

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

# SPECIFICATION

SPEC. NO. : LM202-5  
DATE : JAN. 14, 1999  
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  
320x240 LCD MODULE  
PRODUCT NO.: LTD79H202L5GK

SPEC. NO.: LM202-5

CUSTOMER
APPROVED BY

EDITED ON : JAN. 14 ,1999

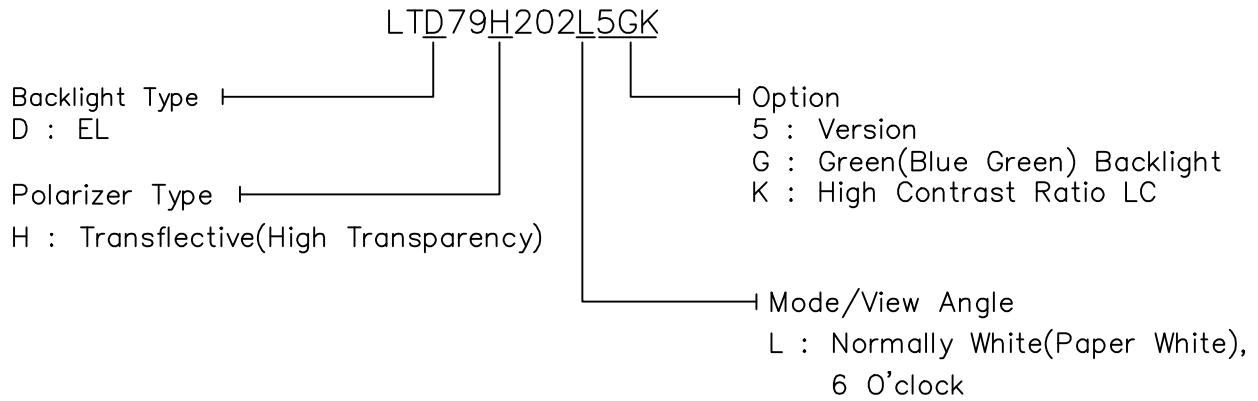
SALE MANAGER	TECHNICAL APPROVE	DESIGN MANAGER	DESIGN CHECK	DESIGNER

REV/DATE	RO/ 01.14.99'					APP	CHK	BY
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# 1. MECHANICAL DATA

- (1) Product No. LTD79H202L5GK
- (2) Module Size 75.1 (W)mm X 93.8 (H)mm X 7.5 (D)mm
- (3) Dot Size 0.225 (W)mm X 0.225 (H)mm
- (4) Dot Pitch 0.24 (W)mm X 0.24 (H)mm
- (5) Number of Dots 240 (W) X 320 (H) Dots
- (6) Duty 1/240
- (7) LCD Display Mode FSTN: Black and White(Normally White,Paper White /Positive Image)  
 Rear Polarizer: Transflective(High Transparency)
- (8) Viewing Direction 6 O'clock
- (9) Backlight EL B/L
- (10) Weight 60g(Included EL B/L and TOUCH PANEL)
- (11) Controller Excluded
- (12) DC/DC Converter Excluded
- (13) EL B/L Inverter Circuit Built-in
- (14) Touch Panel Included

Note :



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## 2. ABSOLUTE MAXIMUM RATINGS

### (1) ELECTRICAL ABSOLUTE RATINGS

VSS=0V

ITEM	SYMBOL	MIN	MAX	UNIT	COMMENT
Power Supply for Logic	VDD-VSS	-0.3	7.0	V	
Power Supply for LC Drive	VEE-VSS	-0.3	30.0	V	
Input Voltage	VI	-0.3	VDD	V	
Static Electricity	-	-	-	-	Note 1

### (2) ENVIRONMENTAL ABSOLUTE MAXIMUM RATINGS

ITEM	OPERATING		STORAGE	
	MIN.	MAX.	MIN.	MAX.
Ambient Temperature	-20	70	-30	80
Humidity(Without Condensation)	Note 2,4		Note 3,4	

Note 1 LCM should be grounded during handling LCM.

Note 2  $T_a \leq 70^\circ\text{C}$  : 75%RH max

$T_a > 70^\circ\text{C}$  : Absolute humidity must be lower

than the humidity of 75%RH at  $70^\circ\text{C}$

Note 3  $T_a$  at  $-30^\circ\text{C}$  will be < 48hrs, at  $80^\circ\text{C}$  will be < 120hrs

Note 4 Background color will change slightly depending on ambient temperature.  
That phenomenon is reversible.

