

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

SPECIFICATION

SPEC. NO. : LM193-0

DATE : 09.03.1998

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
128x128 LCD MODULE
PRODUCT NO.: LM_9A_193_

SPEC. NO.: LM193-0-~~0~~[△]

CUSTOMER
APPROVED BY
DATE:

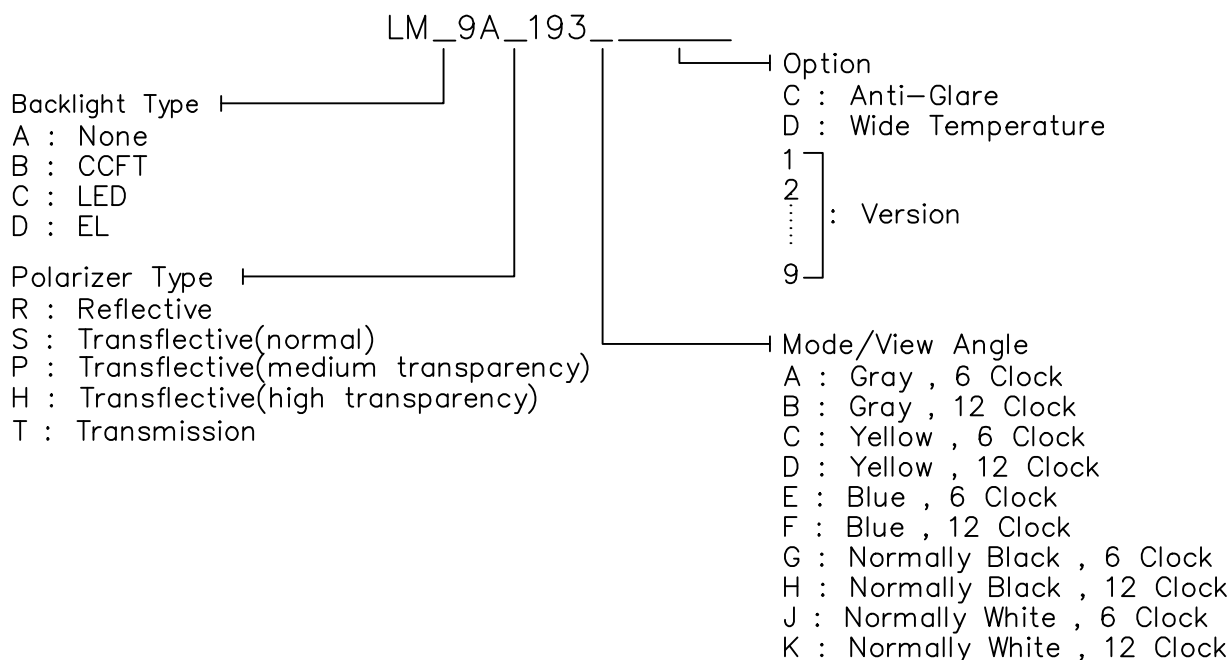
SALE MANAGER	TECHNICAL APPROVE	DESIGN MANAGER	DESIGN CHECK	DESIGNER

REV/DATE	RO/ 09.03,98'					APP	CHK	BY
----------	------------------	--	--	--	--	-----	-----	----

1. MECHANICAL DATA

- (1) Product No. LM_9A_193_
- (2) Module Size 92.0 (W)mm x 106.0 (H)mm x MAX12.0(D)mm
(W/O,EL B.L.)
92.0 (W)mm x 106.0 (H)mm x MAX15.0(D)mm
(LED B.L.)
- (3) Dot Size 0.5 (W)mm x 0.5 (H)mm
- (4) Dot Pitch 0.55 (W)mm x 0.55 (H)mm
- (5) Number of Characters 128 (W) x 128 (H)Dots
- (6) Duty 1/128
- (7) LCD Display Mode STN: Gray Mode Yellow Mode Blue Mode
FSTN: Black and White(Normal White/Positive Image)
 Black and White(Normal Black/Negative Image)
- Rear Polarizer: Reflective Transflective Transmissive
- (8) Viewing Direction 6 O'clock 12 O'clock ___O'clock
- (9) Backlight W/O LED B/L EL B/L
- (10) LCD Controller T6963C
- (11) Weight W/O B/L: 90.4g
EL B/L: 96.5g
LED B/L: 120.5g

Note :



