

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

SPECIFICATION

SPEC. NO. : LM157-0
DATE : Feb. 20, 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
640x480 LCD MODULE
PRODUCT NO.: LTBSHT157GC

SPEC. NO.: LM157-0

APPROVED BY

EDITED ON : Feb. 20, 1998

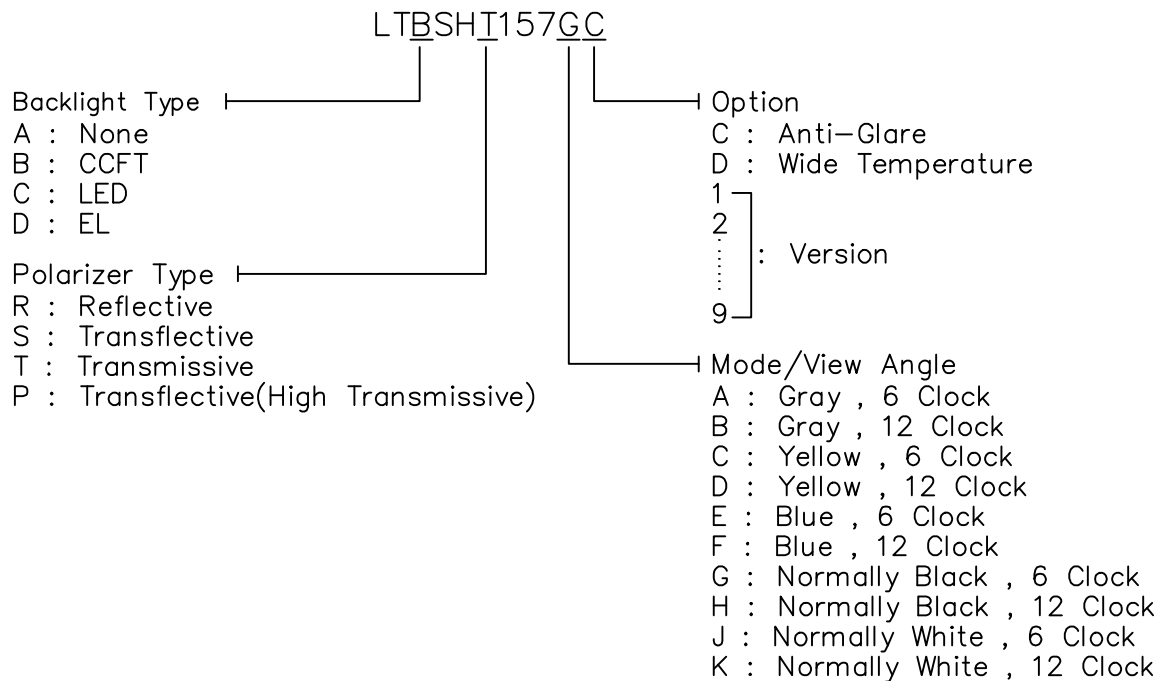
SALES MANAGER	DESIGN MANAGER	PERSON IN CHARGE

REV/DATE	RO/ 02.20.98'					APP	CHK	BY
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1. MECHANICAL DATA

- (1) Product No. LTBSHT157GC
- (2) Module Size 260.0 (W)mm x 174.0 (H)mm x MAX8.0 (D)mm
- (3) Dot Size 0.27 (W)mm x 0.27 (H)mm
- (4) Dot Pitch 0.30 (W)mm x 0.30 (H)mm
- (5) Number of Dots 640 (W) x 480 (H)Dots
- (7) Duty 1/240
- (8) LCD Display Mode STN: 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)
- (9) Viewing Direction 6 O'clock 12 O'clock ___O'clock
- (10) Backlight W/O CCFL
- (11) Weight W/O B/L:
CCFL B/L: about 353.5 g

Note :



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2. ABSOLUTE MAXIMUM RATINGS

(1) ELECTRICAL ABSOLUTE RATINGS

VSS=0 V Standard

ITEM	SYMBOL	MIN	MAX	UNIT	COMMENT
Power Supply for Logic	VDD-VSS	-0.3	6.5	V	
Input Voltage	VDD-VEE	0	27	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	-25	60
Humidity (Without Condensation)	Note 1,3		Note 2,3	
Vibration(Note ※)	-		49m/s ² (5G)	

Note 1 Ta ≤ 50°C : 85%RH max

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

Note 2 Ta at -25°C will be < 48 hrs, at 60°C will be < 120 hrs

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

Note※

Frequency (HZ)	10~55~10/1 min
Vibration Width	1.5 m/m
Vibration Direction	X/Y/Z
Vibration Time	15 min- 1cycle X 3 directions