### 3. ELECTRICAL CHARACTERISTICS

( VDD= 3.3V± 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	VEE-VSS (Vop)	1/240 Duty 1/13 Bias	-20°C	24.2	24.6	25.0	v
			0°C	22.9	23.0	23.4	
			25°C	22.3	22.7	23.1	
			50°C	21.1	21.5	21.9	
			70°C	20.3	20.7	21.1	
Power Supply Current	IDD	VDD= 3.3V VSS= 0V VEE-VSS=22.7V FLM=70Hz	-	0.2	0.5	mA	
	IEE		-	3.3	6.0		
EL Power Supply Current	IEL	VEL= 3.3V VELG= 0V BLE=3.3V	-	30	40	mA	
LCM	Surface Luminance	L	PATTERN: (Dots All On) ■ ■ ■ ■ ■ ■ ■ ■	-	2.0	-	cd/m <sup>2</sup>
			PATTERN: (Dots All Off) □ □ □ □ □ □ □ □	-	9.29	-	

# 4.OPTICAL CHARACTERISTICS

AT V<sub>OP</sub>

ITEM MODE		Cr(Contrast Ratio)						$\theta$ (Viewing Angle)		$\phi$ (Viewing Angle)	
		0°C		25°C		50°C		25°C		25°C	
		MIN.	TYP.	MIN.	TYP.	MIN.	TYP.	MIN.	TYP.	MIN.	TYP.
H	L	-	9.0	-	10.0	-	7.0	-	84	-	79
NOTE		NOTE6						NOTE5			

NOTE :

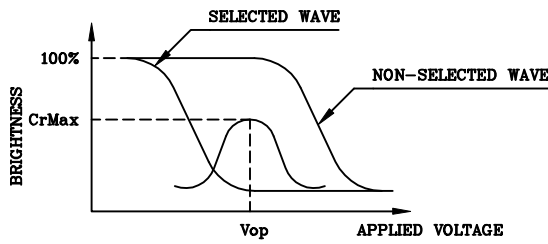
H: TRANSFLECTIVE(HIGH TRANSPARENCY)  
L: NORMALLY WHITE(PAPER WHITE)

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

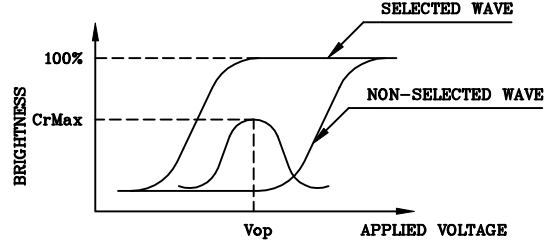
ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Response Time (rise)	Tr	-20°C	-	3000	4500	ms	NOTE 2
		0°C	-	1100	1650		
		25°C	-	300	450		
		50°C	-	150	225		
		70°C	-	100	150		
Response Time (fall)	Tf	-20°C	-	2800	4200	ms	NOTE 2
		0°C	-	500	800		
		25°C	-	200	300		
		50°C	-	100	150		
		70°C	-	80	120		

(NOTE 1)

Definition of Operation Voltage(Vop)



(positive type)



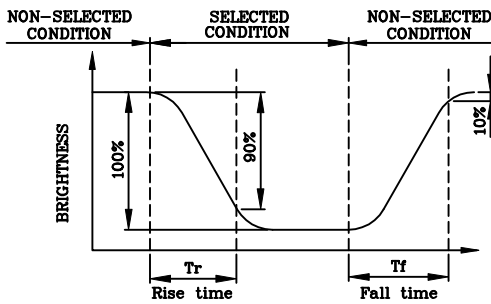
(negative type)

\*Conditions

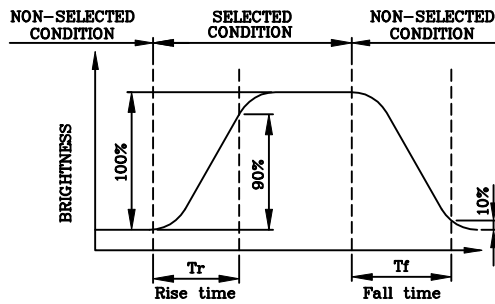
Viewing Angle : 0  
 Frame Frequency : 70Hz  
 Applied Waveform : 1/N duty, 1/a bias

(NOTE 2)

Definition of Response Time(Tr,Tf)



(positive type)



