

NAN YA PLASTICS CORPORATION

SPECIFICATION OF
LCD MODULE
PRODUCT NO.: LTA75_227_1_

SPEC. NO.: LT227-1-△

CUSTOMER
APPROVED BY
DATE:

LCD DEPARTMENT
ELECTRONIC MATERIALS DIVISION
NAN YA PLASTICS CORPORATION
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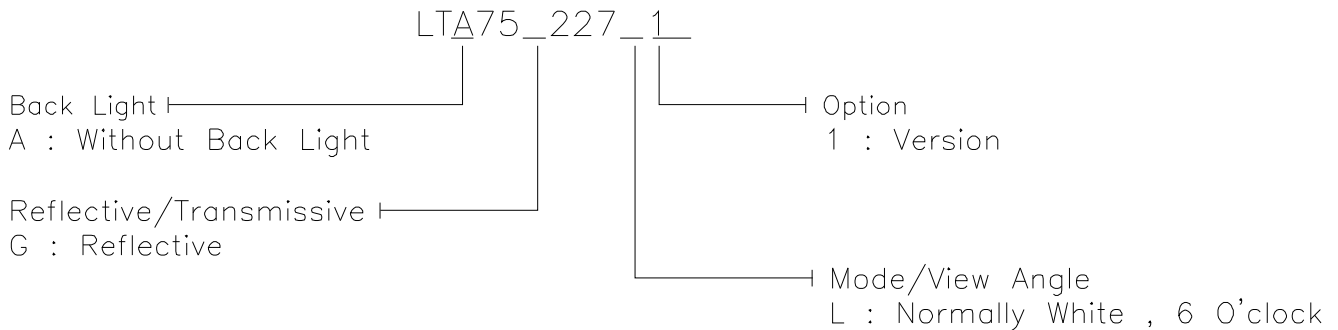
EDITED ON : APR. 15, 1999

SALE MANAGER	TECHNICAL APPROVE	DESIGN MANAGER	DESIGN CHECK	DESIGNER

1. MECHANICAL DATA

(1) Product No.	LTA75_227_1_
(2) Module Size	74.6MAX(W)mm X 56.1MAX(H)mm X 4.5 MAX (D)mm
(3) Dot Size	0.23 (W)mm X 0.23 (H)mm
(4) Dot Pitch	0.24 (W)mm X 0.24 (H)mm
(5) Number of Dots	240 (W) X 160 (H) Dots
(6) Duty	1/160
(7) LCD Display Mode	FSTN:Black and White(Normally White/Positive Image) Rear Polarizer: Reflective
(8) Viewing Direction	6 O'clock
(9) Backlight	Excluded
(10) Weight	15 g(approx)
(11) Controller	Excluded
(12) DC/DC Converter	Excluded

Note :



REV/DATE	R0/ 04.15.98'					APP	CHK	BY
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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	NORMAL TEMP.			
	OPERATING		STORAGE	
	MIN.	MAX.	MIN.	MAX.
Ambient Temperature	0	50	-20	70
Humidity(Without Condensation)	Note 2,4		Note 3,5	

Note 1 LCM should be grounded during handling LCM.

Note 2 $T_a \leq 70^\circ\text{C}$: 85%RH max

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

than the humidity of 85%RH at 50°C

Note 3 T_a 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 $T_a \leq 70^\circ\text{C}$: 75%RH max

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

than the humidity of 75%RH at 70°C

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 (Normal TEMP. LCM)	VEE-VSS (Vop)	1/160 Duty	0°C	20.4	20.8	21.2	V
			25°C	19.0	19.4	19.8	
		1/13 Bias	50°C	17.3	17.7	18.1	
Power Supply Current	IDD	VDD = 3.3V VSS = 0V VEE-VSS = 19.4V FLM = 70Hz		-	0.07	-	mA
	IEE	PATTERN : 		-	0.4	0.8	

4.OPTICAL CHARACTERISTICS

AT V_{OP}

ITEM MODE		Cr(Contrast Ratio)						θ (Viewing Angle)		ϕ (Viewing Angle)	
		0°C		25°C		50°C		25°C		25°C	
		MIN.	TYP.	MIN.	TYP.	MIN.	TYP.	MIN.	TYP.	MIN.	TYP.
G	L	-	5.5	-	5.0	-	4.0	-	74	-	74
NOTE		NOTE6						NOTE5			

NOTE :

G REFLECTIVE

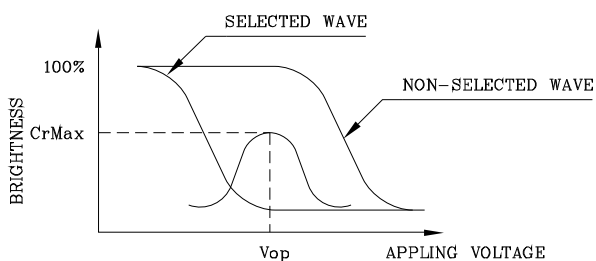
L NORMALLY WHITE 6 O'CLOCK

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

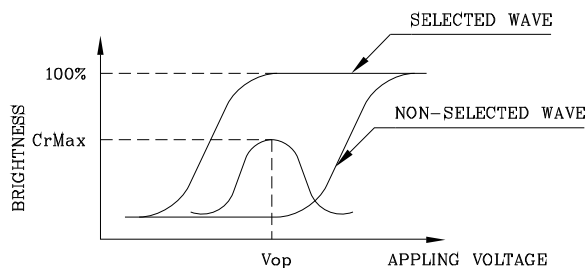
ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Response Time (rise)	Tr	0°C	-	700	1050	ms	NOTE 2
		25°C	-	200	300		
		50°C	-	100	150		
Response Time (fall)	Tf	0°C	-	550	850	ms	NOTE 2
		25°C	-	150	230		
		50°C	-	70	110		

