



# NAN YA PLASTICS CORPORATION

SPECIFICATION OF  
LCD MODULE  
PRODUCT NO.: LTA75\_227\_

SPEC. NO.: LT227-0- $\triangle$

CUSTOMER
APPROVED BY
DATE:

LCD DEPARTMENT  
ELECTRONIC MATERIALS DIVISION  
NAN YA PLASTICS CORPORATION  
201, TUNG HWA N. ROAD, TAIPEI  
TEL: 886-2-27122211 EXT. 5993~5995  
FAX: 886-2-27178253  
E-mail: lcdsales@npc.com.tw

EDITED ON : APR. 02, 1999

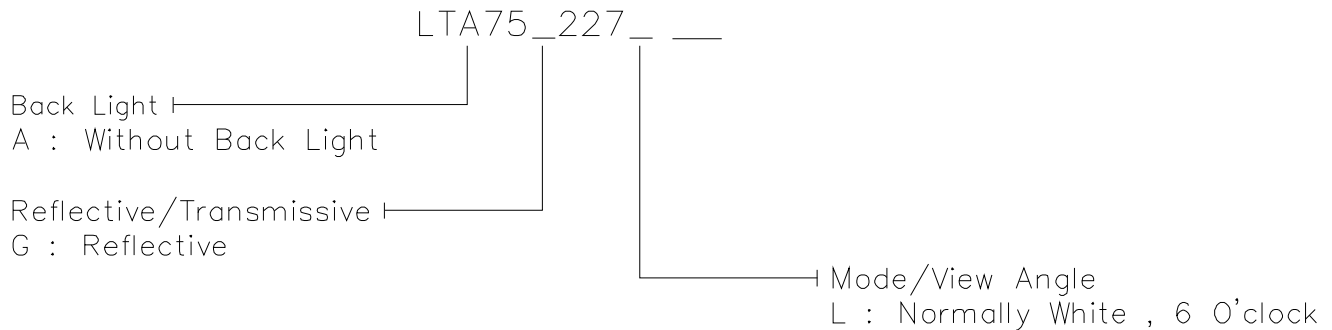
SALE MANAGER	TECHNICAL APPROVE	DESIGN MANAGER	DESIGN CHECK	DESIGNER



# 1. MECHANICAL DATA

(1) Product No.	LTA75_227_
(2) Module Size	74.6 (W)mm X 56.1 (H)mm X 5.5 (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
(11) Controller	Excluded
(12) DC/DC Converter	Excluded

Note :



REV/DATE	R0/ 12.01.98'	R1/ 04.02.99'				APP	CHK	BY
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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	VEE-VSS	0	27	V	
Static Electricity	-	-	-	-	Note 1

### (2) ENVIRONMENTAL ABSOLUTE MAXIMUM RATINGS

ITEM	OPERATING		STORAGE	
	MIN.	MAX.	MIN.	MAX.
Ambient Temperature	0	50	-20	70
Humidity (Without Condensation)	Note 2,4		Note 3,4	
Vibration(Note 5)	-		49m/s <sup>2</sup> (5G)	

Note 1 LCM should be grounded during handling LCM.

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 < 48 hrs, at 70°C will be < 120 hrs

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

Note 5

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

### 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	21.7	22.1	22.5	V
			25°C	19.9	20.3	20.7	
		1/13 Bias	50°C	18.0	18.8	18.4	
Power Supply Current	IDD	VDD = 3.3V VSS = 0V VEE-VSS = 20.3V FLM = 70Hz		-	0.07	-	mA
	IEE			-	0.4	0.8	

# 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.
G	L	-	8.0	-	8.0	-	5.0	-	74	-	74
NOTE		NOTE6						NOTE5			

NOTE :

G REFLECTIVE

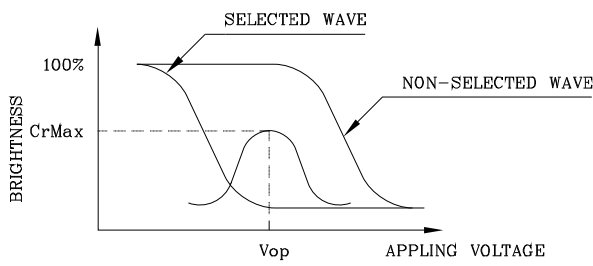
L NORMALLY WHITE 6 O'CLOCK

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

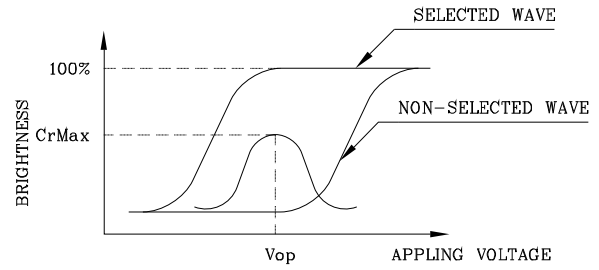
ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Response Time (rise)	Tr	0°C	-	885	879	ms	NOTE 2
		25°C	-	230	223		
		50°C	-	100	96		
Response Time (fall)	Tf	0°C	-	305	299	ms	NOTE 2
		25°C	-	115	108		
		50°C	-	65	58		

