

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

# SPECIFICATION

SPEC. NO. : LM011-0  
DATE : May 22, 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  
160x80 LCD MODULE  
PRODUCT NO.: LM\_87\_011\_\_\_\_\_

SPEC. NO.: LM011-0

APPROVED BY

EDITED ON : May 22, 1997

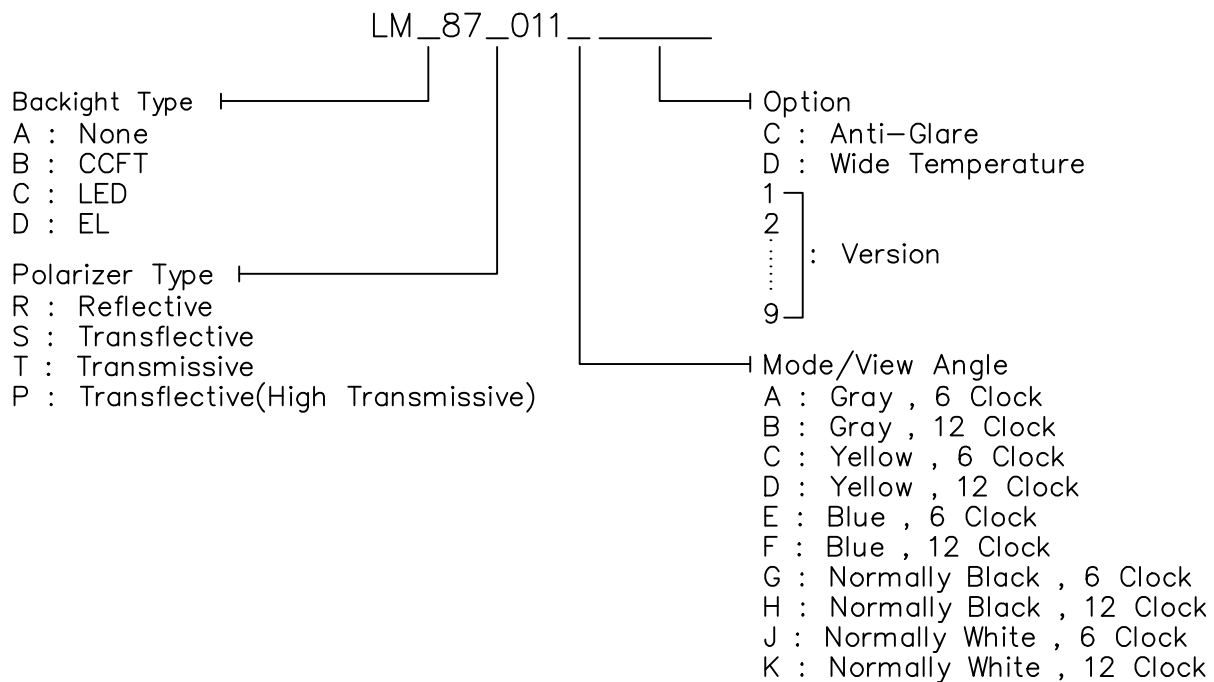
TECHNICAL MANAGER	DESIGN MANAGER	PERSON IN CHARGE

REV/DATE	RO/ 05.22.97'					APP	CHK	BY
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# 1. MECHANICAL DATA

- (1) Product NO. LM\_87\_011\_ \_\_\_\_\_
- (2) Module Size 88.0(W)mm X 71.0(H)mm X MAX13.0(D)mm  
(LED B.L.)
- (3) Dot Size 0.39 (W)mm x 0.39 (H)mm
- (4) Dot Pitch 0.42 (W)mm x 0.42 (H)mm
- (5) Number of Dots 160 (W) x 80 (H)Dots
- (6) Duty 1/80
- (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  
 Transflective(High Transmissive)
- (8) Viewing Direction  6 O'clock  12 O'clock  \_\_\_O'clock
- (9) Backlight  W/O  LED  EL  CCFT
- (10) Weight  W/O : about 60g  
 LED : about 71g

Note :



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## 2. ABSOLUTE MAXIMUM RATINGS

### (1) ELECTRICAL ABSOLUTE RATINGS

VSS=0V Standard

ITEM	SYMBOL	MIN	MAX	UNIT	COMMENT
Power Supply for Logic	VDD-VSS	-0.3	7.0	V	
Power Supply for LCM	VDD-VEE	0	25.0	V	
Input Voltage	VI	-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.			
	OPERATING		STORAGE	
	MIN.	MAX.	MIN.	MAX.
Ambient 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  $50^\circ\text{C}$