REV/DATE	R0/ 09.03,98'					APP	CHK	BY
----------	------------------	--	--	--	--	-----	-----	----

2. ABSOLUTE MAXIMUM RATINGS

(1) ELECTRICAL ABSOLUTE RATINGS

V_{SS}=0V

	SYMBOL	MIN	MAX	UNIT	COMMENT
Power Supply for Logic	VDD-VSS	-0.3	5.5	V	
Input Voltage	V _I	-0.3	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 2,4		Note 3,4		Note 4,5		Note 4,6	

Note 2 Ta ≤ 50°C : 85%RH max

Ta > 50°C : Absolute humidity must be lower
than the humidity of 85%RH at 50°C

Note 3 Ta at -20°C will be < 48hrs, at 70°C will be < 120hrs

Note 4 Background color changes slightly depending on ambient temperature.
This phenomenon is reversible.

Note 5 Ta ≤ 70°C : 75%RH max

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

Note 6 Ta at -30°C will be < 48hrs, at 80°C will be < 120hrs

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	
Recommended LC Driving Voltage (NORMAL TEMP. LCM)	VDD-V0	DUTY= 1/128 Bias= 1/12	0°C	18.4	19.4	-	V
			25°C	17.2	18.2	19.2	
			50°C	15.4	16.7	-	
Recommended LC Driving Voltage (WIDE TEMP. LCM)	VDD-V0	DUTY= 1/128 Bias= 1/12	-20°C	16.8	17.2	17.6	V
			0°C	15.7	16.1	16.5	
			25°C	15.6	16.0	16.4	
			50°C	15.3	15.7	16.1	
			70°C	15.1	15.5	15.9	
Power Supply Current for LCM	IDD	VDD = 5.0V	17	22	29	mA	
Power Supply Current for LED	ILED	VBL = 5.0V RBL = 0Ω	95	101	111	mA	
Power Supply Current for EL	IEL	VBL = 110Vac 400Hz RBL = 0Ω	-	-	10	mA	

4. OPTICAL CHARACTERISTICS

(FOR NORMAL TEMPERATURE MODE LCM)

AT Vop

MODE	ITEM	Cr(Contrast Ratio)		θ (Viewing Angle)		ϕ (Viewing Angle)	
		25℃		25℃		25℃	
		MIN.	TYP.	MIN.	TYP.	MIN.	TYP.
R	A	-	-	-	-	-	-
	C	-	7	-	60	-	28
	J	-	8	-	60	-	35
S	A	-	-	-	-	-	-
	C	-	6	-	50	-	25
	J	-	-	-	-	-	-
T	E	-	-	-	-	-	-
	G	-	-	-	-	-	-
NOTE		FIG 6		FIG 5			

NOTE :

R: REFLECTIVE
S: TRANSFLECTIVE
T: TRANSMISSIVE
A: GRAY
C: YELLOW
E: BLUE
G: NORMALLY BLACK
J: NORMALLY WHITE

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

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Response Time (rise)	Tr	0℃	-	270	540	ms	FIG 2
		25℃	-	140	280		
		50℃	-	50	120		
Response Time (fall)	Tf	0℃	-	760	1500	ms	FIG 2
		25℃	-	210	420		
		50℃	-	120	240		

4-1. OPTICAL CHARACTERISTICS

(FOR WIDE TEMPERATURE MODE LCM)

AT Vop

MODE	ITEM	Cr(Contrast Ratio)		θ (Viewing Angle)		ϕ (Viewing Angle)	
		25℃		25℃		25℃	
		MIN.	TYP.	MIN.	TYP.	MIN.	TYP.
R	A	-	3.8	-	-	-	-
	C	-	4.1	-	-	-	-
	J	-	6.5	-	26	-	33
S	A	-	4.0	-	46	-	25
	C	-	-	-	-	-	-
	J	-	-	-	-	-	-
T	A	-	2.5	-	-	-	-
NOTE		FIG 6		FIG 5			

NOTE :

R: REFLECTIVE
S: TRANSFLECTIVE
T: TRANSMISSIVE
A: GRAY

C: YELLOW
E: BLUE
G: NORMALLY BLACK
J: NORMALLY WHITE

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

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Response Time (rise)	Tr	-20℃	-	1620	2400	ms	FIG 2
		0℃	-	350	520		
		25℃	-	120	180		
		50℃	-	70	105		
		70℃	-	55	80		
Response Time (fall)	Tf	-20℃	-	1330	2000	ms	FIG 2
		0℃	-	640	900		
		25℃	-	200	300		
		50℃	-	80	120		
		70℃	-	35	50		