3. ELECTRICAL CHARACTERISTICS

ITEM	SYMBOL	CONDITION		MIN.	TYP.	MAX.	UNIT
Power Supply for Logic	VDD-VSS	-		4.75	5.0	5.25	V
Input Voltage	VIL	L level		VSS	0.2VDD	-	V
	VIH	H level		0.8VDD	VDD	-	V
LCM Recommend LCD Module Driving Voltage	VDD-VEE	VDD=5V Bias=1/13	0°C	-	23.8	24.8	V
			25°C	-	23.0	-	
			50°C	18.6	19.6	-	
Power Supply Current for LCM	IDD	VDD=5.0V VDD-VEE=23.0V		-	30	-	mA
	IEE	FLM=70Hz		-	20	-	
Power Supply Current for CCFL B.L.	ICCFL	450 Vrms 30KHz		-	5	-	mA

4. 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	J	-	-	-	-	-	-
S	J	-	-	-	-	-	-
P	J	-	-	-	-	-	-
T	E	-	-	-	-	-	-
	G	6	20	45	80	25	40
NOTE		NOTE6		NOTE5			

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

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Response Time (rise)	Tr	0°C	-	730	1100	ms	NOTE 2
		25°C	-	390	580		
		50°C	-	160	240		
Response Time (fall)	Tr	0°C	-	980	1450	ms	NOTE 2
		25°C	-	120	250		
		50°C	-	70	130		

NOTE :

R: REFLECTIVE

S: TRANSFLECTIVE

P: TRANSFLECTIVE(HIGH TRANSMISSIVE)

T: TRANSMISSIVE

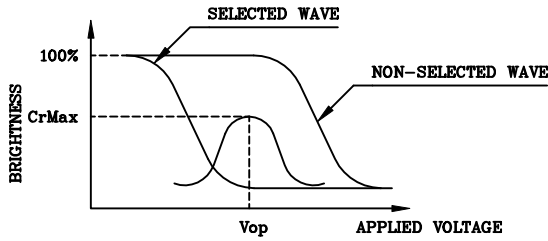
E: BLUE

G: NORMALLY BLACK

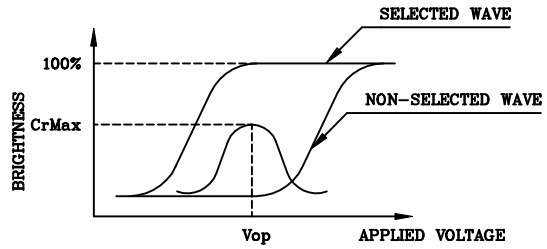
J: NORMALLY WHITE

(NOTE 1)

Definition of Operation Voltage(Vop)



(positive type)



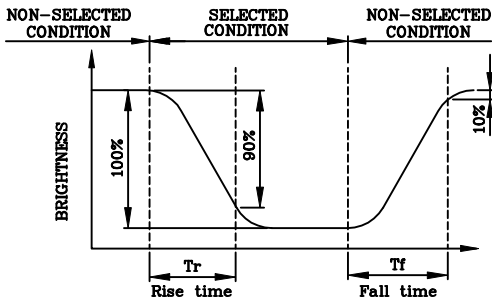
(negative type)

*Conditions

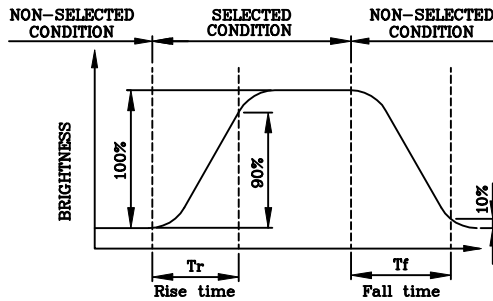
Viewing Angle : 0
Frame Frequency : 70Hz
Applied Waveform : 1/N duty, 1/a bias

(NOTE 2)

Definition of Response Time(Tr,Tf)



(positive type)



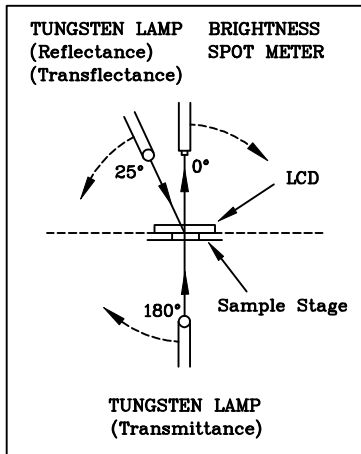
(negative type)