(NOTE 1)

Definition of Operation Voltage(Vop)



(positive type)



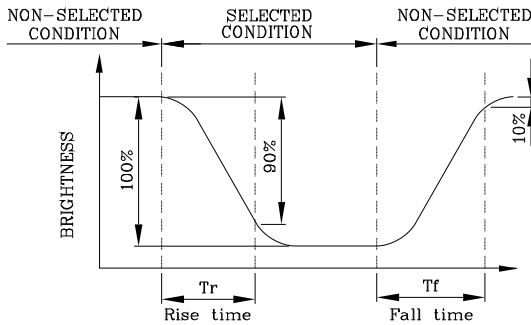
(negative type)

\*Conditions

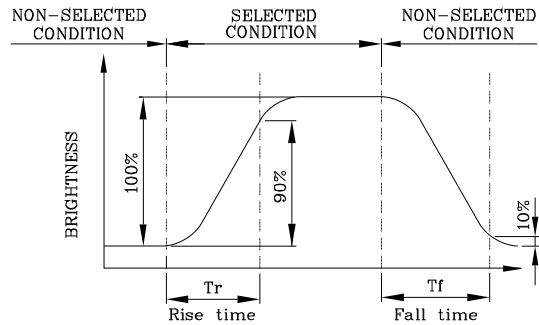
Viewing Angle : 0  
Frame Frequency : 70Hz  
Applying Waveform : 1/N duty 1/a bias

(NOTE 2)

Definition of Response Time(Tr,Tf)



(positive type)



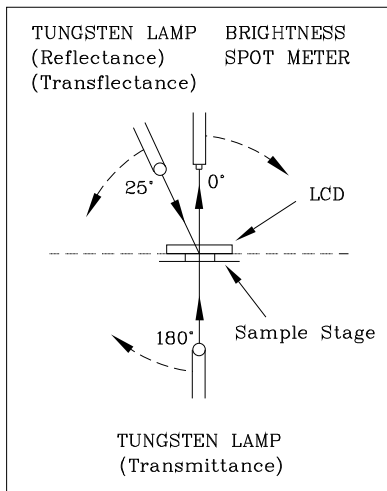
(negative type)

\*Conditions

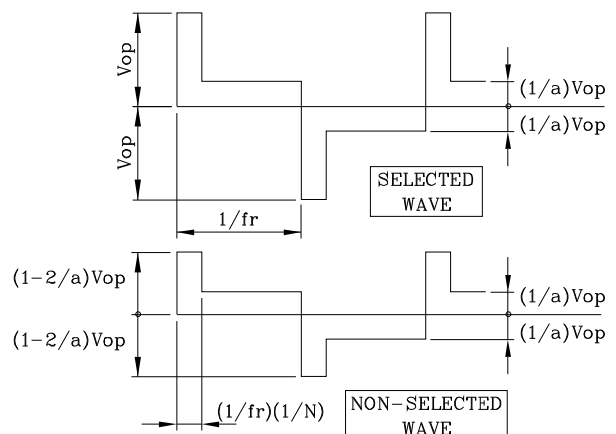
Operating Voltage : Vop  
Viewing Angle (θ,φ) : (0,0)  
Frame Frequency : 70Hz  
Applying Waveform : 1/N duty 1/a bias

(NOTE 3)

Description of Measuring Equipment and Driving Waveforms

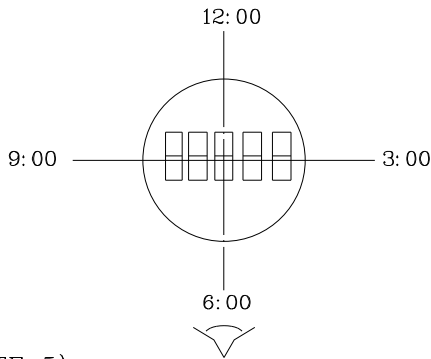


Multiplex Driving ( 1/N duty 1/a bias )