4-2. OPTICAL CHARACTERISTICS

(FOR LOW VOLTAGE MODE LCM)

AT Vop

MODE	ITEM	Cr(Contrast Ratio)		θ (Viewing Angle)		ϕ (Viewing Angle)	
		25℃		25℃		25℃	
		MIN.	TYP.	MIN.	TYP.	MIN.	TYP.
R	A	-	-	-	-	-	-
	C	-	-	-	-	-	-
	J	-	-	-	-	-	-
S	A	-	-	-	-	-	-
	C	-	-	-	-	-	-
	J	-	-	-	-	-	-
T	E	-	-	-	-	-	-
	G	-	-	-	-	-	-
NOTE		FIG 6		FIG 5			

NOTE :

R: REFLECTIVE
S: TRANSFLECTIVE
T: TRANSMISSIVE
A: GRAY

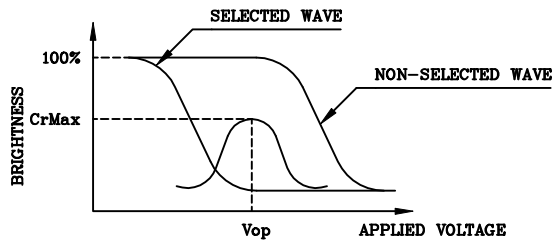
C: YELLOW
E: BLUE
G: NORMALLY BLACK
J: NORMALLY WHITE

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

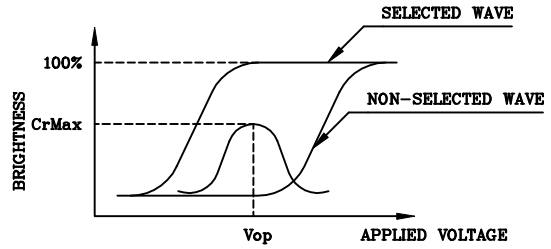
ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Response Time (rise)	Tr	-20℃	-	-	-	ms	FIG 2
		0℃	-	-	-		
		25℃	-	-	-		
		50℃	-	-	-		
		70℃	-	-	-		
Response Time (fall)	Tf	-20℃	-	-	-	ms	FIG 2
		0℃	-	-	-		
		25℃	-	-	-		
		50℃	-	-	-		
		70℃	-	-	-		

(NOTE 1)

Definition of Operation Voltage(Vop)



(positive type)



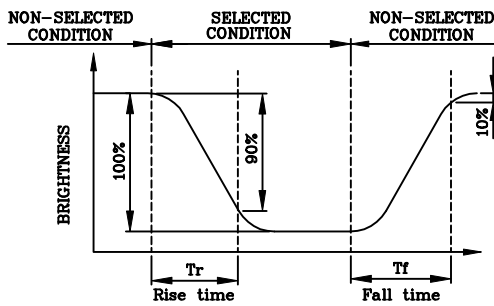
(negative type)

*Conditions

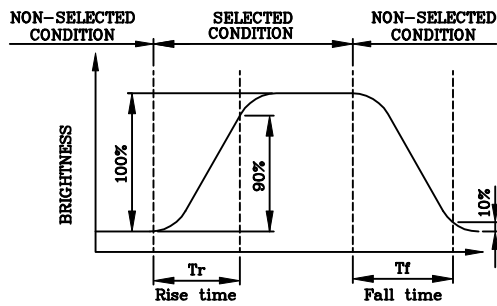
Viewing Angle : 0
Frame Frequency : 70Hz
Applied Waveform : 1/N duty, 1/a bias

(NOTE 2)

Definition of Response Time(Tr,Tf)



(positive type)