Note 2  $T_a$  at  $-20^\circ\text{C}$  will be < 48hrs, at  $70^\circ\text{C}$  will be < 120hrs

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
Recommended LC Driving Voltage	VDD-VEE	Duty= 1/80	0°C	-	10.7	11.3	V
			25°C	9.6	10.2	10.8	
		Bias= 1/8	50°C	8.9	9.4	-	
Power Supply Current	IDD	FLM=70 Hz VDD=5.0 V VEE=-5.2 V		-	1.5	-	mA
	IEE	PATTERN : □ ■ □ ■ □ ■ ■ □ ■ □ ■ □		-	1.0	-	mA
LED Power Supply Current	I LED	V <sub>LED</sub> = 4.6 Vdc		-	60.0	-	mA

## 4. OPTICAL CHARACTERISTICS

AT V<sub>OP</sub>

MODE	ITEM	Cr(Contrast Ratio)		$\theta$ (Viewing Angle)		$\phi$ (Viewing Angle)	
		25°C		25°C , Cr $\geq$ 2		25°C , Cr $\geq$ 2	
		MIN.	TYP.	MIN.	TYP.	MIN.	TYP.
S	A	3.0	4.5	25	40	15	20
	C	-	-	-	-	-	-
	J	-	-	-	-	-	-
P	A	-	-	-	-	-	-
	C	-	-	-	-	-	-
	J	-	-	-	-	-	-
note		NOTE6		NOTE5			

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

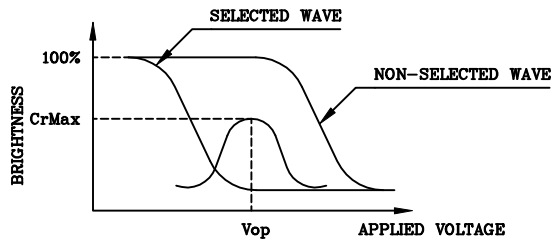
ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Response Time (rise)	Tr	0°C	-	500	1000	ms	NOTE 2
		25°C	-	140	280		
		55°C	-	90	180		
Response Time (fall)	Tf	0°C	-	1000	1500	ms	NOTE 2
		25°C	-	250	390		
		55°C	-	110	200		

note:

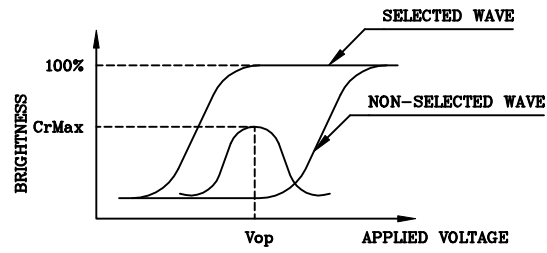
S: TRANSFLECTIVE  
P: TRANSFLECTIVE (HIGH TRANSMISSIVE)  
A: GRAY  
C: YELLOW  
J: NORMALLY WHITE

(NOTE 1)

Definition of Operation Voltage(Vop)



(positive type)



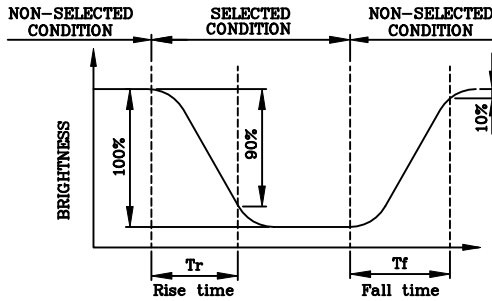
(negative type)

\*Conditions

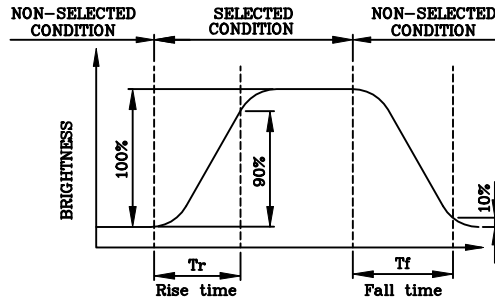
Viewing Angle : 0  
 Frame Frequency : 70Hz  
 Applied Waveform : 1/N duty, 1/a bias

(NOTE 2)

Definition of Response Time(Tr,Tf)



(positive type)