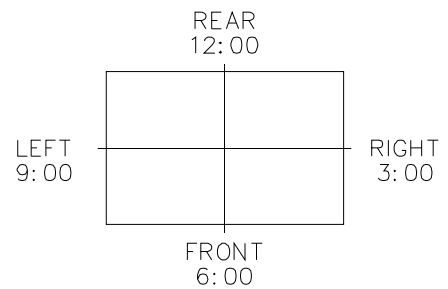
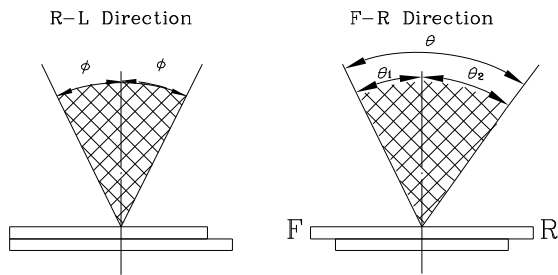
(NOTE 4)

Definition of Viewing Direction



(NOTE 5)

Definition of Viewing Angle



\*For This Product

The Viewing Direction Is 6 O'clock  
 So  $\theta_1 > \theta_2$

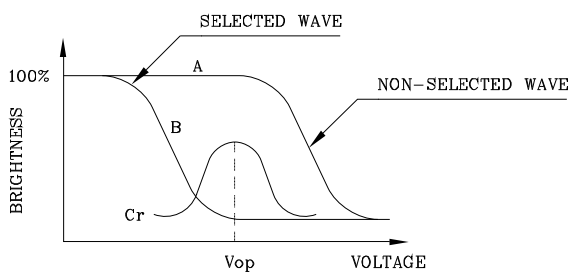
$$\theta = \theta_1 + \theta_2$$

\*Conditions

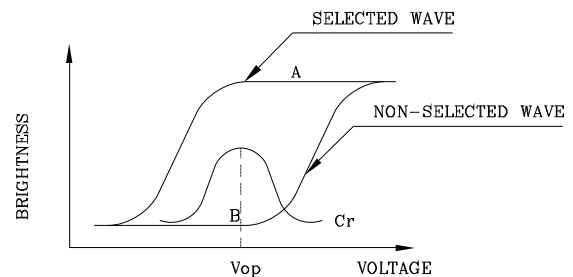
Operating Voltage :  $V_{op}$   
 Frame Frequency : 70Hz  
 Applying Waveform : 1/N duty 1/a bias  
 Contrast Ratio : larger than 2

(NOTE 6)

Definition of Contrast Ratio (Cr)



(positive type)



(negative type)