(NOTE 1)

Definition of Operation Voltage(Vop)



(positive type)



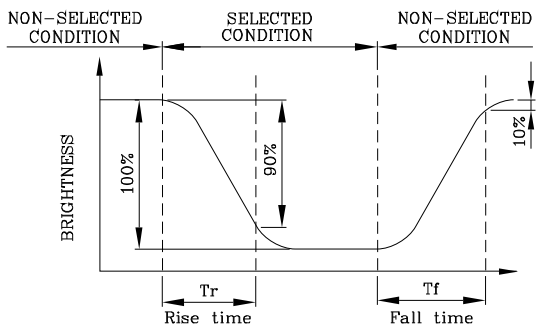
(negative type)

*Conditions

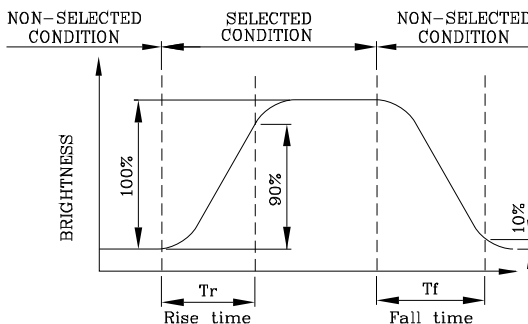
Viewing Angle : 0
Frame Frequency : 70Hz
Applying Waveform : 1/N duty 1/a bias

(NOTE 2)

Definition of Response Time(Tr,Tf)



(positive type)



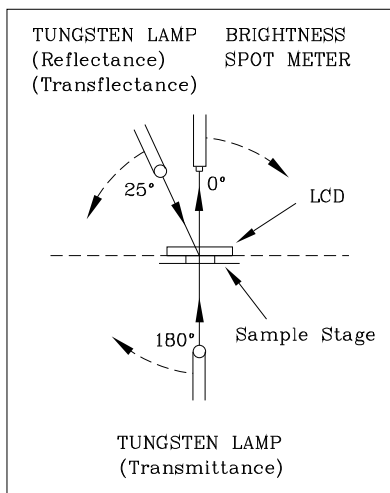
(negative type)

*Conditions

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

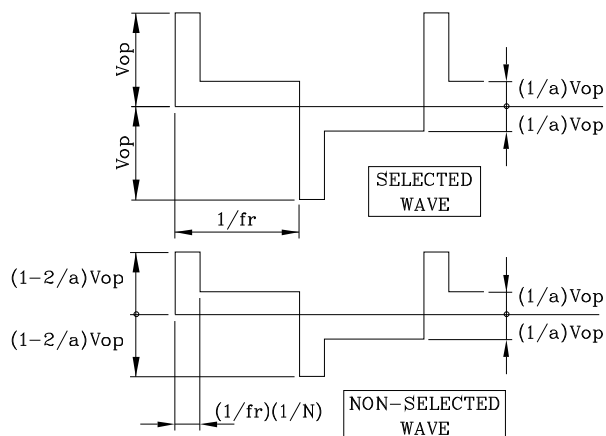
(NOTE 3)

Description of Measuring Equipment and Driving Waveforms



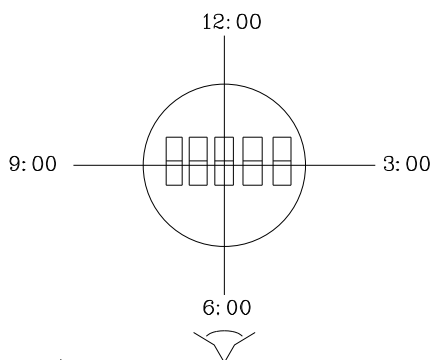
CONST.
TEMP.
CHAMBER

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



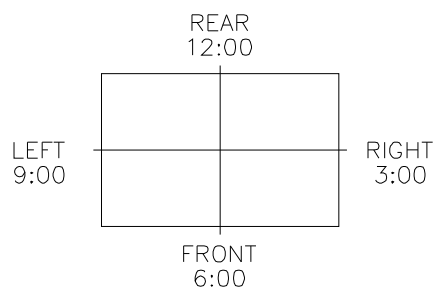
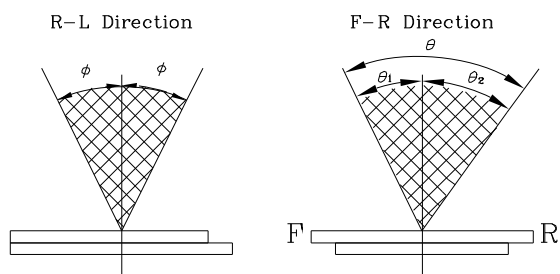
(NOTE 4)