*Conditions

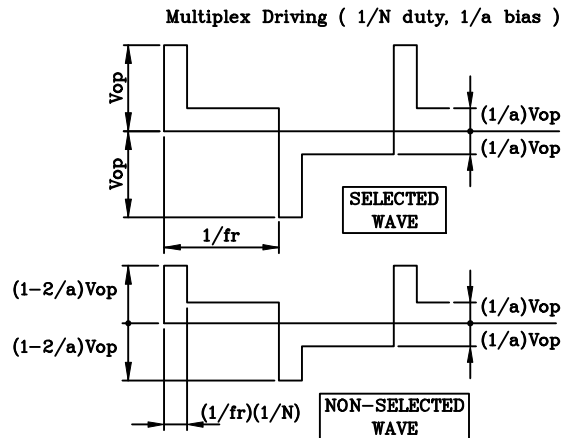
Operating Voltage : Vop
Viewing Angle (θ,φ) : (0,0)
Frame Frequency : 70Hz
Applied Waveform : 1/N duty, 1/a bias

(NOTE 3)

Description of Measuring Equipment and Driving Waveforms

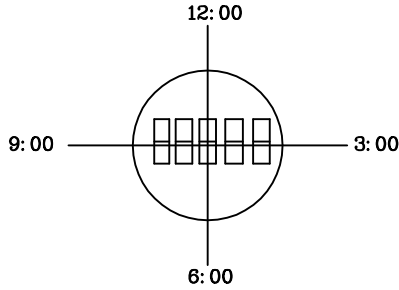


CONST.
TEMP.
CHAMBER



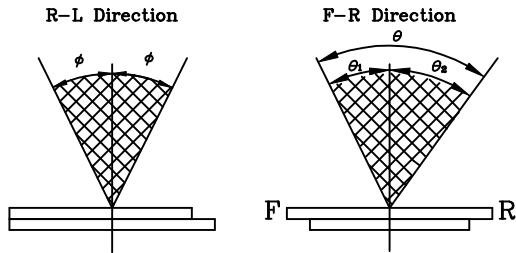
(NOTE 4)

Definition of Viewing Direction



(NOTE 5)

Definition of Viewing Angle



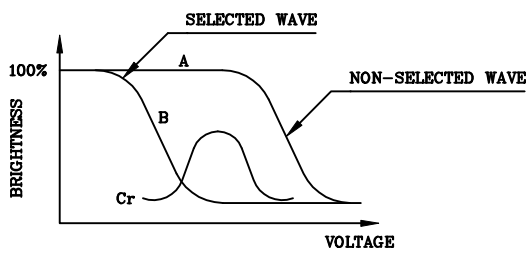
$$\theta = \theta_1 + \theta_2$$

*Conditions

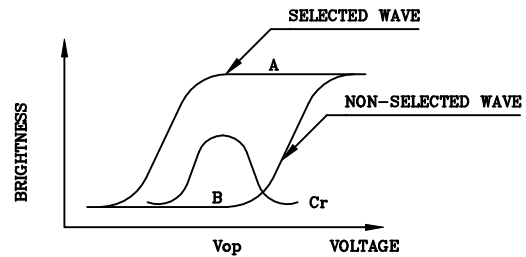
Operating Voltage : V_{op}
 Frame Frequency : 70Hz
 Applied Waveform : 1/N duty, 1/a bias
 Contrast Ratio : larger than 2

(NOTE 6)

Definition of Contrast Ratio (Cr)



(positive type)