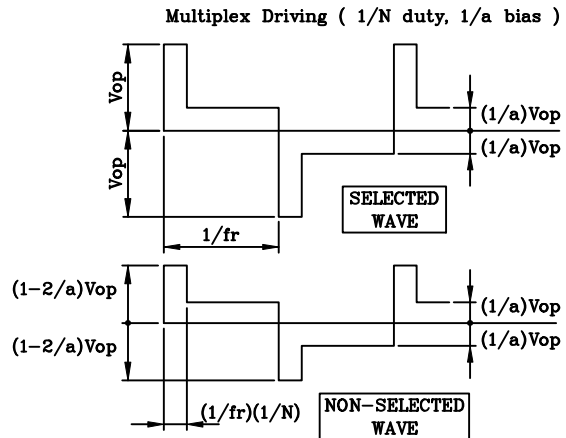
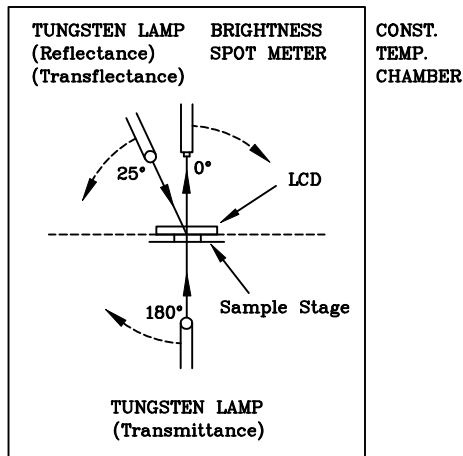
(negative type)

\*Conditions

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

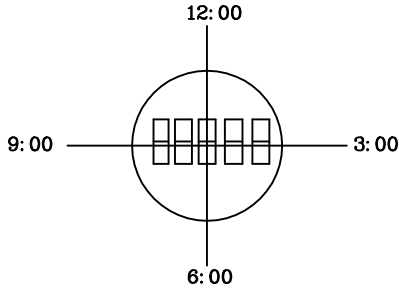
(NOTE 3)

Description of Measuring Equipment and Driving Waveforms



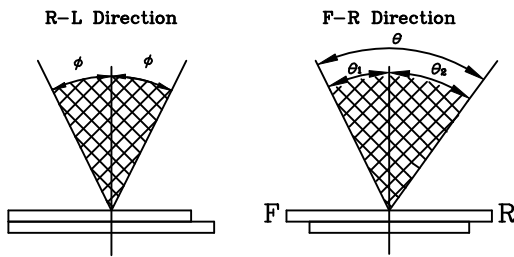
(NOTE 4)

Definition of Viewing Direction



(NOTE 5)

Definition of Viewing Angle



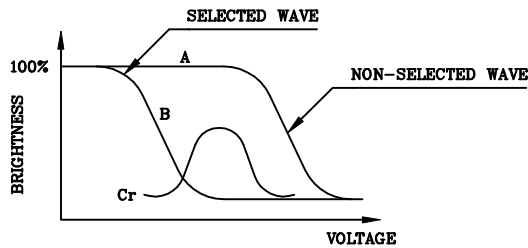
$$\theta = \theta_1 + \theta_2$$

\*Conditions

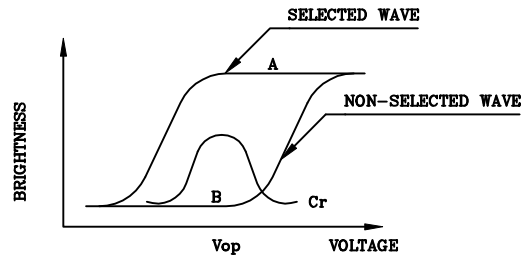
Operating Voltage :  $V_{op}$   
 Frame Frequency : 70Hz  
 Applied Waveform : 1/N duty, 1/a bias  
 Contrast Ratio : larger than 2

(NOTE 6)

Definition of Contrast Ratio (Cr)



(positive type)



(negative type)