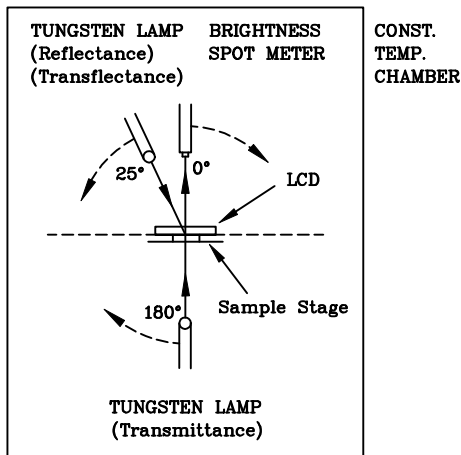
(negative type)

\*Conditions

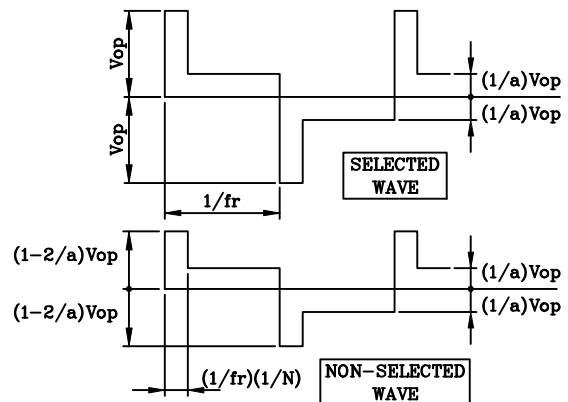
Operating Voltage : Vop  
 Viewing Angle (θ,φ) : (0,0)  
 Frame Frequency : 70Hz  
 Applied Waveform : 1/N duty, 1/a bias

(NOTE 3)

Description of Measuring Equipment and Driving Waveforms

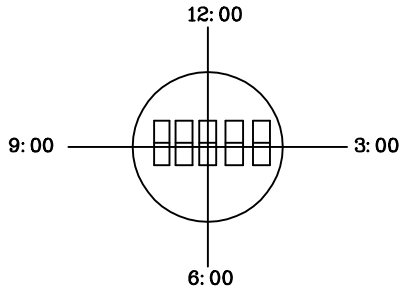


Multiplex Driving ( 1/N duty, 1/a bias )



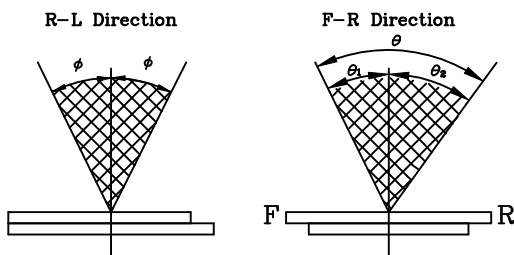
(NOTE 4)

Definition of Viewing Direction



(NOTE 5)

Definition of Viewing Angle



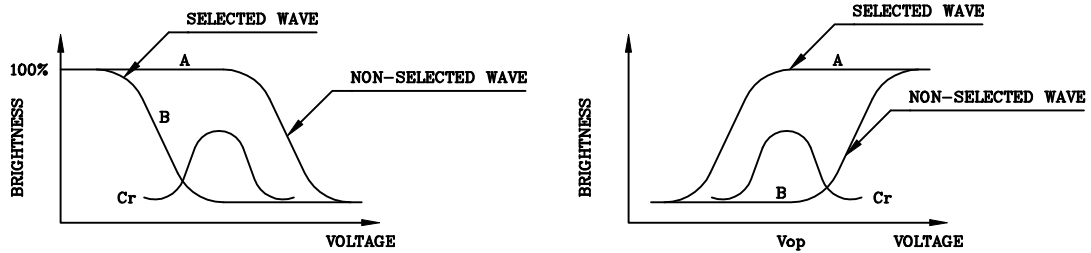
$\theta = \theta_1 + \theta_2$

\*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)



(positive type)