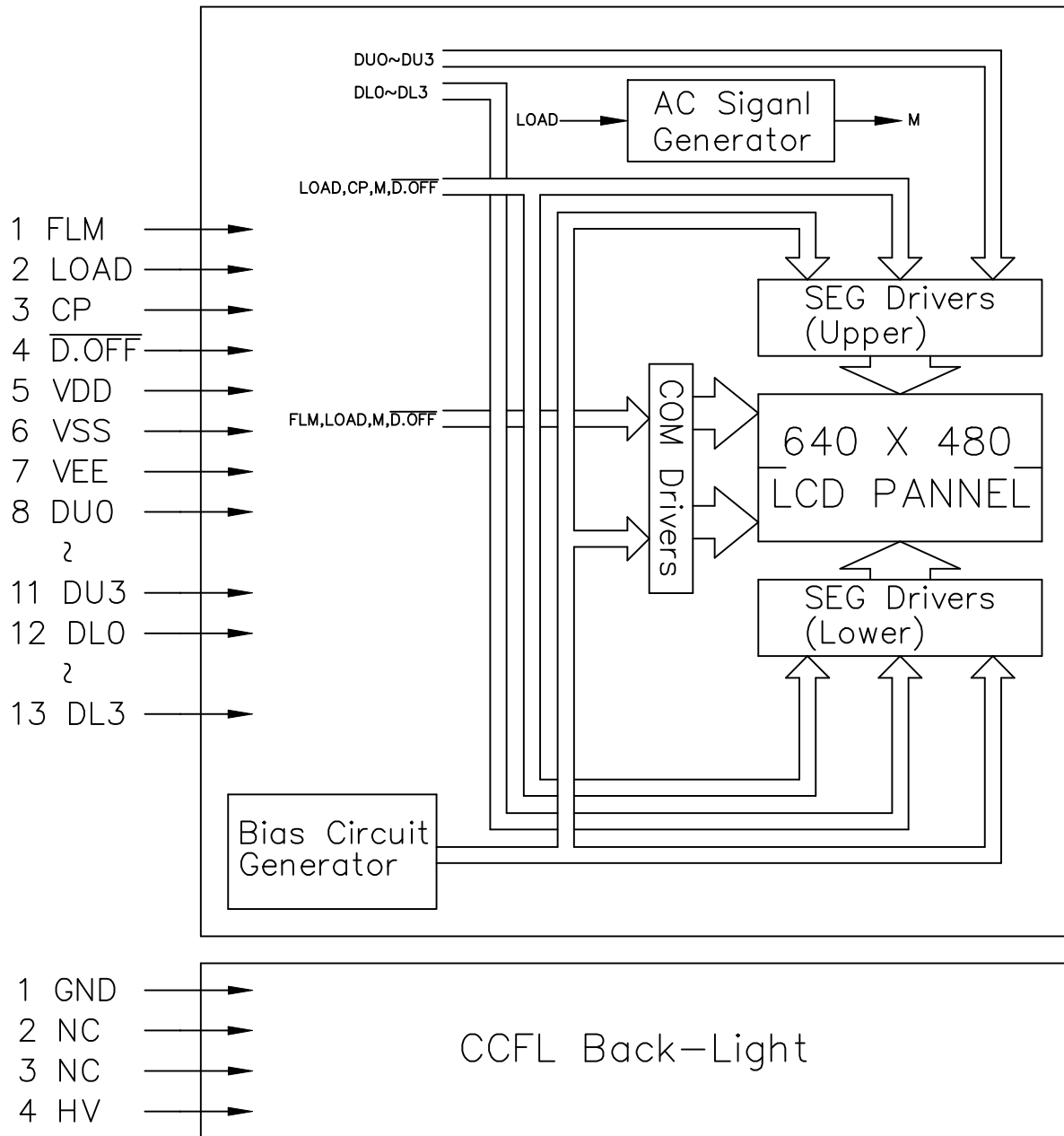
(negative type)

Contrast Ratio : $Cr = A/B$

*Conditions

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

5. BLOCK DIAGRAM



* AC Signal Setting

J1	J2	J3	J4	J5	J6	J7	J8
H	L	L	H	H	L	L	L

6. INTERNAL PIN CONNECTION

LCD

Pin No.	Symbol	Level	Function
1	FLM	H/L	SCAN START-UP SIGNAL
2	LOAD	H.÷L	DATA LATCH PULSE
3	CP	H.÷L	DATA SHIFT PULSE
4	$\overline{D.OFF}$	H/L	DISPLAY OFF ("H"=ON,"L"=OFF)
5	VDD	-	POWER SUPPLY FOR LOGIC (+5V)
6	VSS	-	SIGNAL GROUND (GND)
7	VEE	-	POWER SUPPLY FOR LCD (-V)
8	DU0	H/L	DISPLAY DATA (UPPER HALF)
9	DU1		
10	DU2		
11	DU3		
12	DL0	H/L	DISPLAY DATA (LOWER HALF)
13	DL1		
14	DL2		
15	DL3		

CCFT

Pin No.	Symbol	Level	Function
1	GND	-	GROUND LINE (INVERTER)
2	NC	-	NON CONNECTION
3	NC	-	NON CONNECTION
4	HV	-	HIGH VOLTAGE LINE (INVERTER)

LCD

Used connector : 53261-1590 (MOLEX)

Mating connector : 51021-1500 (MOLEX)