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

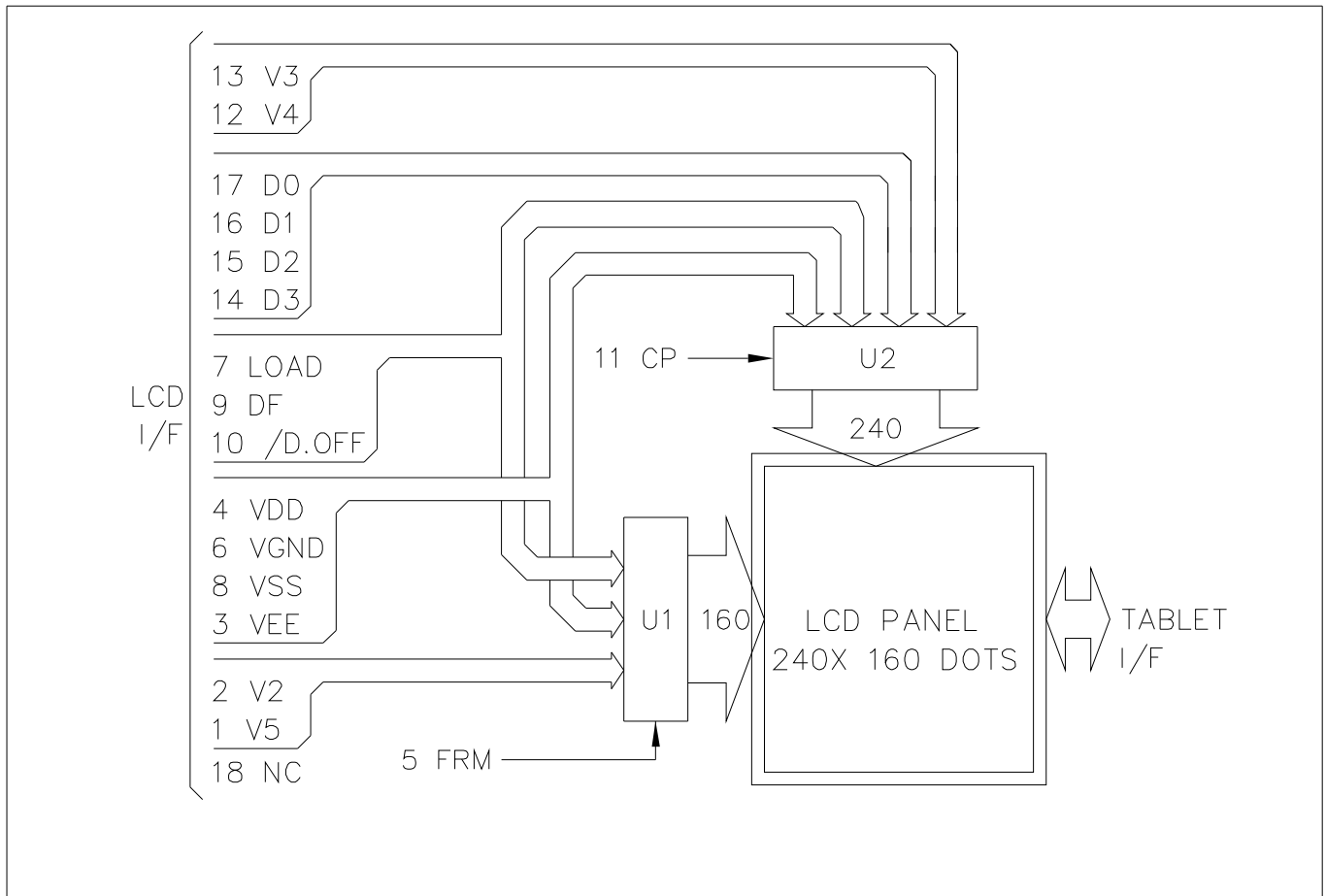
\*Conditions

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

REV/DATE	R0/ 12.01.98'	R1/ 04.02.99'				APP	CHK	BY
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## 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,  $VOP = VEE - VSS = 20.3 \text{ V}$ .

## 6. INTERNAL PIN CONNECTION

### LCD

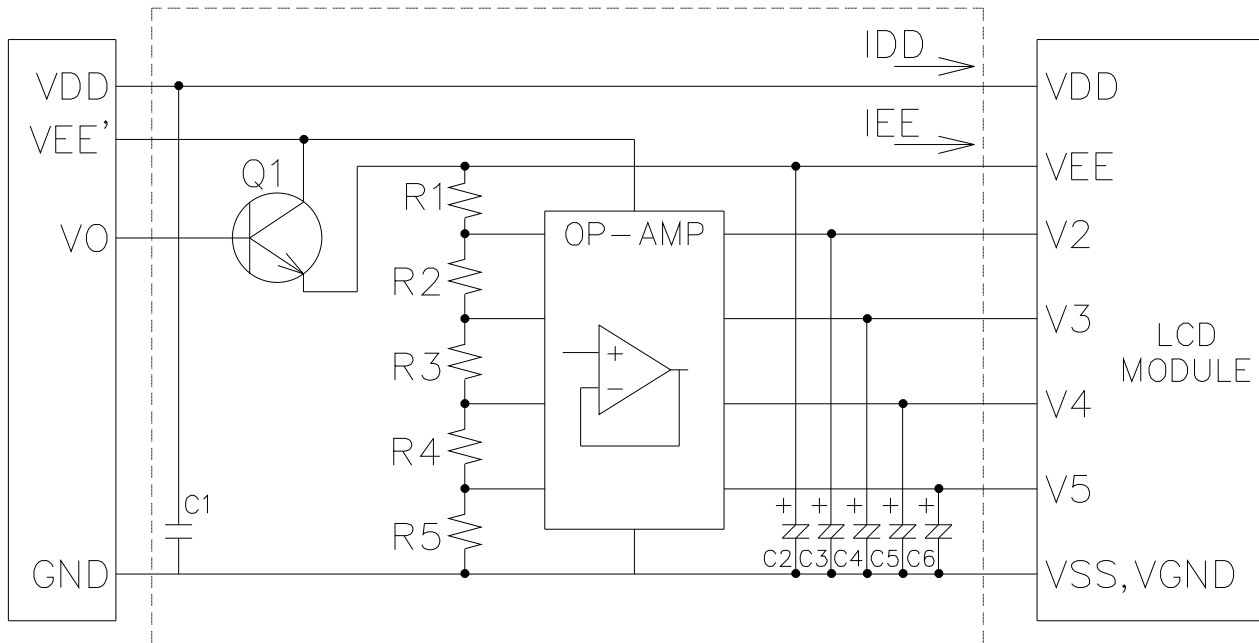
Pin No.	Symbol	Function
1	V5	Bias voltage for non-select (Common driver)
2	V2	Bias voltage for non-select (Common driver)
3	VEE	Power supply for LCD (+V)
4	VDD	Power supply for logic (+3.3V)
5	FRM	Frame start signal (Data signal of the shift register of the common driver)
6	VGND	GND, Power supply for 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