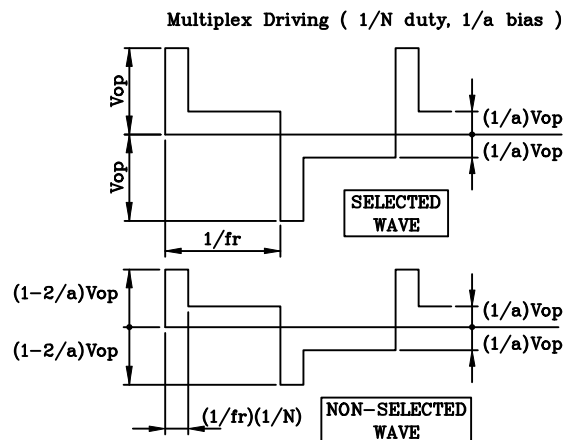
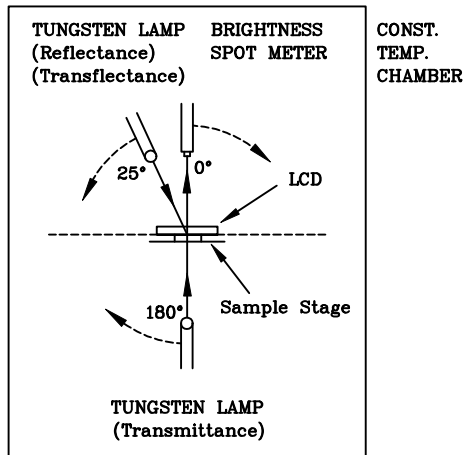
(negative type)

*Conditions

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

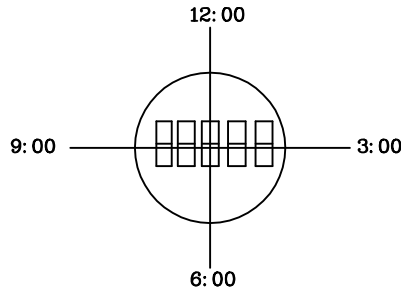
(NOTE 3)

Description of Measuring Equipment and Driving Waveforms



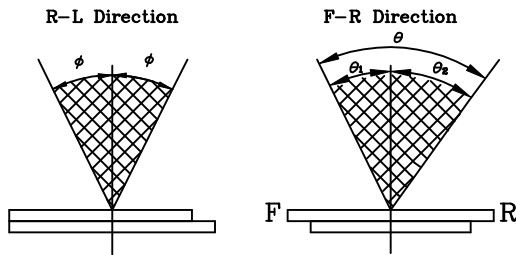
(NOTE 4)

Definition of Viewing Direction



(NOTE 5)

Definition of Viewing Angle



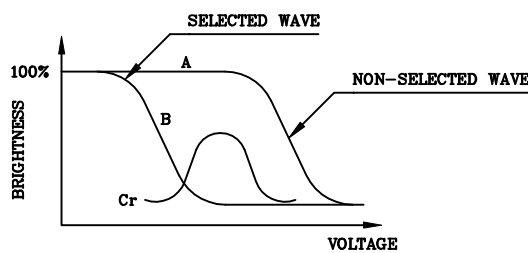
$\theta = \theta_1 + \theta_2$

*Conditions

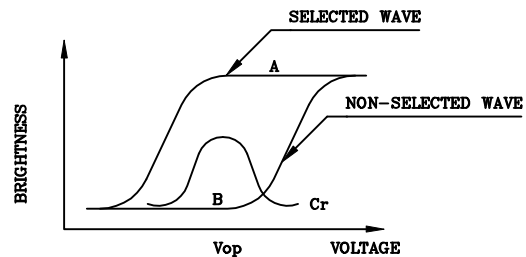
- Operating Voltage : V_{op}
- Frame Frequency : 70Hz
- Applied Waveform : 1/N duty, 1/a bias
- Contrast Ratio : larger than 2

(NOTE 6)

Definition of Contrast Ratio (Cr)



(positive type)