CCFT

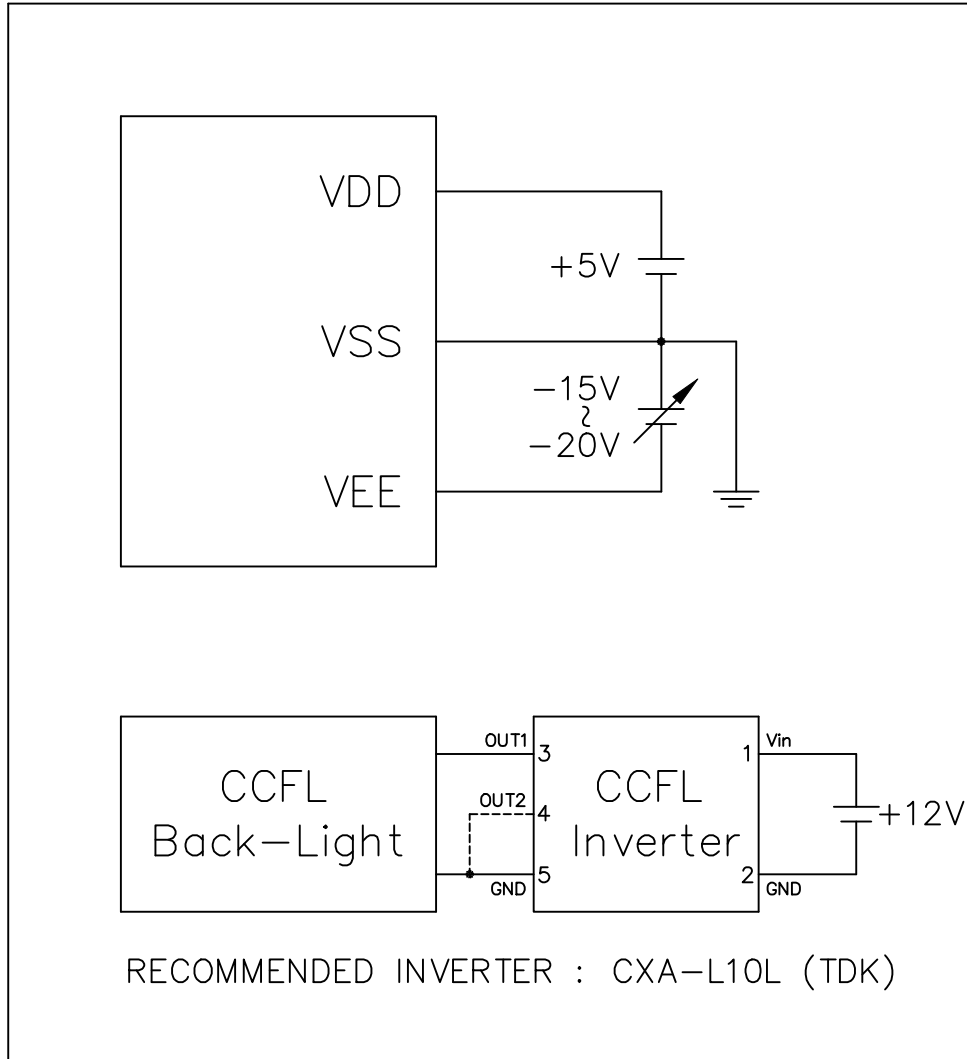
Used connector : M63M83-04 (MITSUMI)

Mating connector : M60-04-30-114P (MITSUMI)

M60-04-30-134P (MITSUMI)

M61M73-04 (MITSUMI)