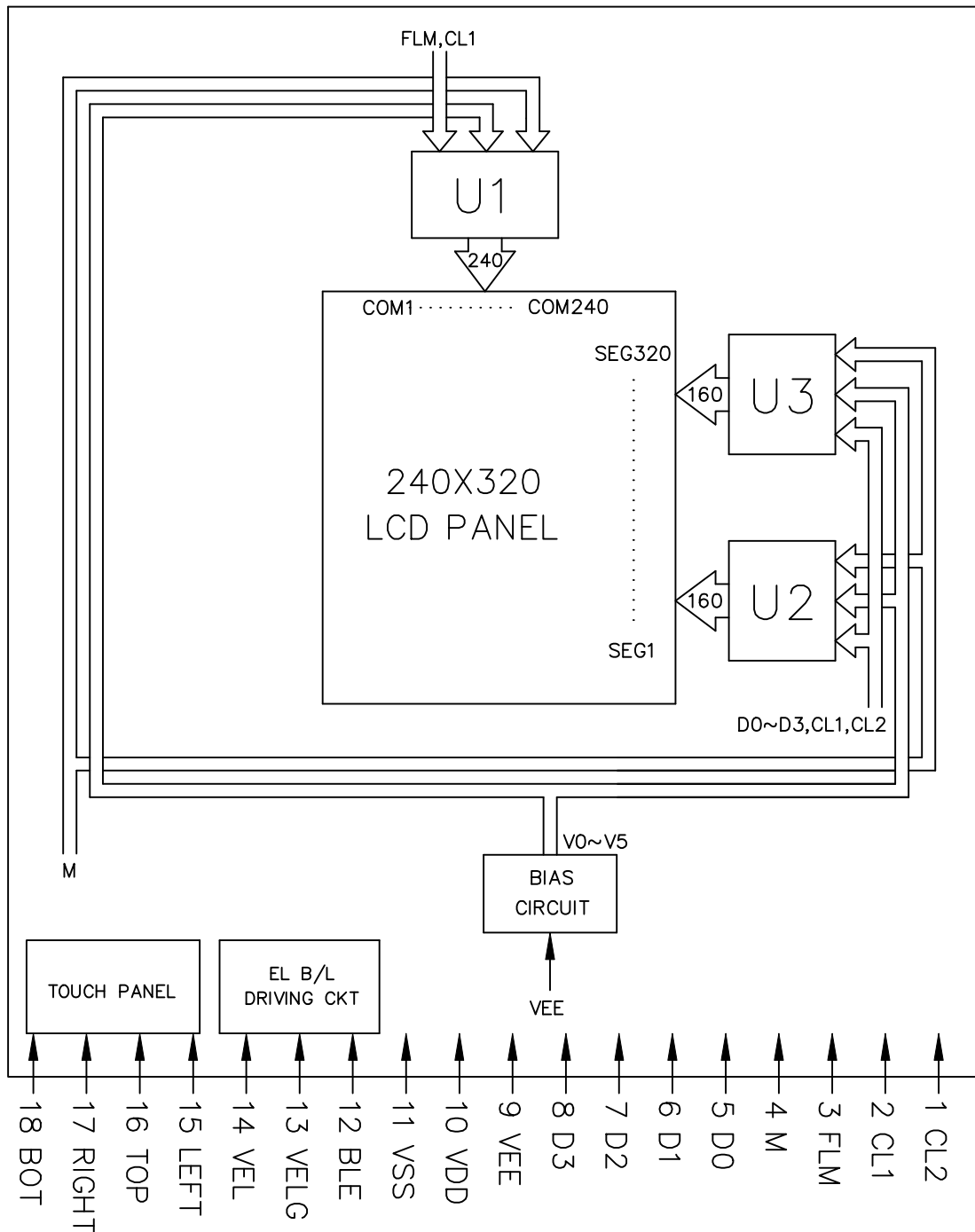
(negative type)

Contrast Ratio :  $Cr = A/B$

\*Conditions

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

# 5. BLOCK DIAGRAM



\* M SIGNAL SHOULD BE SUPPLIED BY USERS

REV/DATE	R0/ 01.14.99'					APP	CHK	BY
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## 6. INTERNAL PIN CONNECTION

CN1

Pin No.	Symbol	Level	Function
1	CL2	H/L	Data Shift Clock Signal
2	CL1	H/L	Data Latch Clock Signal
3	FLM	H/L	Frame Signal
4	M	H/L	Alternate Signal
5	D0	H/L	Display Data
6	D1	H/L	
7	D2	H/L	
8	D3	H/L	
9	VEE	-	Power Supply for LCD (+V)
10	VDD	-	Power Supply for Logic
11	VSS	-	Power Supply (0V)
12	BLE	H/L	H: EL Enable ; L: EL Disable
13	VELG	-	Power Supply for EL (GND,0V)
14	VEL	-	Power Supply for EL (+)
15	LEFT	-	Touch Panel Connection
16	TOP	-	
17	RIGHT	-	
18	BOT	-	