### TOUCH PANEL

Pin No.	Symbol
1	Y2
2	X1
3	Y1
4	X2

REV/DATE	R0/ 12.01.98'	R1/ 04.02.99'				APP	CHK	BY
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## 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	t <sub>C</sub>	Fig. a	82	-	-	ns
CP Pulse Width	t <sub>SWH</sub> , t <sub>SWL</sub>	Fig. a	28	-	-	ns
CP Rise/Fall Time	t <sub>CR</sub> , t <sub>CF</sub>	Fig. a	-	-	50	ns
Data Set Up Time	t <sub>DSU</sub>	Fig. a , Fig. b	20	-	-	ns
Data Hold Time	t <sub>DHD</sub>	Fig. a , Fig. b	23	-	-	ns
LOAD Cycle Time	t <sub>L</sub>	Fig. b	250	-	-	ns
LOAD "H" Pulse Width	t <sub>LWH</sub>	Fig. a , Fig. b	30	-	-	ns
LOAD Rise/Fall Time	t <sub>LR</sub> , t <sub>LF</sub>	Fig. b	-	-	50	ns
CP To LOAD Delay Time	t <sub>CL</sub>	Fig. a	30	-	-	ns
LOAD To CP Delay Time	t <sub>LC</sub>	Fig. a	65	-	-	ns
FRM TO LOAD SETUP TIME	t <sub>FLS</sub>	Fig. b	30	-	-	ns
FRM TO LOAD HOLD TIME	t <sub>FLH</sub>	Fig. b	50	-	-	ns

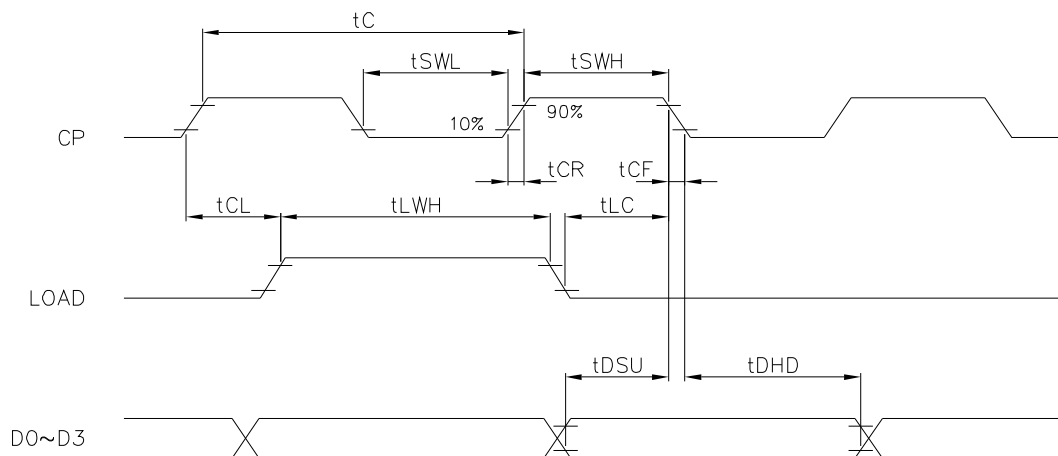


Fig . a Interface timing (SEGMENT)