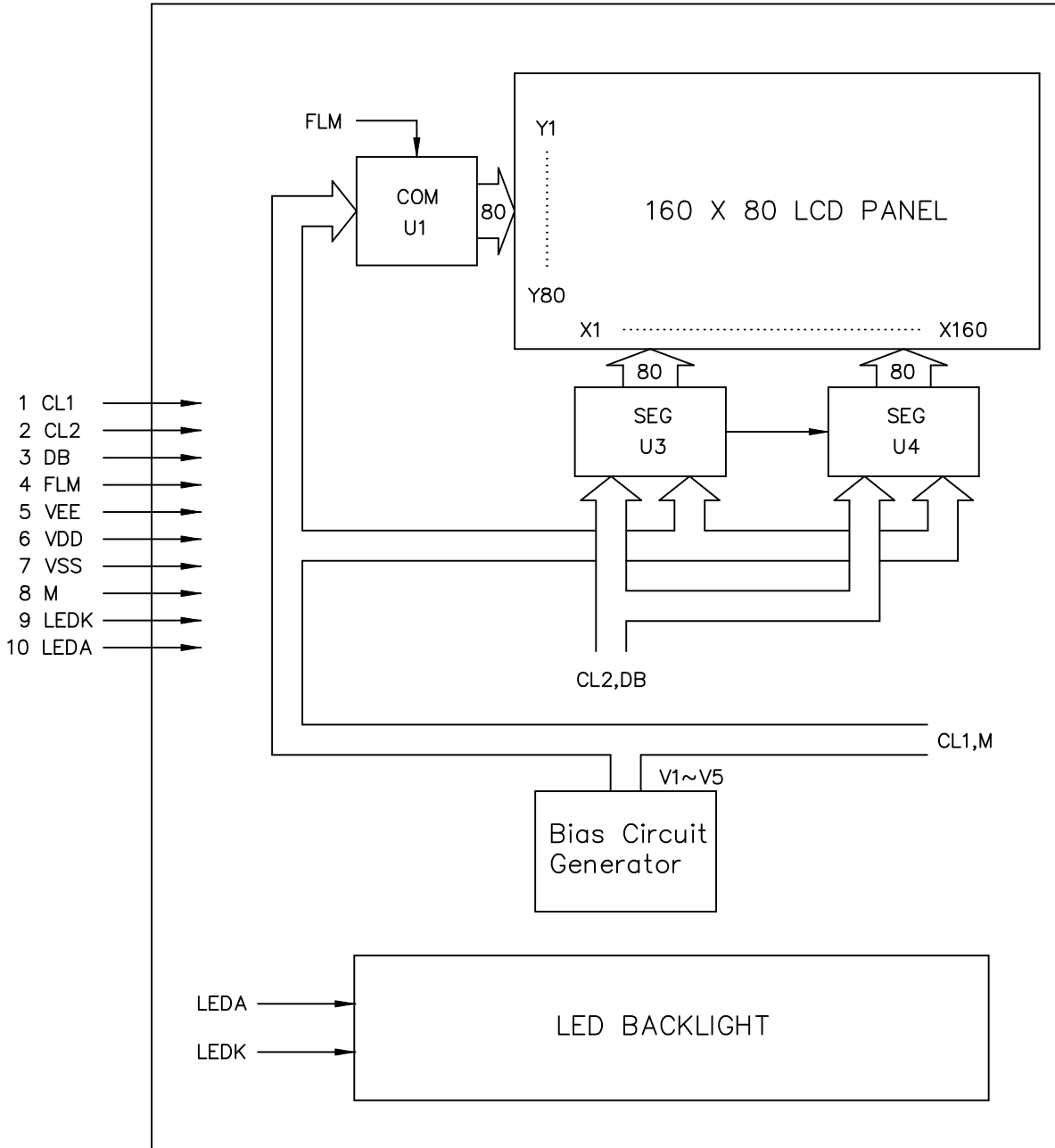
$$\text{Contrast Ratio : } Cr = A/B$$

\*Conditions

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

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# 5. BLOCK DIAGRAM

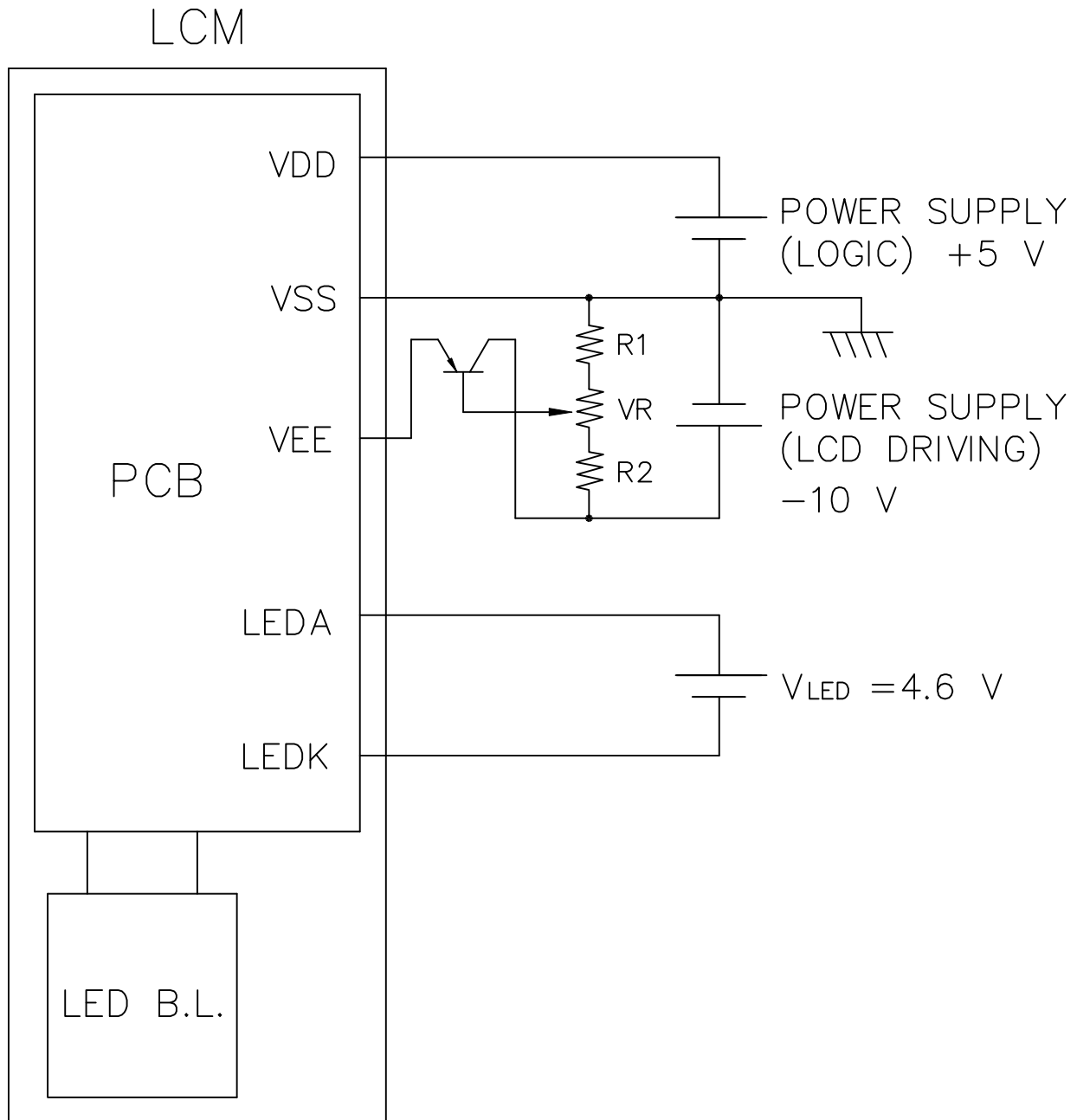




## 6. INTERNAL PIN CONNECTION

PIN NO.	SYMBOL	FUNCTION
1	CL1	DISPLAY DATA LATCH CLOCK
2	CL2	DISPLAY DATA SHIFT CLOCK
3	DB	DISPLAY DATA BIT
4	FLM	FRAME SIGNAL