USED CABLE(CN1) :

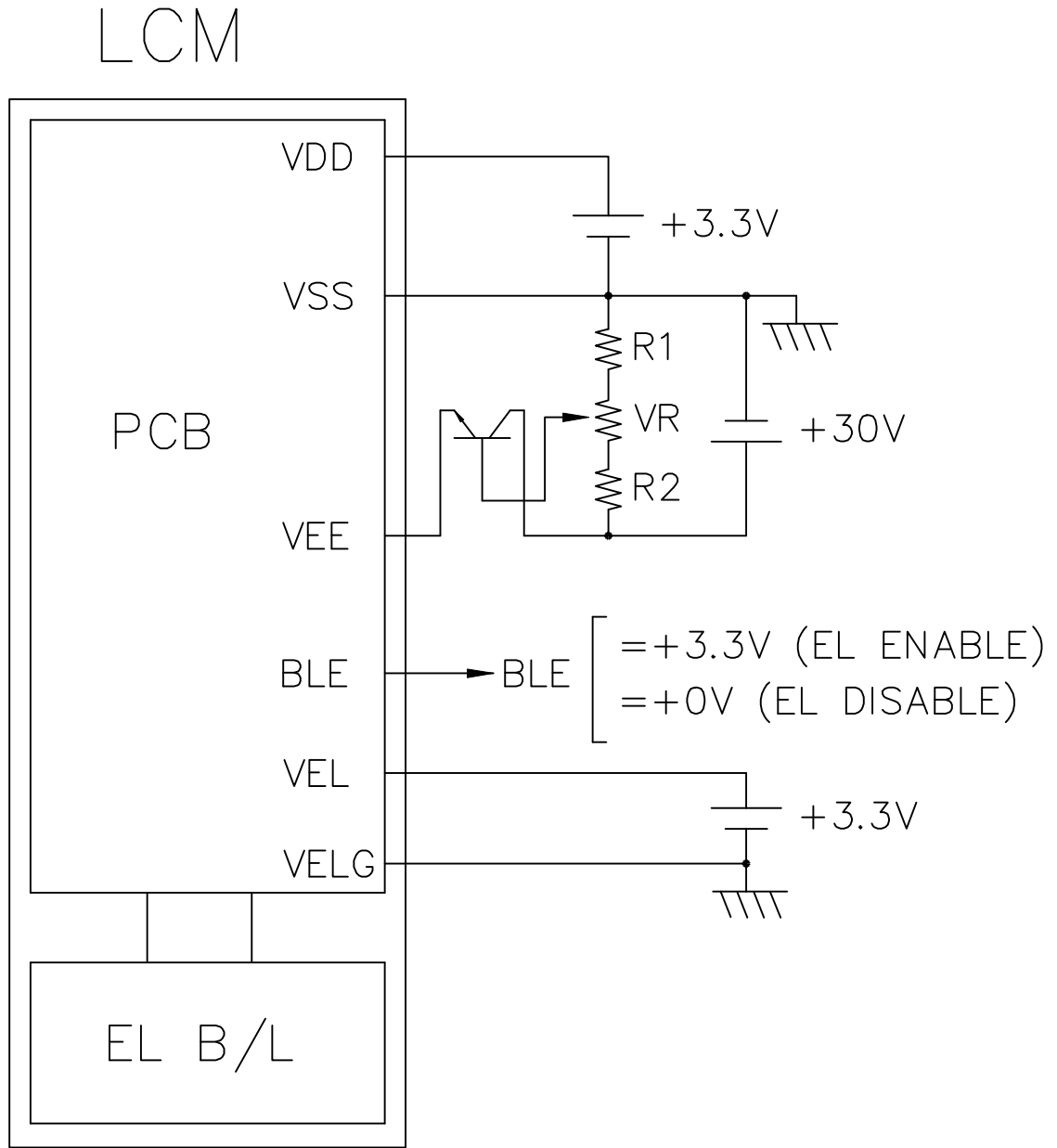
FFC,N18,PITCH=1.0mm,THICKNESS=0.3mm

MATING CONNECTOR :