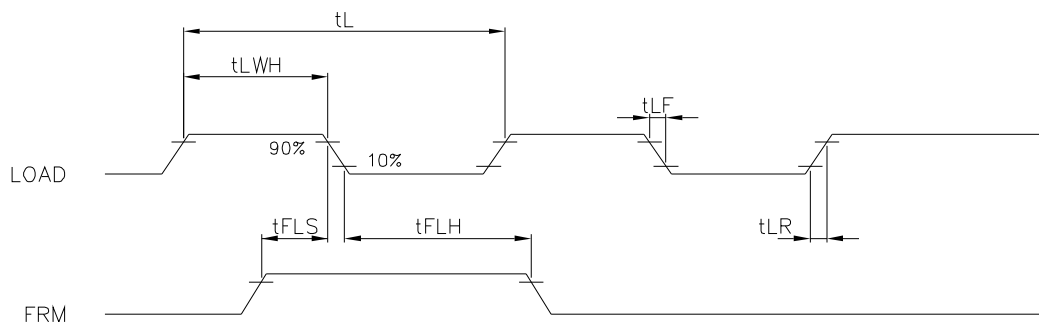
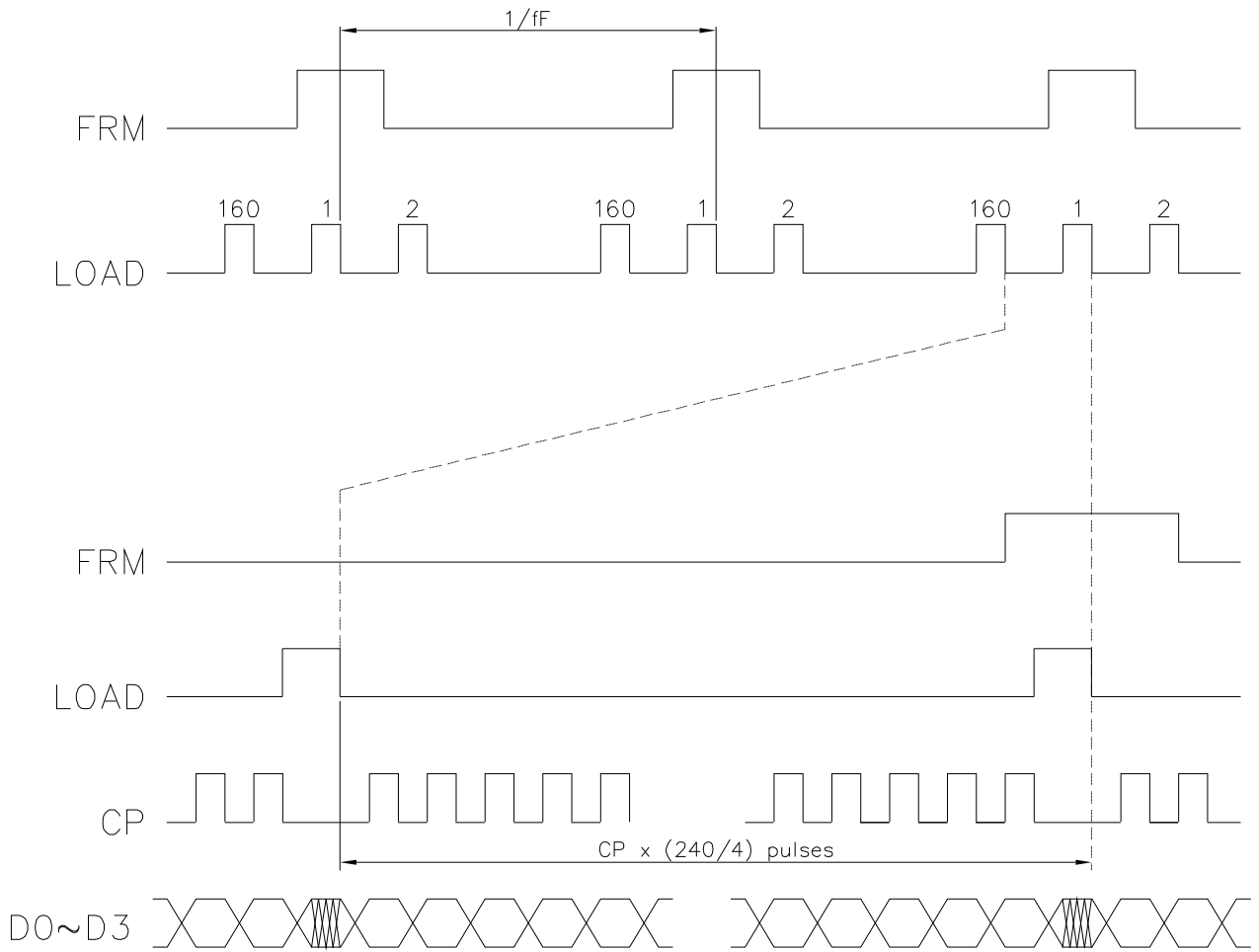