7. POWER SUPPLY

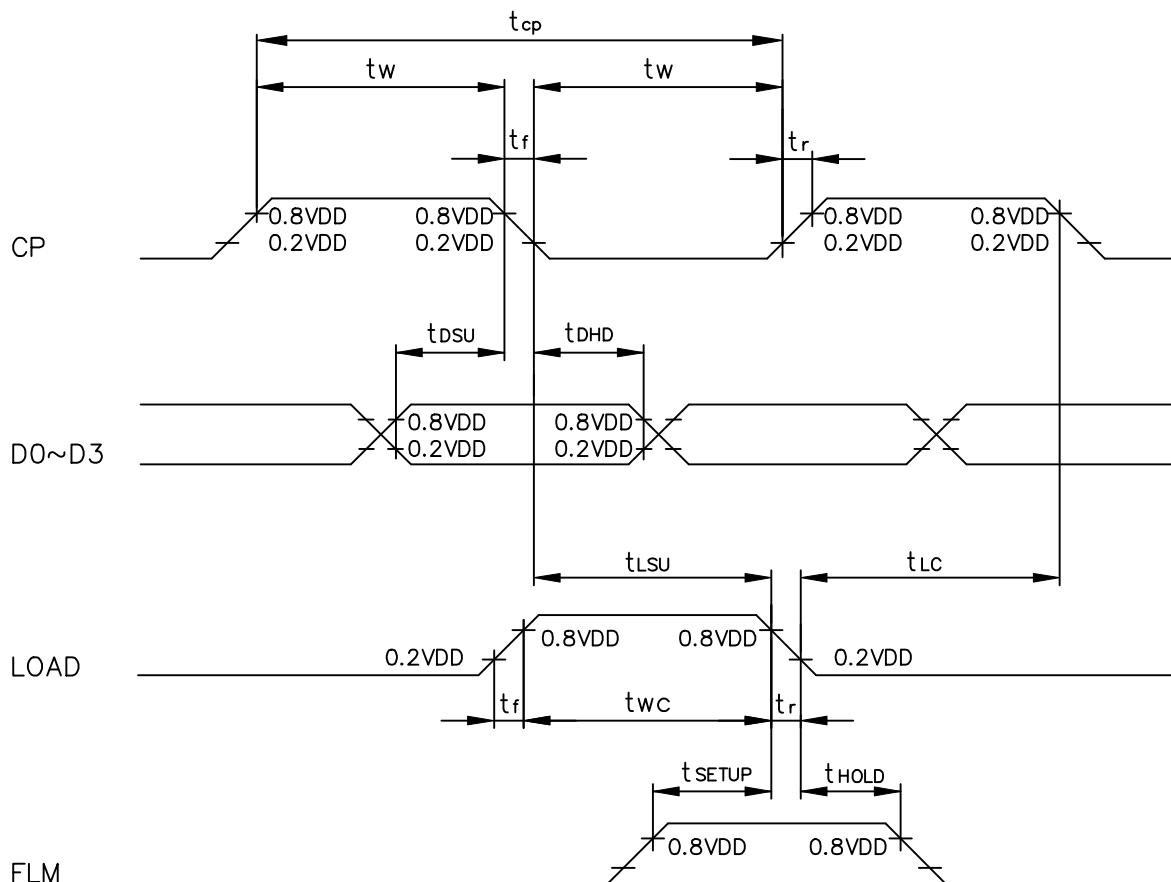


8. TIMING CHARACTERISTICS

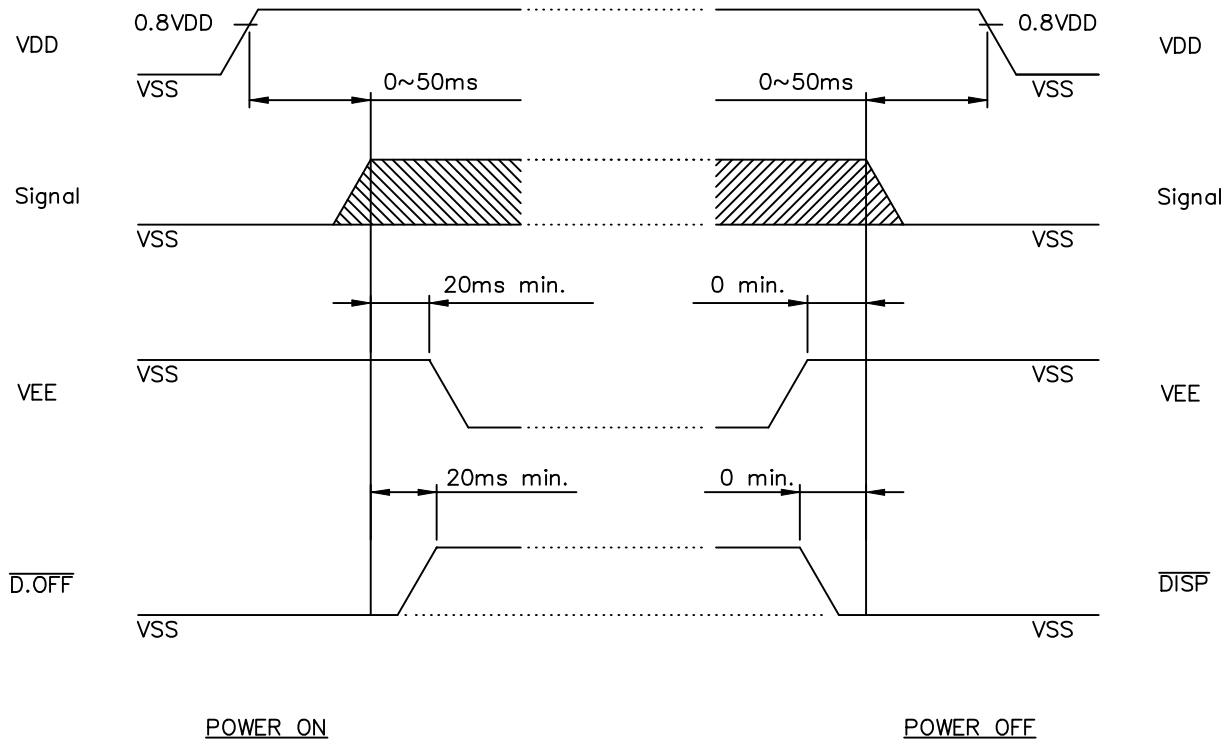
8-1. INTERFACE TIMING

@VDD=2.5~5.5V

ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT
Shift Clock Period	t_{cp}	152	-	-	ns
"CP" PULSE WIDTH	t_w	65	-	-	ns
CLOCK RISE, FALL TIME	t_r, t_f	-	-	50	ns
DATA SETUP TIME	t_{dsu}	50	-	-	ns
DATA HOLD TIME	t_{dhd}	40	-	-	ns
"CP" → "LOAD" FALL TIME	t_{lsu}	65	-	-	ns
"LOAD" → "CP" FALL TIME	t_{lc}	65	-	-	ns
"FLM" SETUP TIME	t_{setup}	100	-	-	ns
"FLM" HOLD TIME	t_{hold}	100	-	-	ns
"LOAD" PULSE WIDTH	t_{wc}	65	-	-	ns