MOLEX 52207-1890 or COMPATIBLE

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# 7. POWER SUPPLY



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

# 8. TIMING CHARACTERISTICS

## 8-1 INTERFACE TIMING

© VDD=3.3V±10%, Ta=-20~70°C

Item	Symbol	Test condition	Min.	Typ.	Max.	Unit
Clock Cycle	tC	Fig.a	500	-	-	ns
SCP Pulse Width	tSWH,tSWL	Fig.a	240	-	-	ns
Data Set Up Time	tDSU	Fig.a , Fig.b	240	-	-	ns
Data Hold Time	tDHD	Fig.a , Fig.b	240	-	-	ns
SCP Rise/Fall Time	tr,tf	Fig.a , Fig.b	-	-	50	ns
LP Rise Time	tLRP	Fig.a	240	-	-	ns
LP Fall Time	tLFP	Fig.a	240	-	-	ns
LP Pulse Width	tLW	Fig.a	240	-	-	ns
SCP To LP Delay Time	tSL	Fig.a	50	-	-	ns
LP To SCP Delay Time	tLS	Fig.a	100	-	-	ns
LP "H" Pluse Width	tCWH	Fig.b	40	-	-	ns
LP "L" Pluse Width	tCWL	Fig.b	170	-	-	ns

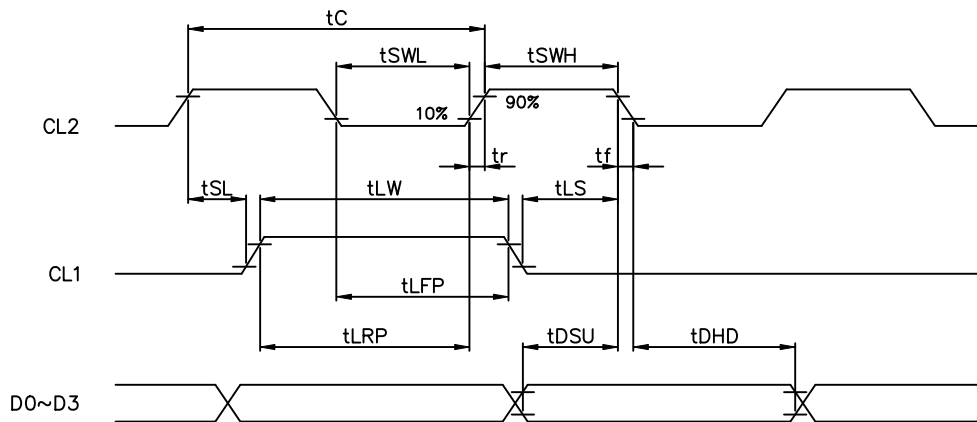


Fig . a Interface timing (SEGMENT)

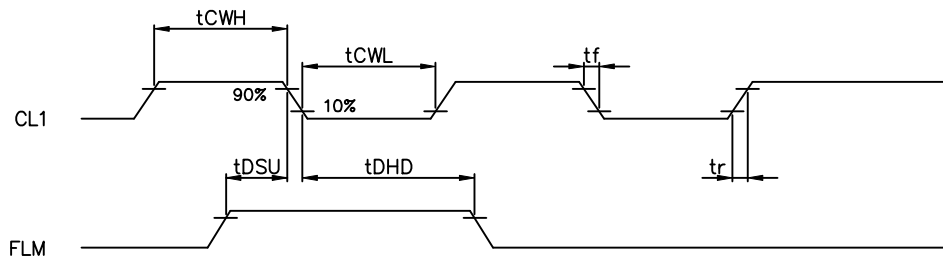
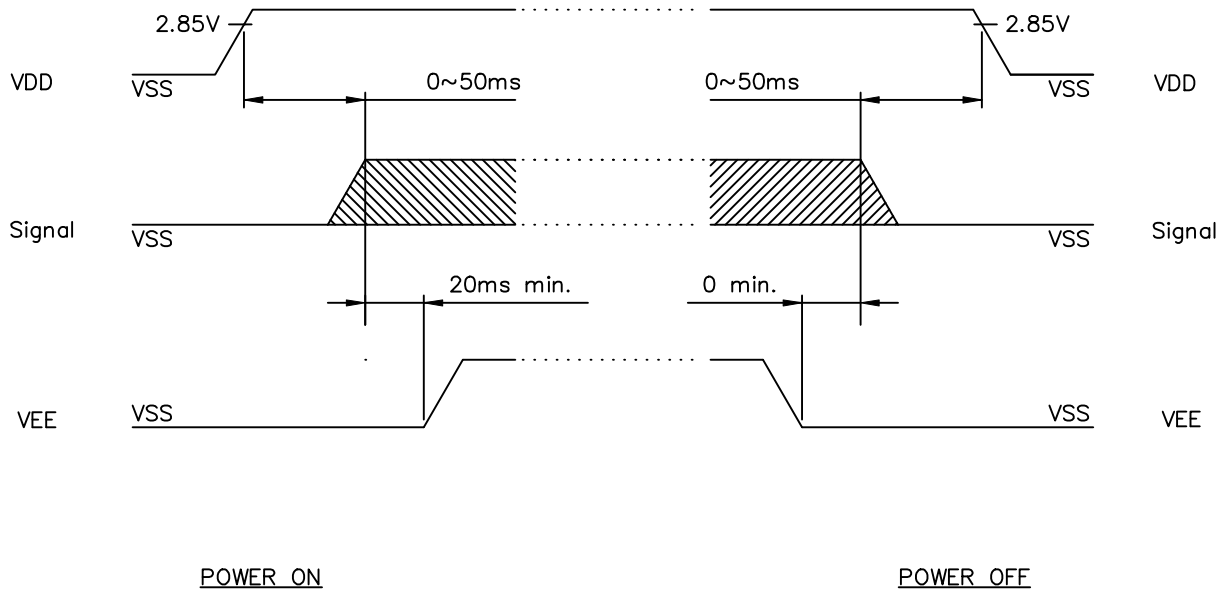