Definition of Viewing Direction



(NOTE 5)

Definition of Viewing Angle



*For This Product
 The Viewing Direction Is 6 O'clock
 So $\theta_1 > \theta_2$

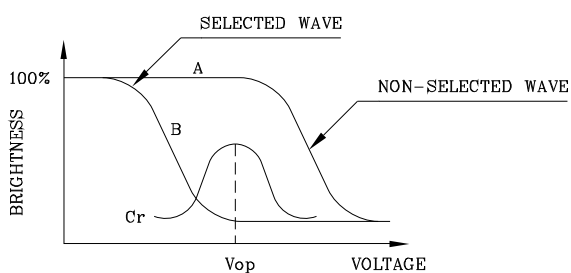
$$\theta = \theta_1 + \theta_2$$

*Conditions

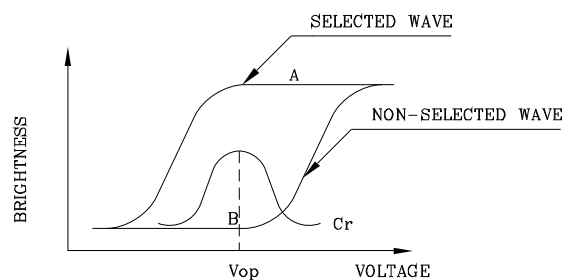
Operating Voltage : V_{op}
 Frame Frequency : 70Hz
 Applying Waveform : 1/N duty 1/a bias
 Contrast Ratio : larger than 2

(NOTE 6)

Definition of Contrast Ratio (Cr)



(positive type)



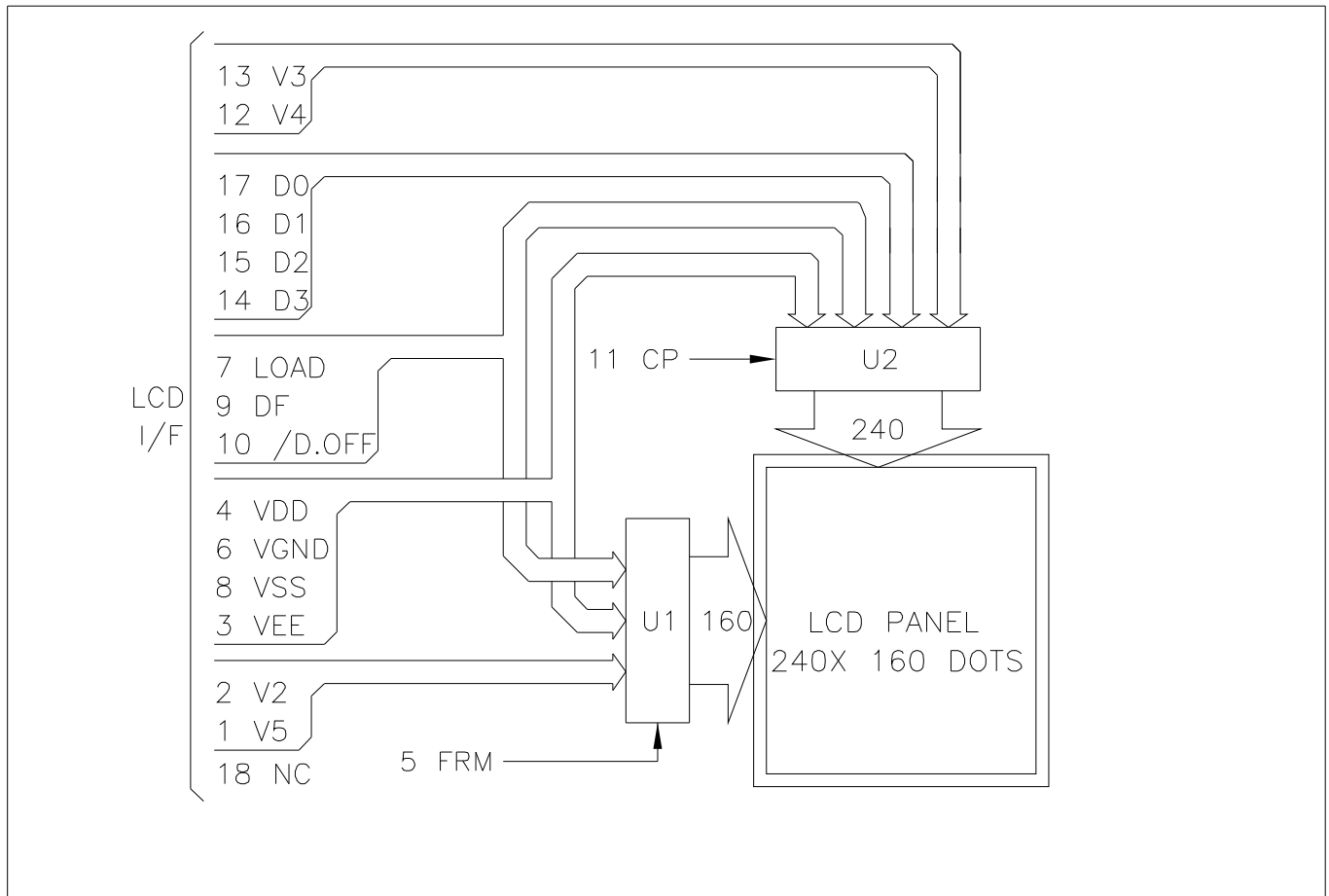
(negative type)