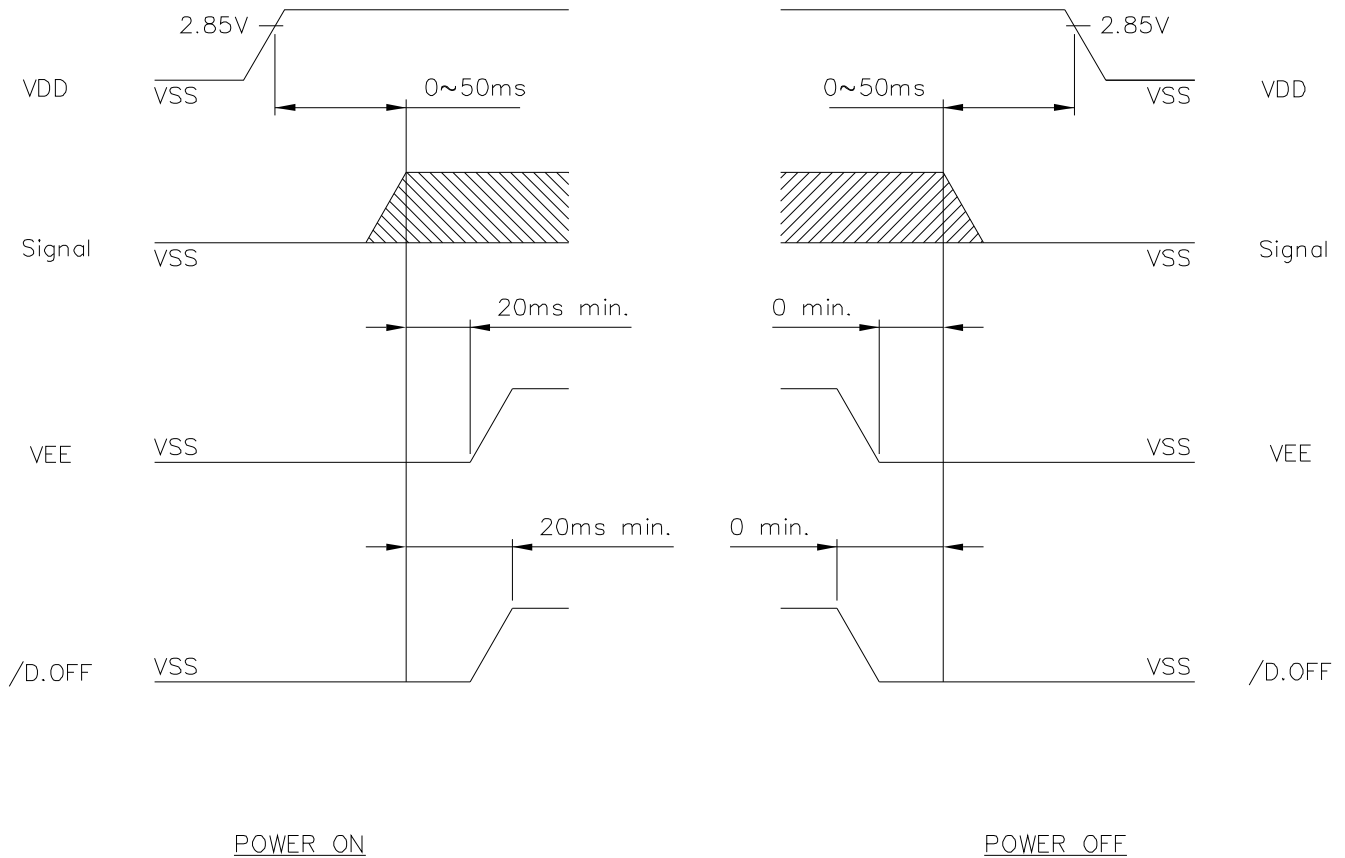
Fig . b Interface timing (COMMON)

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### 8-2 TIMING CHART OF INPUT SIGNAL



### 8-3 POWER ON/OFF TIMING

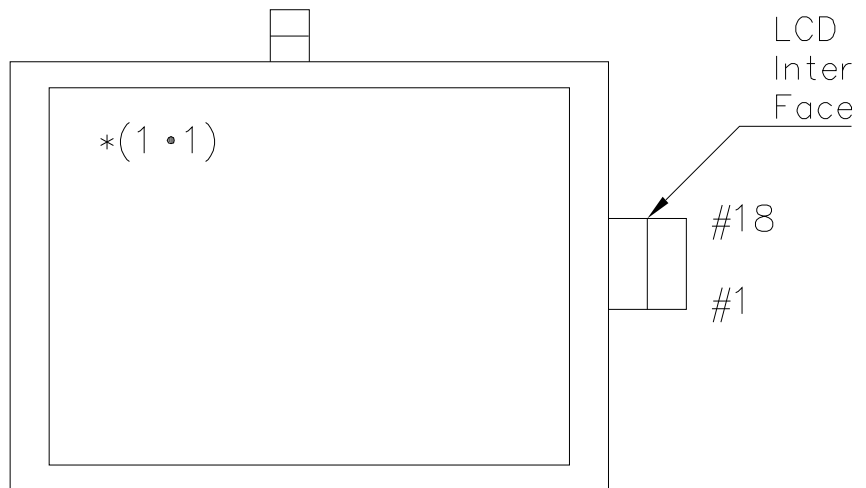


The missing pixels may occur when the LCM is driven beyond above power interface timing sequence.

REV/DATE	R0/ 12.01.98'	R1/ 04.02.99'				APP	CHK	BY
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### 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

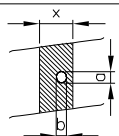
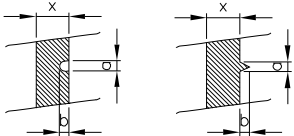
NO	ITEM	CONDITION			STANDARD	NOTE
1	HIGH TEMP. STORAGE	70°C	120HR		Appearance without defect	
2	LOW TEMP. STORAGE	-20°C	120HR		Appearance without defect	
3	HIGH TEMP. & HIGH HUMI. STORAGE	40°C 90%RH	120HR		Appearance without defect	
4	THERMAL SHOCK	-20°C,30min → 25°C,5min → 60°C,30min → 25°C,5min (1cycle)			Appearance without defect	5 cycles