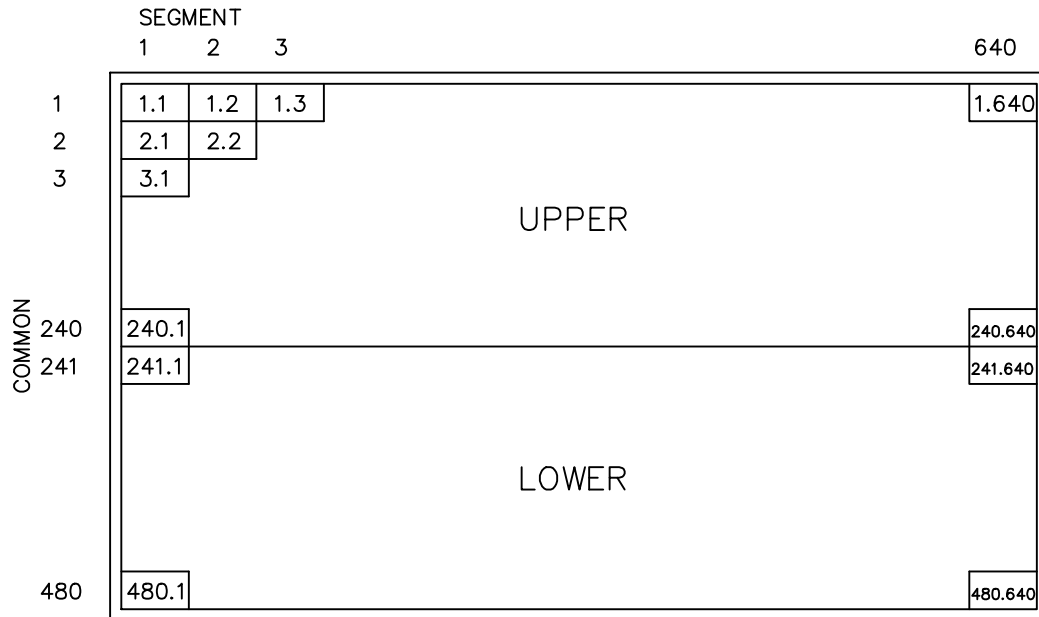


8-2. POWER ON/OFF TIMING

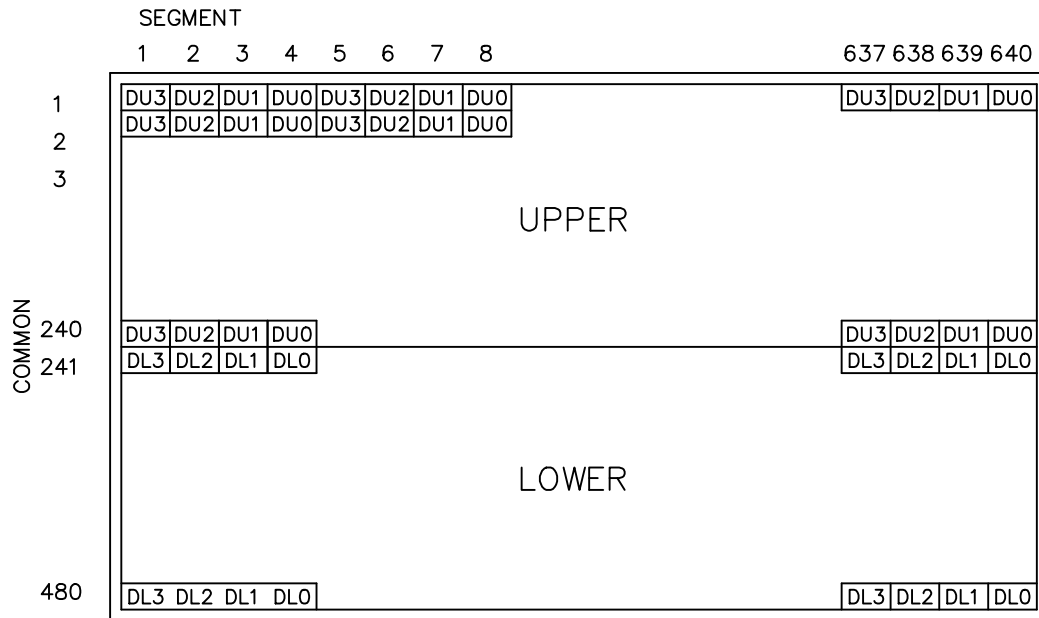


The missing pixels may occur when the LCM is driven beyond above power interface timing sequence.

9. DISPLAY PATTERN



NOTE : 1.1 MEANS 1ST COMMON 1ST SEGMENT DOT

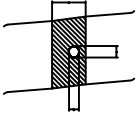
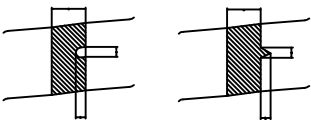


10. RELIABILITY TEST

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)	<p>(1) ROUND TYPE</p> <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> <p>(2) LINEAR TYPE</p> <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>		DIAMETER mm (a*)			NO. OF DEFECT*		a	≦ 0.20	NEGLECT	0.20	< a	≦ 0.35	5 MAX	0.35	< a		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
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L ≦ 3	0.03 < W ≦ 0.08	6																													
3 < L	0.08 < W	NONE																													
2.	SCRATCH	<p>1.SCRATCH ON PROTECTIVE FILM IS PERMITTED . 2.SCRATCH ON POLARIZER SHALL BE AS FOLLOW: (1) ROUND TYPE</p> <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> <p>(2) LINEAR TYPE BE JUDGED BY 1.-(2) LINEAR TYPE</p>		DIAMETER mm (a*)			NO. OF DEFECT*		a	≦ 0.15	NEGLECT	0.15	< a	≦ 0.20	2 MAX	0.20	< a		NONE												
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0.15	< a	≦ 0.20	2 MAX																												
0.20	< a		NONE																												
3.	DENT	DIAMETER < 1.5mm																													
4.	BUBBLE	NOT EXCEEDING 0.5mm AVERAGE DIAMETER IS ACCEPTABLE BETWEEN GLASS AND POLARIZING FILM.																													
5.	PIN HOLE	<p>(a+b)/2 ≦ 0.15 mm MAXIMUM NUMBER:IGNORED 0.15 < (a+b)/2 ≦ 0.20 MAXIMUM NUMBER:10</p> 																													
6.	DOT DEFECT	<p>(a+b)/2 ≦ 0.20 mm MAXIMUM NUMBER:IGNORED 0.20 < (a+b)/2 ≦ 0.30 MAXIMUM NUMBER:5 x = WIDTH</p> 																													
7.	CONTRAST IRREGULARITY (SPOT)	<p>DIAMETER SPEC.</p> <p>a ≦ 0.50 mm 0.50 < a ≦ 0.75 0.75 < a ≦ 1.00 1.00 < a</p>	<p>NO. OF DEFECT*</p> <p>NEGLECT 5 3 NONE</p>																												
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. : LM157-0 DATE : Feb. 20, 1998 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

REV/DATE	R0/ 02.20.98'					APP	CHK	BY
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