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

*Conditions

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

5. BLOCK DIAGRAM



Note1 :

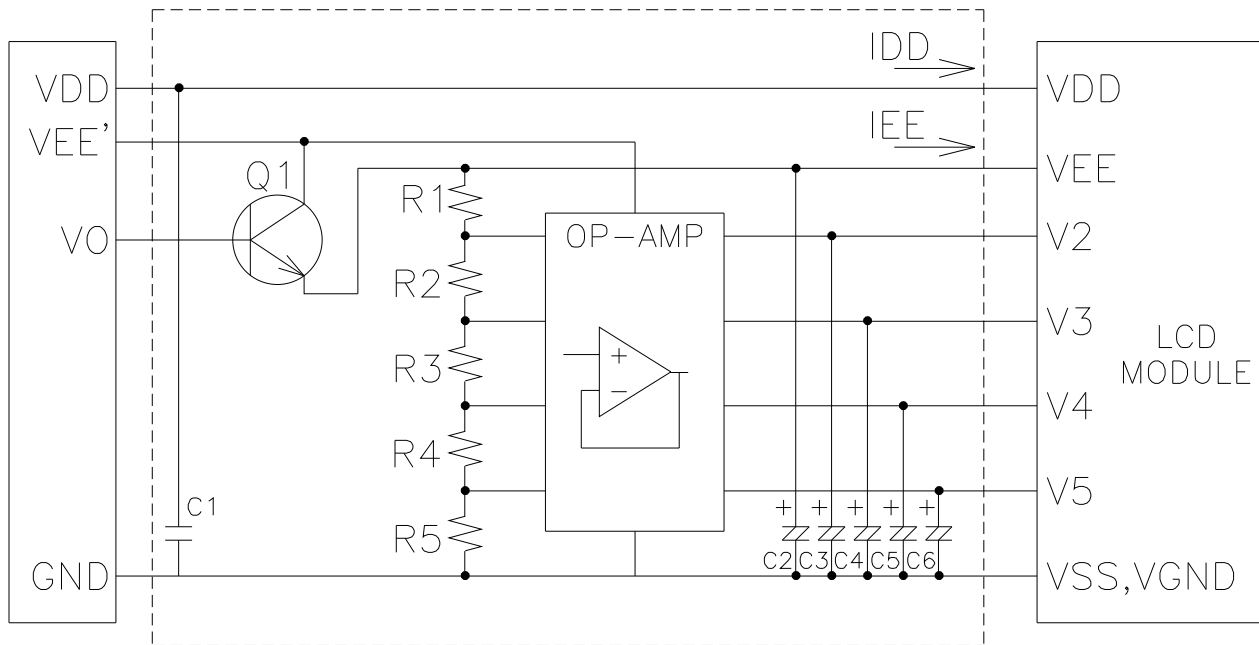
- 1) Controller and bias voltage supply circuit are not included.
- 2) VEE, VGND, V2, V3, V4 and V5 are power supply voltage for LCD.
(VEE > V2 > V3 > V4 > V5 > VGND)
- 3) The bias is 1/13, $VOP = VEE - VSS = 19.4$ V.

6. INTERNAL PIN CONNECTION

LCD

Pin No.	Symbol	Function
1	V5	Bias voltage for non-select (Common driver)
2	V2	Bias voltage for non-select (Common driver)
3	VEE	Power supply for LCD (+V)
4	VDD	Power supply for logic (+3.3V)
5	FRM	Frame start signal (Data signal of the shift register of the common driver)
6	VGND	GND, Power supply for LCD
7	LOAD	1) Latch pulse of display data 2) Shift clock for common driver
8	VSS	GND
9	DF	Switch signal to convert LCD drive waveform into AC
10	/D.OFF	H : Display ON, L : Display OFF
11	CP	Clock pulse for segment shift register
12	V4	Bias voltage for non-select (Segment driver)
13	V3	Bias voltage for non-select (Segment driver)
14	D3	Input data signal
15	D2	Input data signal
16	D1	Input data signal
17	D0	Input data signal
18	N.C.	No connectoin

7. POWER SUPPLY



Q1 :2SC1815

OP-AMP :LP324

$R1=R2=R4=R5=10K\Omega, R3=9R1=91K\Omega(1/13 \text{ Bias})$

$C1=0.1\mu F, C2\sim C6=3.3\mu F$

Note 1 : These are general values.

In case to decrease LCD driving voltage with minimizing bias value, set these values with check display to avoid display's deterioration (response etc).