Fig . b Interface timing (COMMON)

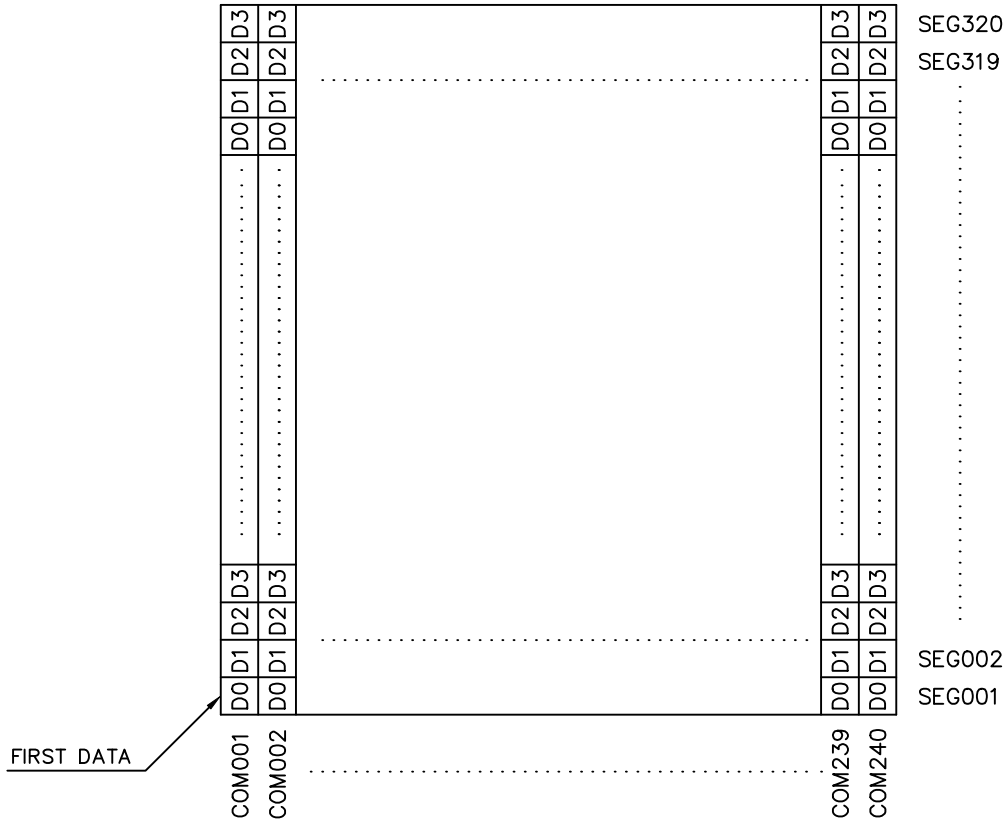
REV/DATE	RO/ 01.14.99'					APP	CHK	BY
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### 8-2 POWER ON/OFF TIMING



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

### 8-3 DISPLAY PATTERN



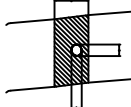
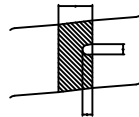
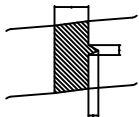
240 X 320 Dots Matrix