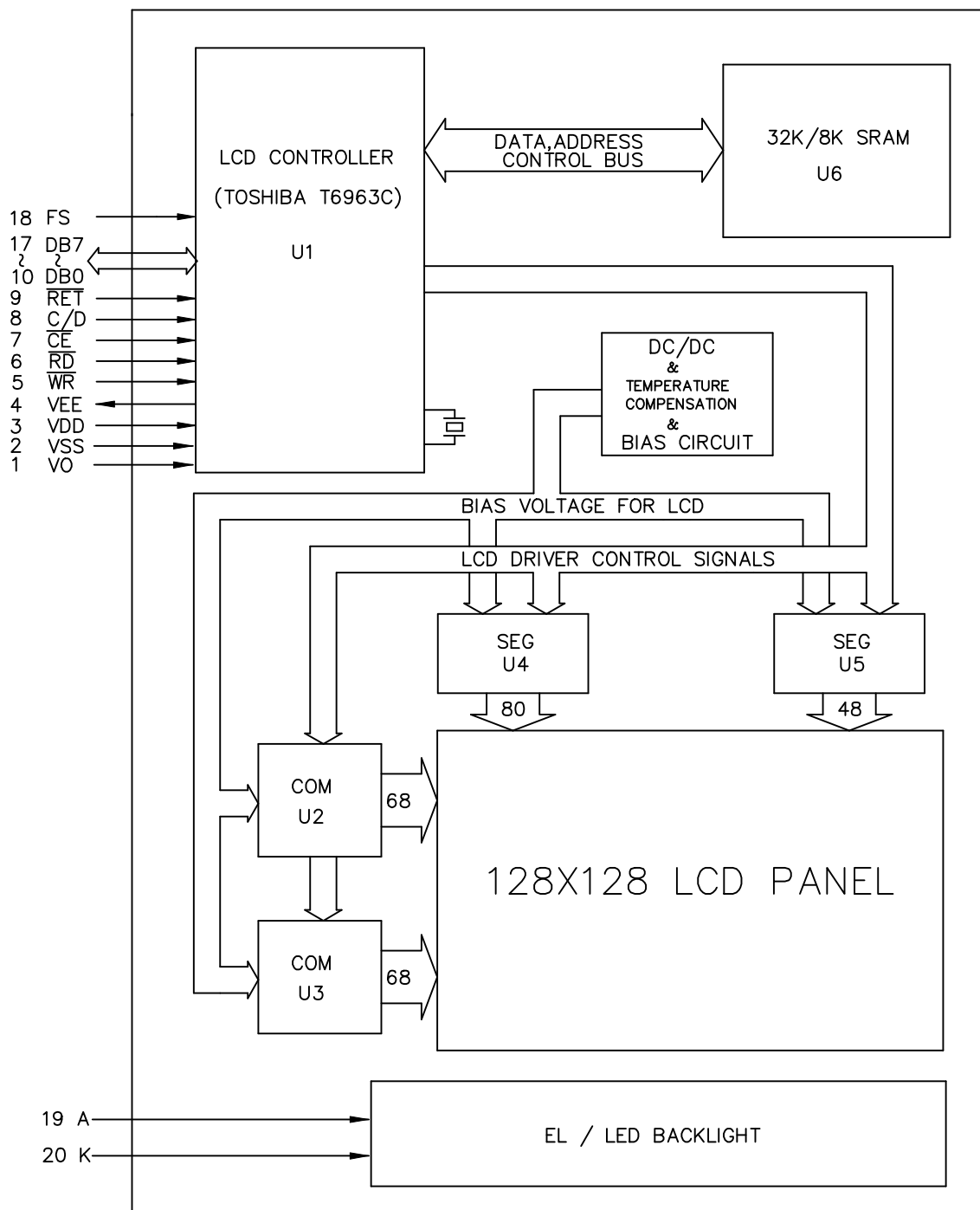
(negative type)