8. TIMING CHARACTERISTICS

8-1 INTERFACE TIMING

@ VDD=3.3V±10%, Ta= 0~50 °C

Item	Symbol	Test condition	Min.	Typ.	Max.	Unit
CP Cycle Time	tC	Fig.a	82	-	-	ns
CP Pulse Width	tSWH,tSWL	Fig.a	28	-	-	ns
CP Rise/Fall Time	tCR,tCF	Fig.a	-	-	50	ns
Data Set Up Time	tDSU	Fig.a , Fig.b	20	-	-	ns
Data Hold Time	tDHD	Fig.a , Fig.b	23	-	-	ns
LOAD Cycle Time	tL	Fig.b	250	-	-	ns
LOAD "H" Pulse Width	tLWH	Fig.a , Fig.b	30	-	-	ns
LOAD Rise/Fall Time	tLR,tLF	Fig.b	-	-	50	ns
CP To LOAD Delay Time	tCL	Fig.a	30	-	-	ns
LOAD To CP Delay Time	tLC	Fig.a	65	-	-	ns
FRM TO LOAD SETUP TIME	tFLS	Fig.b	30	-	-	ns
FRM TO LOAD HOLD TIME	tFLH	Fig.b	50	-	-	ns

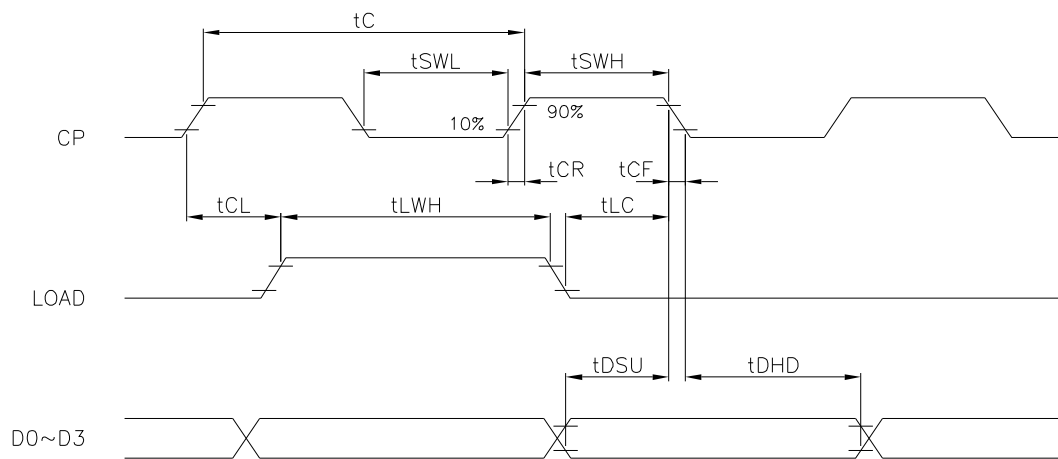


Fig . a Interface timing (SEGMENT)

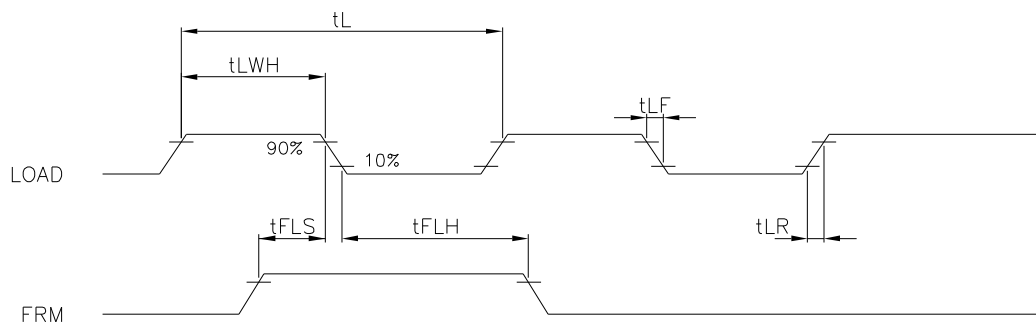
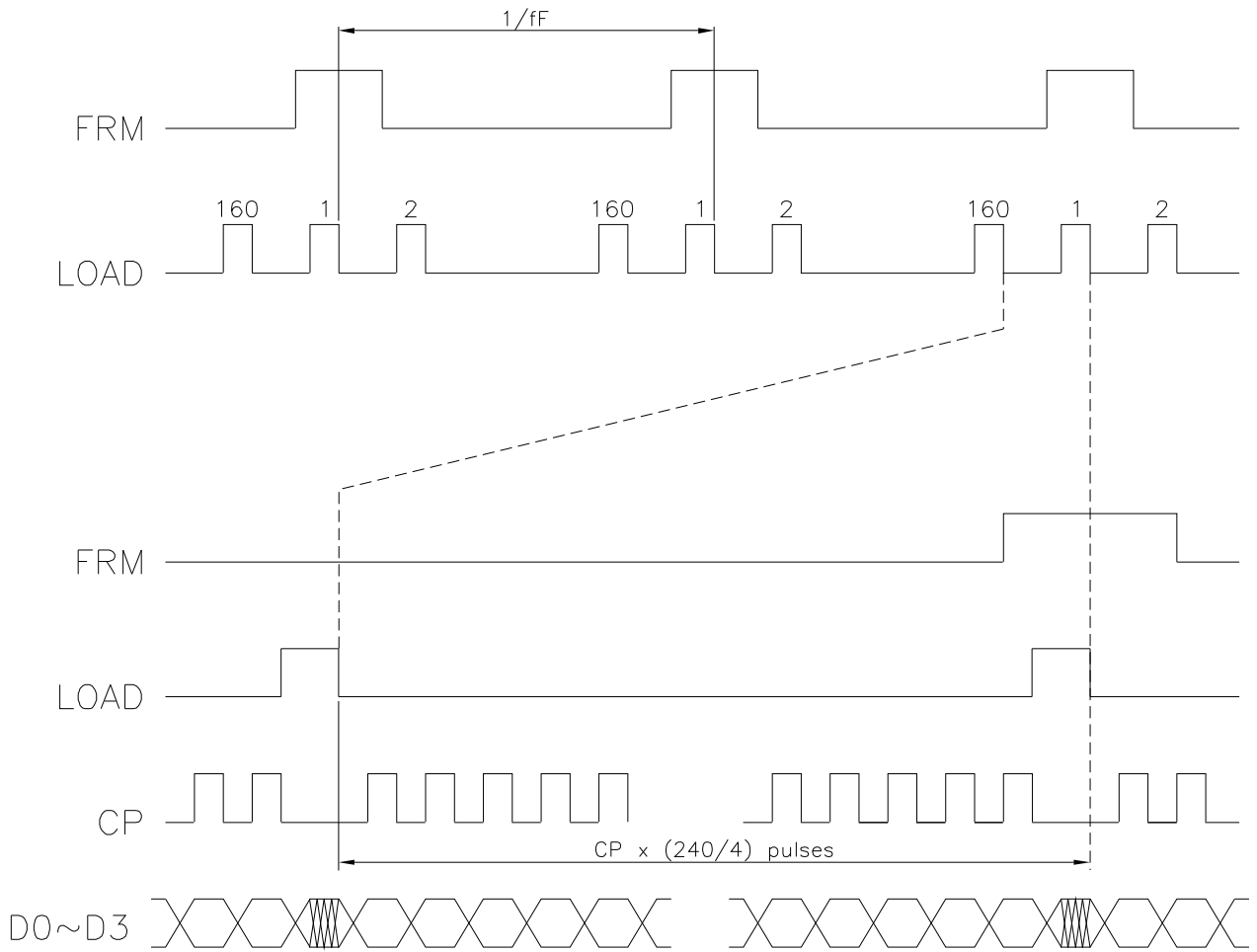