## 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>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													

(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

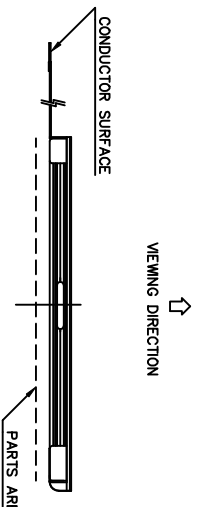
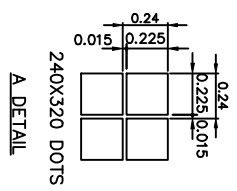
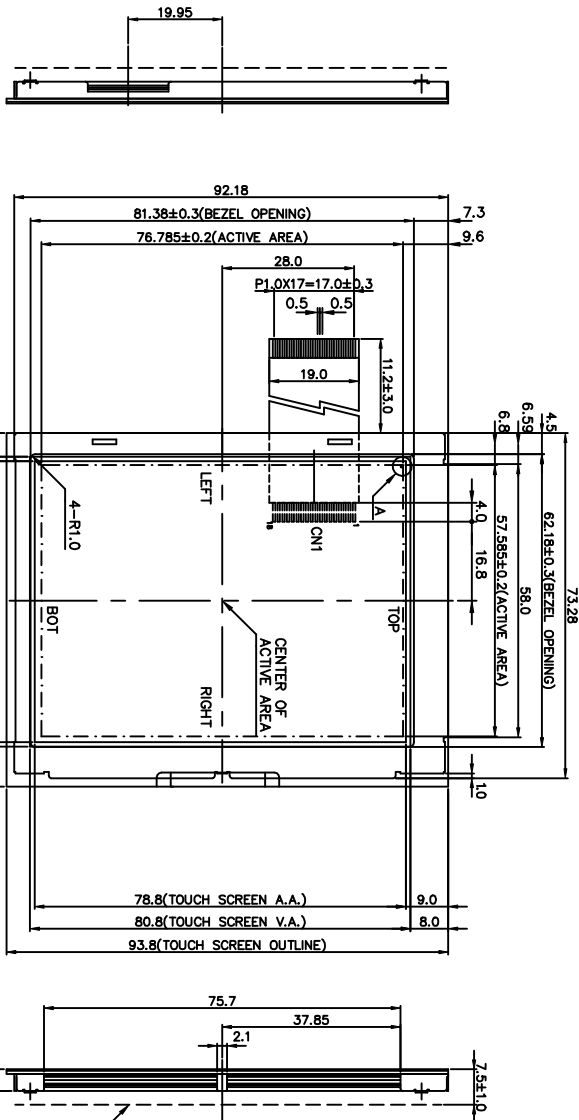
- 1.Acceptance inspection period  
The inspection period is within one month after the arrival of the contracted goods at the buyer's factory site.
- 2.Applicable warranty period  
The warranty period is within twelve months from the date of invoice under normal usage and storage conditions.

• TYPICAL OPERATING LIFETIME OF BACKLIGHT

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

REV/DATE	RO/ 01.14.99'					APP	CHK	BY
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INTERFACE CONNECTION(CN1)

Pin No.	Symbol	Function
1	CL2	Data Shift Clock Signal
2	CL1	Data Latch Signal
3	FLM	First Line Marker
4	M	Alternate Signal
5	D0	Display Data
6	D1	
7	D2	
8	D3	
9	VEE	Power Supply for LCD(+V)
10	VDD	Power Supply for Logic(+)
11	VSS	Power Supply for Logic(+)
12	BLE	H:EL Enable, L:EL Disable
13	VELG	Power Supply for EL(GND,0V)
14	VEL	Power Supply for EL(+)
15	LEFT	Touch Panel Connection
16	TOP	
17	RIGHT	
18	BOT	

NOTE :

1. RESOLUTION : 240 X 320 DOTS
2. BACKLIGHT : EL Backlight, Blue-Green
3. TOLERANCE NO SPECIFIED : ±0.5 mm

產品編號	LTD79H202L5GK	南亞塑膠工業股份有限公司
NAME	DATE	NAN YA PLASTICS CORPORATION
APPROVE		製圖
CHECK		DWG-NO
DESIGN		TDBH202L5GK
DRAW	MAY PING 87.12.03	Rev.A
		UNIT : mm
		SCALE : 2/3