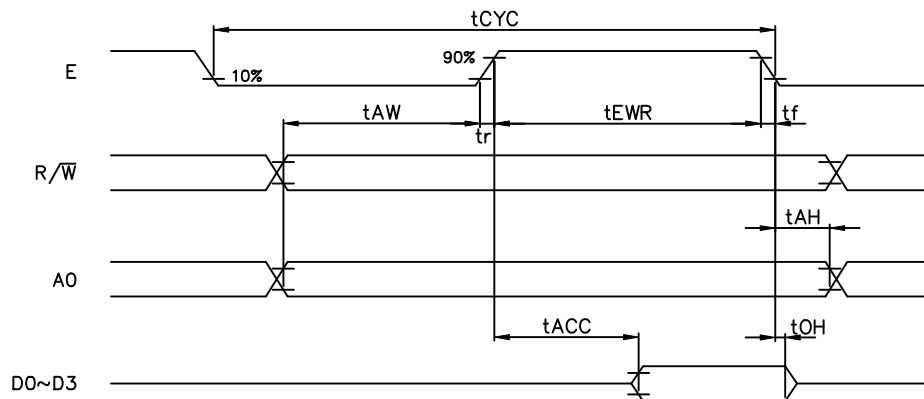


Fig . a Interface timing (Read)

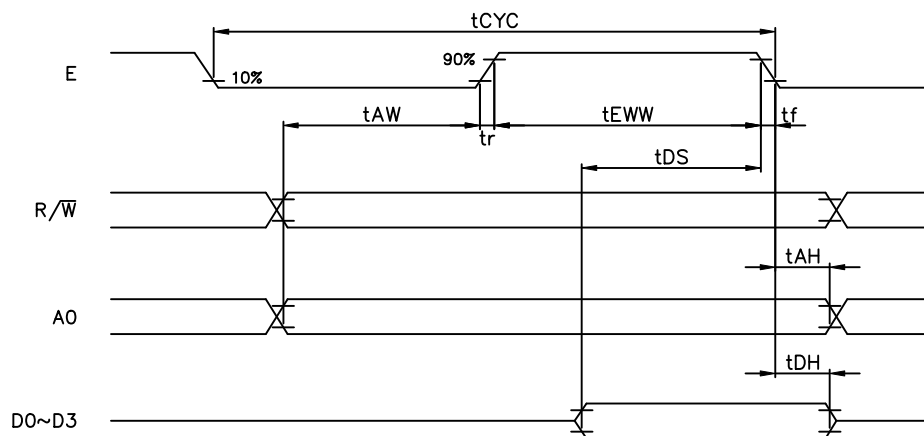
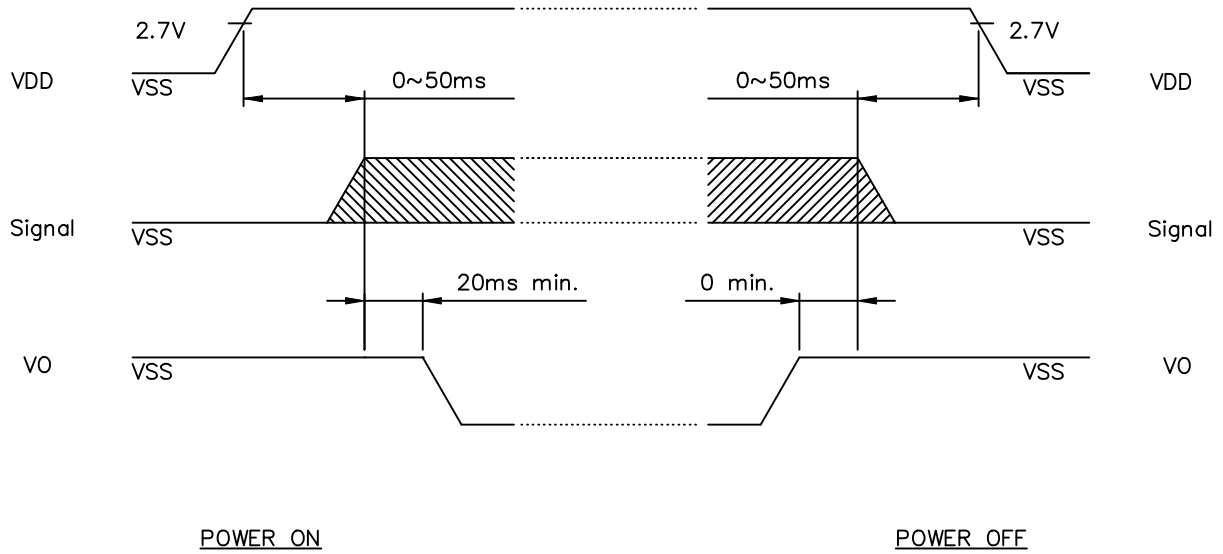


Fig . b Interface timing (Write)