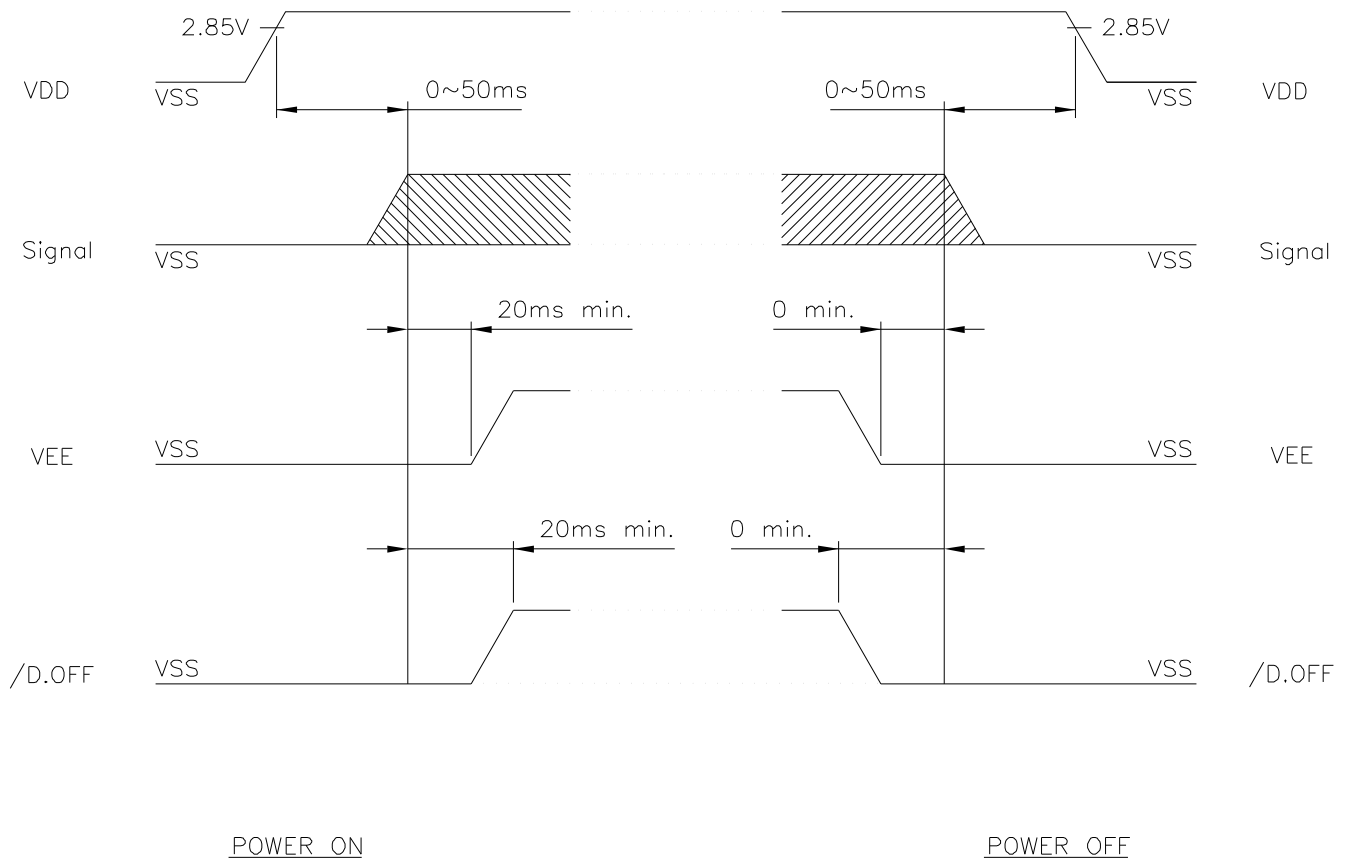
Fig . b Interface timing (COMMON)