5	VEE	POWER SUPPLY FOR LCD (-V)
6	VDD	POWER SUPPLY FOR LOGIC (+5V)
7	VSS	POWER SUPPLY (0V)
8	M	AC SIGNAL FOR LCD DRIVING
9	LEDK	GROUND FOR LED B/L
10	LEDA	POWER SUPPLY FOR LED B/L

# 7. POWER SUPPLY



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

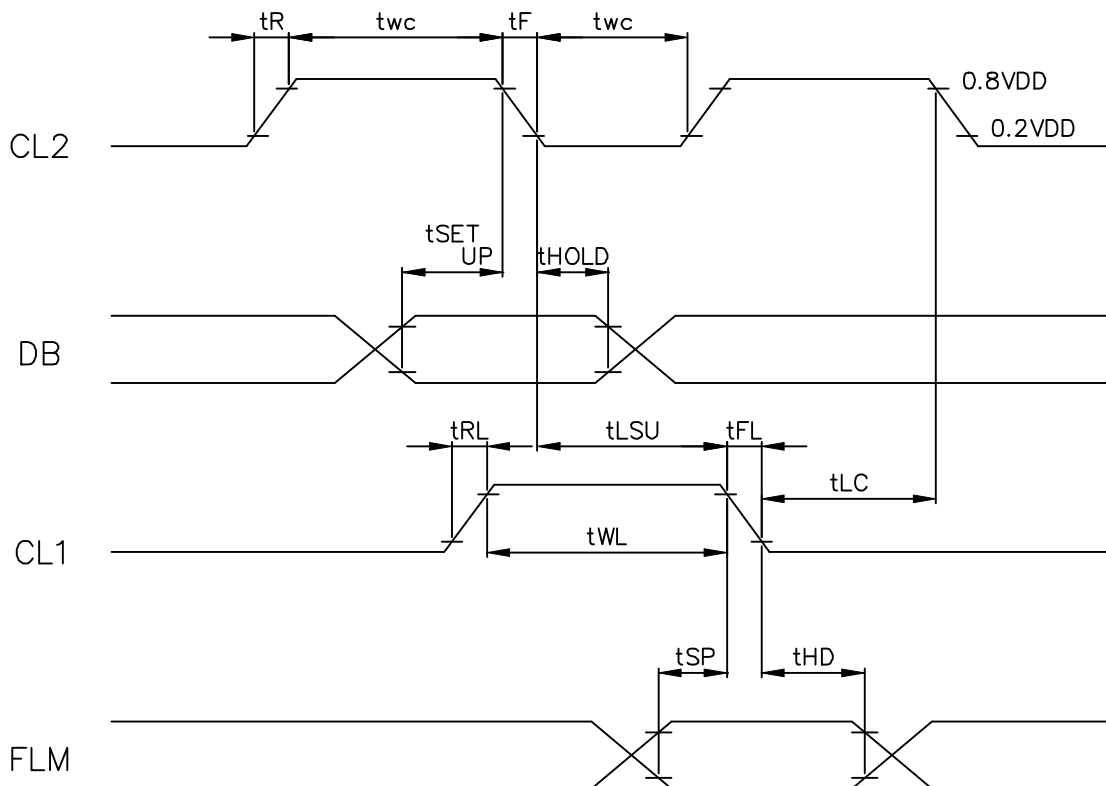
REV/DATE	RO/ 05.22.97'					APP	CHK	BY
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## 8. TIMING CHARACTERISTICS