Contrast Ratio : $Cr = A/B$

*Conditions

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

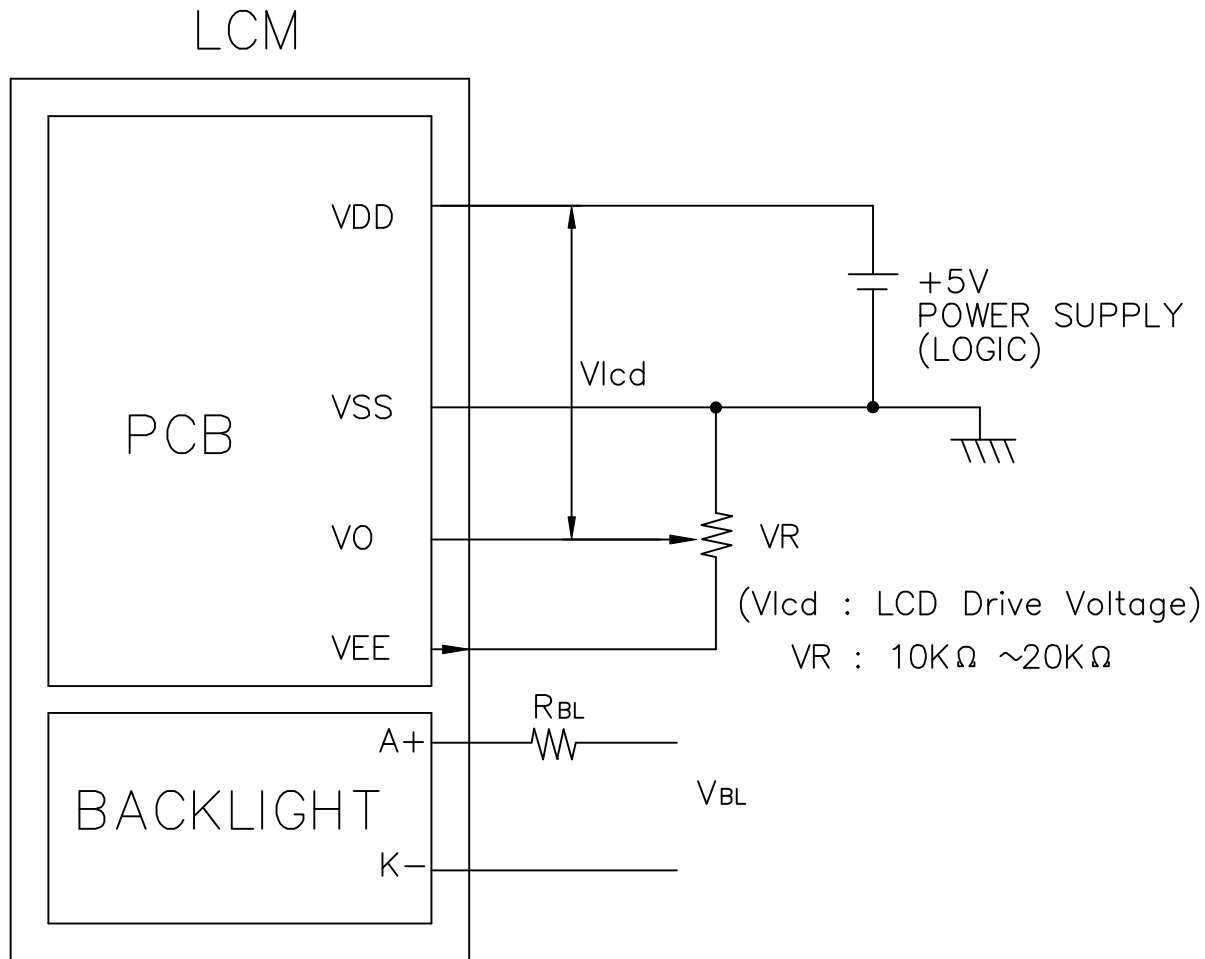
5. BLOCK DIAGRAM



6. INTERNAL PIN CONNECTION

No	Symbol	Function	
1	Vo	Adjust LCD Contrast	
2	VSS	0V	Ground
3	VDD	+5V	Power Supply for Logic
4	VEE	LCD Contrast Voltage Output	
5	\overline{WR}	L	Data Write
6	\overline{RD}	L	Data Read
7	\overline{CE}	L	Chip Enable
8	C/D	H/L	H=Command ; L=Data
9	\overline{RST}	L	Reset
10	DB0	H/L	Data Bus
11	DB1	H/L	
12	DB2	H/L	
13	DB3	H/L	
14	DB4	H/L	
15	DB5	H/L	
16	DB6	H/L	
17	DB7	H/L	
18	FS	H/L	Font Select
19	A(+)	Power Supply for LED/EL	
20	K(-)	Power Supply for LED/EL	

7. POWER SUPPLY



Recommended Value for V_{BL} and R_{BL}

ITEM B.L. VALUE	V_{BL}	R_{BL}
LED	5V	0Ω
EL	110VAC 400HZ	0Ω

8. TIMING CHARACTERISTICS

8-1. INTERFACE TIMING

ITEM	ITEM	CONDITION	MIN.	MAX.	UNIT
C/D SET UP TIME	t_{CDS}	Fig.	100	-	ns
C/D HOLD TIME	t_{CDH}	Fig.	10	-	ns
$\overline{CE}, \overline{RD}, \overline{WR}$ CLOCK WIDTH	t_{CP}, t_{RP}, t_{WP}	Fig.	80	-	ns
DATA SET UP TIME	t_{DS}	Fig.	80	-	ns
DATA HOLD TIME	t_{DH}	Fig.	40	-	ns
ACCESS TIME	t_{ACC}	Fig.	-	150	ns
DATA OUTPUT HOLD TIME	t_{OH}	Fig.	10	50	ns