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8-2 TIMING CHART OF INPUT SIGNAL



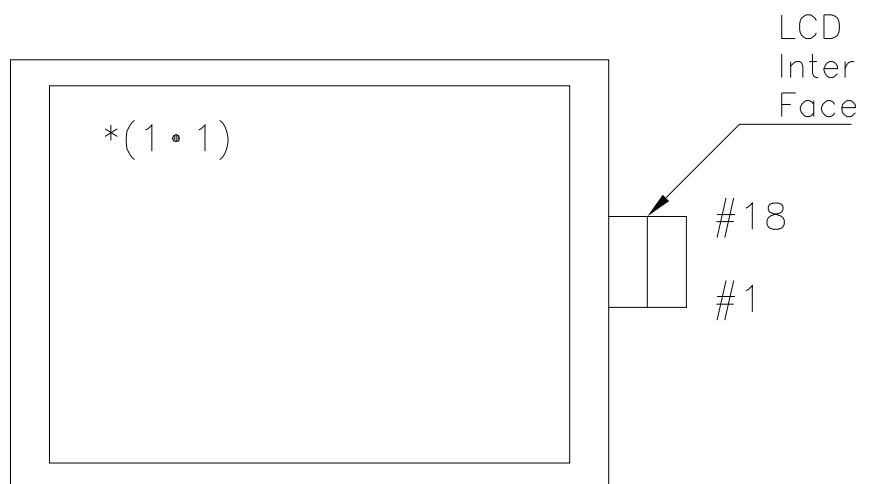
8-3 POWER ON/OFF TIMING



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

8-4 DISPLAY PATTERN

	Column1	Column2	Column3	Column4	Column240
Row 1	1•1	1•2	1•3	1•4	1•240
Row 2	2•1	2•2	2•3		
Row 3	3•1	3•3			
	D0: (1•4)↘ (1•8) (160•240) D1: (1•3)↘ (1•7) (160•239) D2: (1•2)↘ (1•6) (160•238) D3: (1•1)↘ (1•5) (160•237)				
Row 160	160•1				160•240

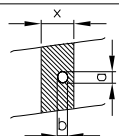
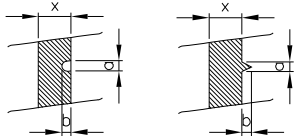


9. RELIABILITY TEST

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 HUMI. STORAGE	40°C 90%RH	120HR		Appearance without defect	
4	THERMAL SHOCK	-20°C,30min→25°C,5min →70°C,30min→25°C,5min (1cycle)			Appearance without defect	5 cycles

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>$a \leq 0.20$</td> <td>NEGLECT</td> </tr> <tr> <td>$0.20 < a \leq 0.35$</td> <td>5 MAX</td> </tr> <tr> <td>$0.35 < a$</td> <td>NONE</td> </tr> </tbody> </table>	DIAMETER mm (a*)	NO. OF DEFECT*	$a \leq 0.20$	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>$W \leq 0.03$</td> <td>NEGLECT</td> </tr> <tr> <td>$L \leq 3$</td> <td>$0.03 < W \leq 0.08$</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	$W \leq 0.03$	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>$a \leq 0.15$</td> <td>NEGLECT</td> </tr> <tr> <td>$0.15 < a \leq 0.20$</td> <td>2 MAX</td> </tr> <tr> <td>$0.20 < a$</td> <td>NONE</td> </tr> </tbody> </table>	DIAMETER mm (a*)	NO. OF DEFECT*	$a \leq 0.15$	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 get 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