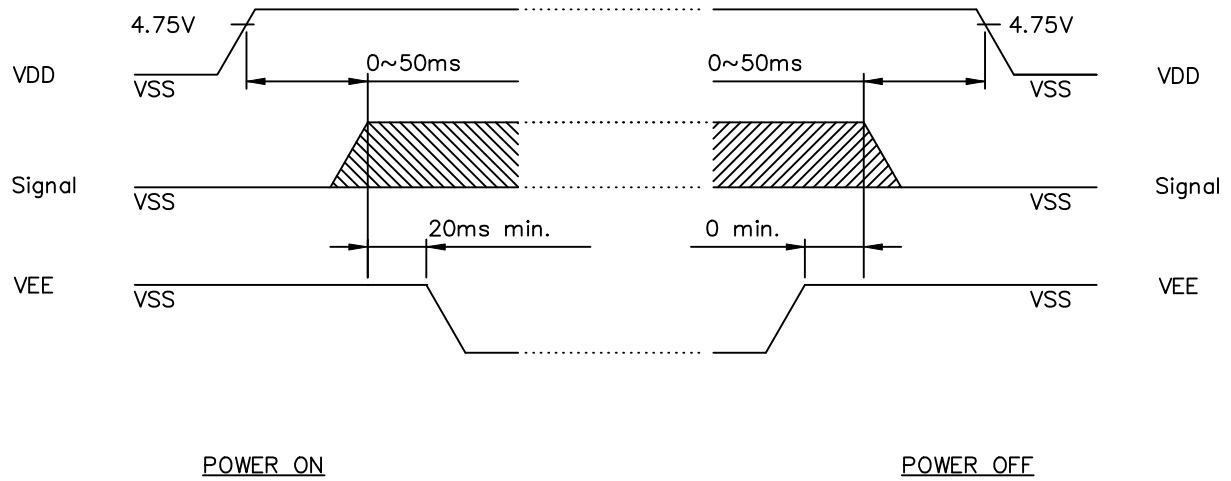
### 8-1 INTERFACE TIMING

@ VDD=5V±10%

Item	Symbol	Min.	Typ.	Max.	Unit
CL2 Pulse Width	tWC	45	—	—	ns
CL1 Pulse Width	tWL	45	—	—	ns
Data to CL2 Setup Time	tSETUP	30	—	—	ns
Data to CL2 Hold Time	tHOLD	30	—	—	ns
CL1 Setup Time	tLSU	80	—	—	ns
CL1 Hold Time	tLC	80	—	—	ns
CL2 Rise Time	tR	—	—	30	ns
CL2 Fall Time	tF	—	—	30	ns
CL1 Rise Time	tRL	—	—	30	ns
CL1 Fall Time	tFL	—	—	30	ns
FLM to CL1 Setup Time	tSP	30	—	—	ns
FLM to CL1 Hold Time	tHD	30	—	—	ns