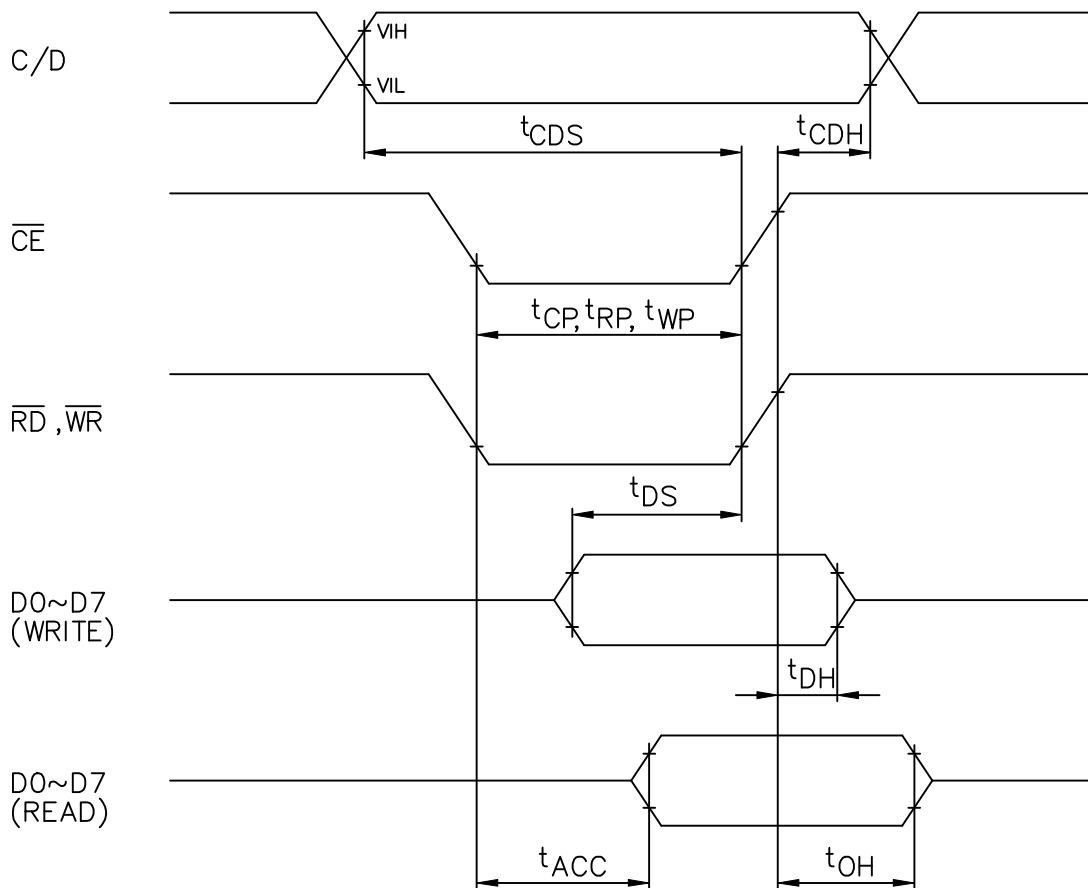


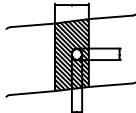
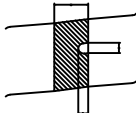
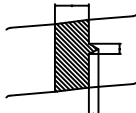
Fig. INTERFACE TIMING CHART

9. 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

10.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 colspan="3">DIAMETER mm (a*)</th> <th>NO. OF DEFECT*</th> </tr> </thead> <tbody> <tr> <td></td> <td>a</td> <td>≦ 0.20</td> <td>NEGLECT</td> </tr> <tr> <td>0.20</td> <td>< a</td> <td>≦ 0.35</td> <td>5 MAX</td> </tr> <tr> <td>0.35</td> <td>< a</td> <td></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 colspan="3">DIAMETER mm (a*)</th> <th>NO. OF DEFECT*</th> </tr> </thead> <tbody> <tr> <td></td> <td>a</td> <td>≦ 0.15</td> <td>NEGLECT</td> </tr> <tr> <td>0.15</td> <td>< a</td> <td>≦ 0.20</td> <td>2 MAX</td> </tr> <tr> <td>0.20</td> <td>< a</td> <td></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.