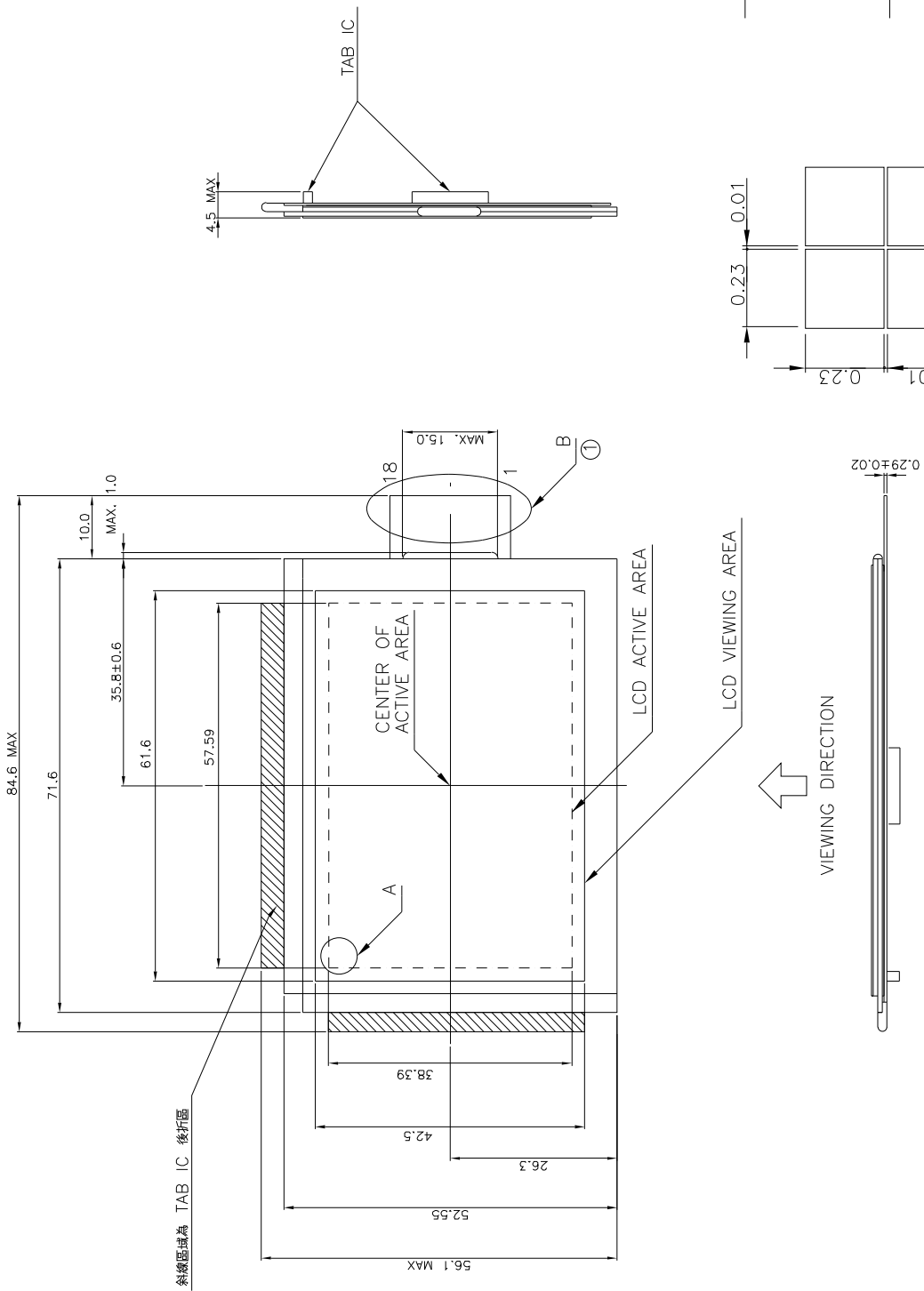
- 1.Avoid static electricity which can damage the CMOS LSI.
- 2.Do not remove the panel or frame from the module.
- 3.The polarizing plate of the display is very fragile. So, please handle it very carefully.
- 4.Do not wipe the polarizing plate with a dry cloth, as it may easily scratch the surface of plate.
- 5.Do not use ketonics solvent & Aromatic solvent, use with a soft cloth soaked with a cleaning naphtha solvent.

• 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 WARRANT

- 1.Acceptance inspection period
The period is within one month after the arrival of contracted commodity at the buyer's factory site.
- 2.Applicable warrant period
The period is within twelve months since the date of shipping out under normal using and storage conditions.



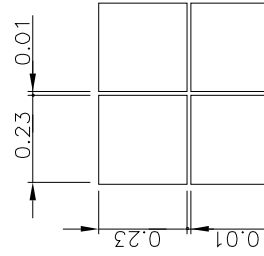
① LCD CONNECTION

Pin No.	Symbol	Pin No.	Symbol
1	V5	10	/D.OFF
2	V2	11	CP
3	VEE	12	V4
4	VDD	13	V3
5	FRM	14	D3
6	VGND	15	D2
7	LOAD	16	D1
8	VSS	17	D0
9	DF	18	NC

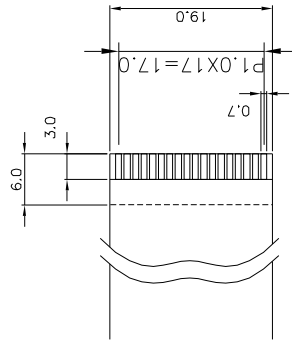
TOLERANCE LIST(S)

DIMENSION	TOLERANCE
$L \leq 6$	± 0.25 (mm)
$6 < L \leq 18$	± 0.3 (mm)
$18 < L \leq 50$	± 0.4 (mm)
$50 < L \leq 125$	± 0.5 (mm)
$125 < L$	± 0.6 (mm)

NOTE : 1.RESOLUTION : 240X160 DOTS



A DETAIL



B DETAIL (透視圖)
SCALE=1/1

產品編號	LTA75G227L1	南亞塑膠工業股份有限公司
APPROVE	NAME	NAN YA PLASTICS CORPORATION
CHECK	DATE	
DESIGN	TITLE	製晶圖
DRAW	DWG-NO	TAAG227L1
	MAY PING	Rev.A
	88.04.15	UNIT : mm
		SCALE : 1/1