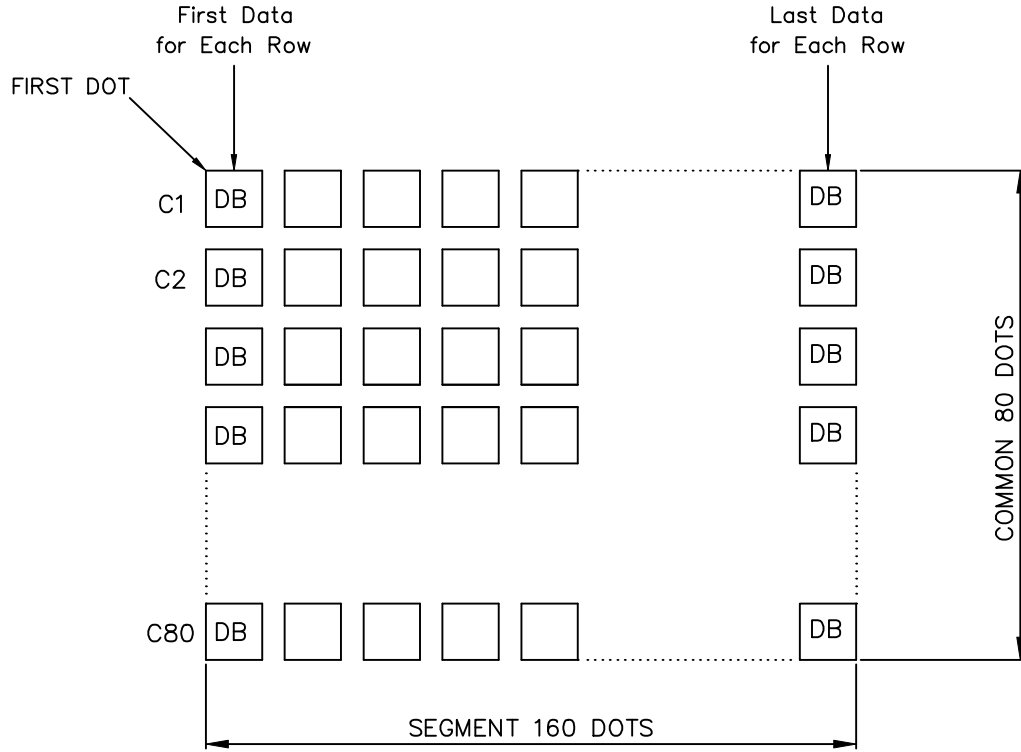


## 8-2 POWER ON/OFF TIMING



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

# 9. DISPLAY PATTERN

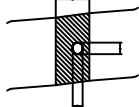
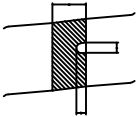
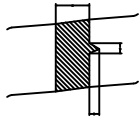


## 10. RELIABILITY TEST

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><math>a \leq 0.20</math></td> <td>NEGLECT</td> </tr> <tr> <td><math>0.20 &lt; a \leq 0.35</math></td> <td>5 MAX</td> </tr> <tr> <td><math>0.35 &lt; a</math></td> <td>NONE</td> </tr> </tbody> </table>	DIAMETER mm (a*)	NO. OF DEFECT*	$a \leq 0.20$	NEGLECT	$0.20 < a \leq 0.35$	5 MAX	$0.35 < a$	NONE					
DIAMETER mm (a*)	NO. OF DEFECT*														
$a \leq 0.20$	NEGLECT														
$0.20 < a \leq 0.35$	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><math>W \leq 0.03</math></td> <td>NEGLECT</td> </tr> <tr> <td><math>L \leq 3</math></td> <td><math>0.03 &lt; W \leq 0.08</math></td> <td>6</td> </tr> <tr> <td><math>3 &lt; L</math></td> <td><math>0.08 &lt; W</math></td> <td>NONE</td> </tr> </tbody> </table>	LENGTH mm(L)	WIDTH mm(W)	NO. OF DEFECT	N A	$W \leq 0.03$	NEGLECT	$L \leq 3$	$0.03 < W \leq 0.08$	6	$3 < L$	$0.08 < W$	NONE	
LENGTH mm(L)	WIDTH mm(W)	NO. OF DEFECT													
N A	$W \leq 0.03$	NEGLECT													
$L \leq 3$	$0.03 < W \leq 0.08$	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><math>a \leq 0.15</math></td> <td>NEGLECT</td> </tr> <tr> <td><math>0.15 &lt; a \leq 0.20</math></td> <td>2 MAX</td> </tr> <tr> <td><math>0.20 &lt; a</math></td> <td>NONE</td> </tr> </tbody> </table>	DIAMETER mm (a*)	NO. OF DEFECT*	$a \leq 0.15$	NEGLECT	$0.15 < a \leq 0.20$	2 MAX	$0.20 < a$	NONE					
DIAMETER mm (a*)	NO. OF DEFECT*														
$a \leq 0.15$	NEGLECT														
$0.15 < a \leq 0.20$	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. $a \leq 0.50$ mm $0.50 < a \leq 0.75$ $0.75 < a \leq 1.00$ $1.00 < a$	NO. OF DEFECT* NEGLECT 5 3 NONE												
8.	DOT WIDTH	DESIGN WIDTH±15%													
9.	COLOR TONE AND UNIFORMITY	OBVIOUS UNEVEN COLOR IS NOT PERMITTED													

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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.