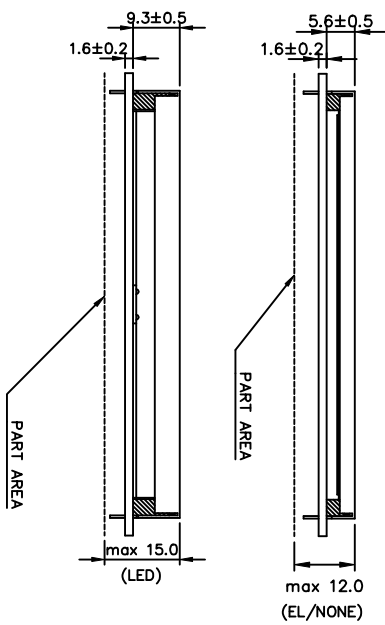
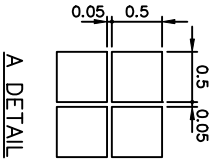
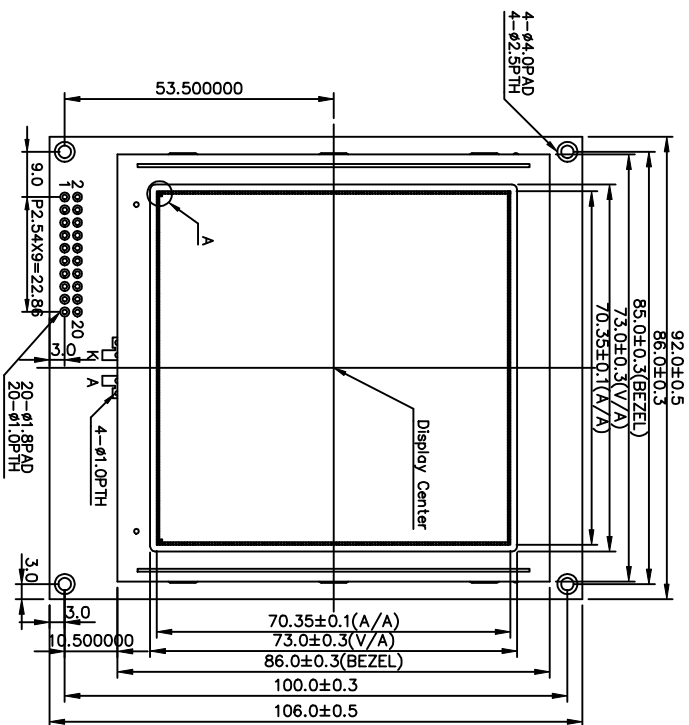
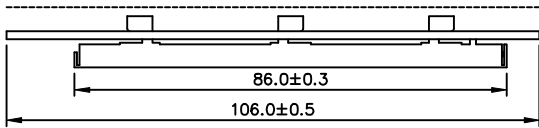
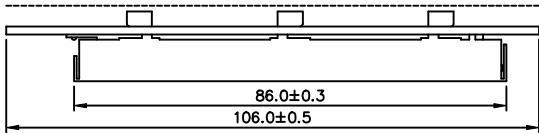
• TERMS OF WARRANTY

- 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/ 09.03,98'					APP	CHK	BY
----------	------------------	--	--	--	--	-----	-----	----



No	Symbol	Function
1	Vo	Adjust LCD Contrast
2	VSS	0V Ground
3	VDD	+5V Power Supply for Logic
4	VEE	LCD Contrast Voltage Output
5	\overline{WR}	L Data Write
6	\overline{RD}	L Data Read
7	\overline{CE}	L Chip Enable
8	C/D	H/L H=Command ; L=Data
9	\overline{RST}	L Reset
10	DB0	H/L (LSB) Data Bus
11	DB1	H/L Data Bus
12	DB2	H/L Data Bus
13	DB3	H/L Data Bus
14	DB4	H/L Data Bus
15	DB5	H/L Data Bus
16	DB6	H/L Data Bus
17	DB7	H/L (MSB) Data Bus
18	FS	H/L Font Select
19	A(+)	Power Supply for LED/EL
20	K(-)	Power Supply for LED/EL

NOTE :
 1. RESOLUTION : 128 X 128 Dots
 2. GENERAL TOLERANCE : ±0.5mm
 3. LOGIC VOLTAGE : 5V
 4. CONTROLLER : T6963C
 5. BACKLIGHT : LED AND EL/NONE
 6. DC TO DC : Built-in
 7. Temp. Comp. CKT : Built-in

P/N : LMC9AX193X
 LMA9AX193X
 LMD9AX193X

產品編號	LM_9A_193_	南亞塑膠工業股份有限公司
NAME	NAN YA PLASTICS CORPORATION	敬告圖
DATE		
APPROVE		DWG-NO MX-X193X Rev.A
CHECK		UNIT : mm
DESIGN		SCALE :
DRAW	KIKI	87.09.03