REV/DATE	R0/ 01.01.97'					APP	CHK	BY
----------	------------------	--	--	--	--	-----	-----	----

8-2. POWER ON/OFF TIMING



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

REV/DATE	R0/ 01.01.97'					APP	CHK	BY
----------	------------------	--	--	--	--	-----	-----	----

9.DISPLAY PATTERN

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

122 x 16 Pixels

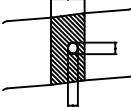
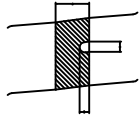
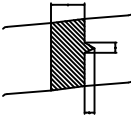
122 x 16 Pixels

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. a ≦ 0.50 mm 0.50 < a ≦ 0.75 0.75 < a ≦ 1.00 1.00 < a	NO. OF DEFECT* NEGLECT 5 3 NONE												
8.	DOT WIDTH	DESIGN WIDTH ±15%													
9.	COLOR TONE AND UNIFORMITY	OBVIOUS UNEVEN COLOR IS NOT PERMITTED													

(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.

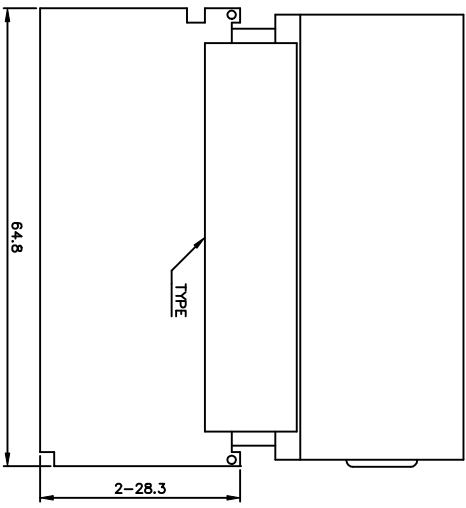
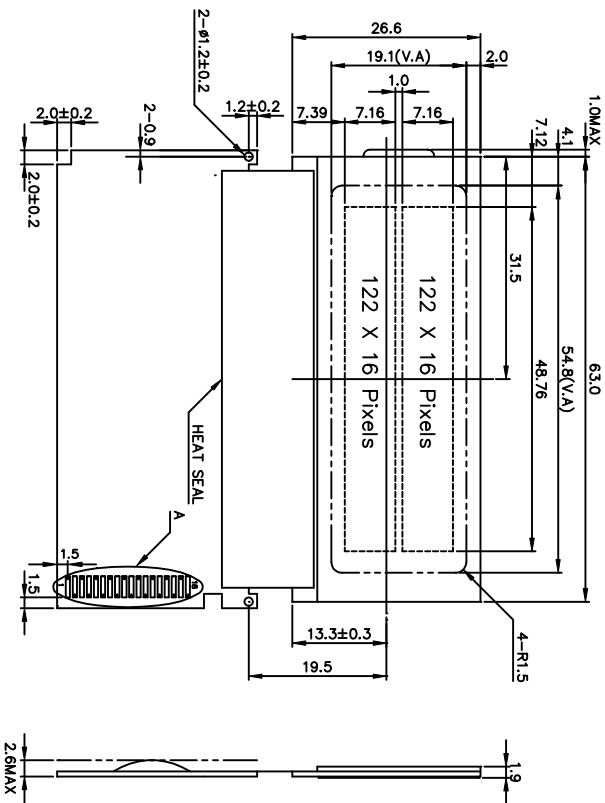
• TERMS OF WARRANTY

- 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.

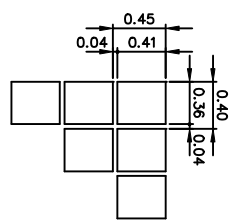
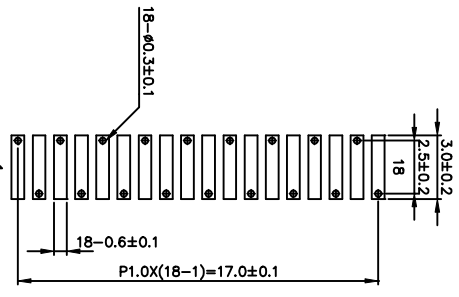
• TYPICAL OPERATING LIFETIME OF BACKLIGHT

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

REV/DATE	R0/ 01.01.97'					APP	CHK	BY
----------	------------------	--	--	--	--	-----	-----	----



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	NC
18	NC



A (DETAIL of INTERFACE TERMINAL)

Pixel DETAIL

NOTES :

1. RESOLUTION: 122 X 32
2. General Tolerance : ±0.5 mm

產品編號	LMA62_087_M	南亞塑膠工業股份有限公司
NAME		NAN YA PLASTICS CORPORATION
DATE		
TITLE		製品圖
APPROVE		
CHECK		
DESIGN		
DRAW	MAY PING	87.01.01
DWG-NO	MA-x087xM	Rev.A
UNIT	mm	
SCALE		