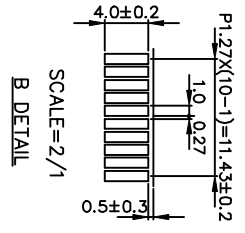
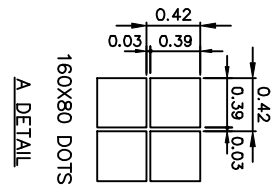
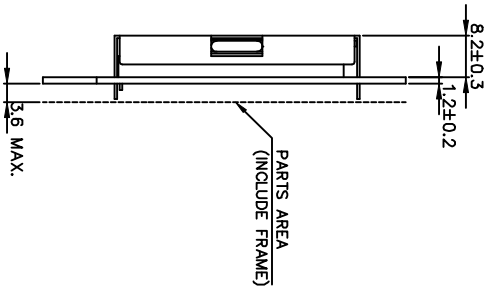
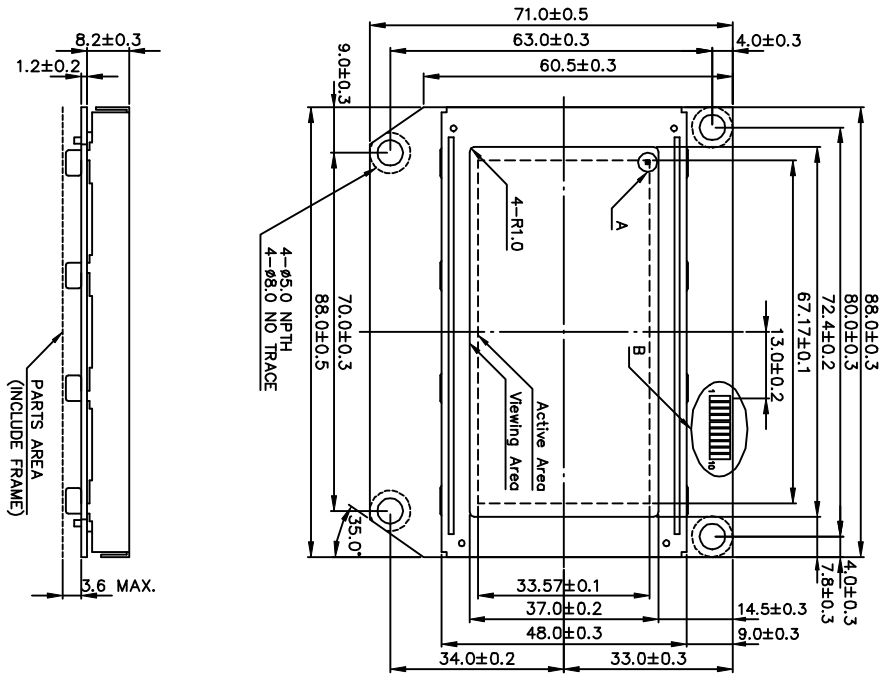
- TYPICAL OPERATING LIFETIME OF BACKLIGHT

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

REV/DATE	RO/ 05.22.97'					APP	CHK	BY
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Pin No.	Symbol	Function
1	CL1	Display Data Latch Clock
2	CL2	Display Data Shift Clock
3	DB	Display Data Bit
4	FLM	Frame Signal
5	VEE	Power Supply for LCD (-V)
6	VDD	Power Supply for Logic (+5V)
7	VSS	Power Supply (0V)
8	M	AC Signal for LCD Driving
9	LEDK	Ground for LED B/L
10	LEDA	Power Supply for LED B/L



- NOTE :
1. RESOLUTION : 160 X 80 Dots
  2. CONTROLLER : WITHOUT
  3. DC/DC : WITHOUT

產品編號	LM_87_011_	南亞塑膠工業股份有限公司
NAME		NAN YA PLASTICS CORPORATION
DATE		
APPROVE		外觀尺寸圖
CHECK		DWG-NO
DESIGN		MX-X011XXX Rev.A
DRAW		UNIT : mm
		SCALE : 7/10
		THIRD ANGLE PROJECT
		MAY PING 86.04.20