REV/DATE	R0/ 12.01.98'	R1/ 04.02.99'				APP	CHK	BY
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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="2">DIAMETER mm (a*)</th> <th>NO. OF DEFECT*</th> </tr> </thead> <tbody> <tr> <td><math>a \leq 0.20</math></td> <td></td> <td>NEGLECT</td> </tr> <tr> <td><math>0.20 &lt; a \leq 0.35</math></td> <td></td> <td>5 MAX</td> </tr> <tr> <td><math>a &gt; 0.35</math></td> <td></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	$a > 0.35$		NONE	
DIAMETER mm (a*)		NO. OF DEFECT*													
$a \leq 0.20$		NEGLECT													
$0.20 < a \leq 0.35$		5 MAX													
$a > 0.35$		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 colspan="2">DIAMETER mm (a*)</th> <th>NO. OF DEFECT*</th> </tr> </thead> <tbody> <tr> <td><math>a \leq 0.15</math></td> <td></td> <td>NEGLECT</td> </tr> <tr> <td><math>0.15 &lt; a \leq 0.20</math></td> <td></td> <td>2 MAX</td> </tr> <tr> <td><math>a &gt; 0.20</math></td> <td></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	$a > 0.20$		NONE	
DIAMETER mm (a*)		NO. OF DEFECT*													
$a \leq 0.15$		NEGLECT													
$0.15 < a \leq 0.20$		2 MAX													
$a > 0.20$		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.

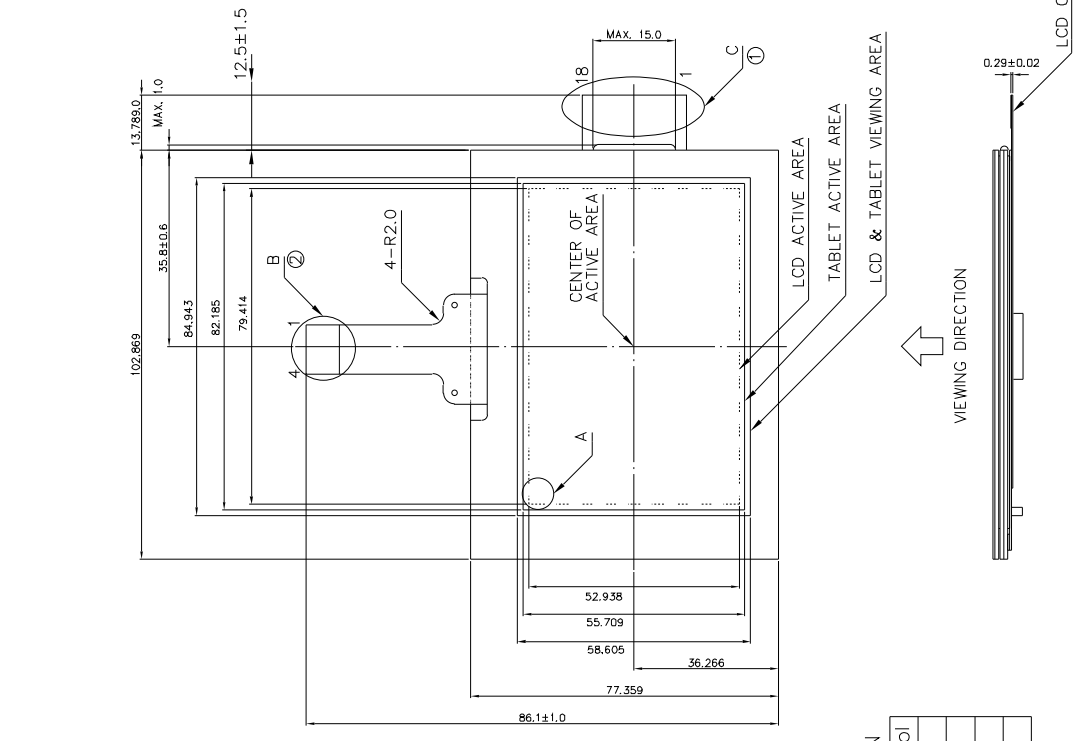
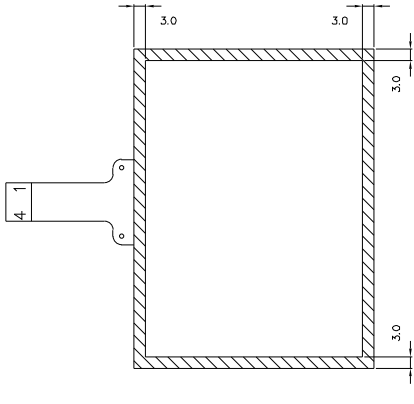
- STORAGE

- 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

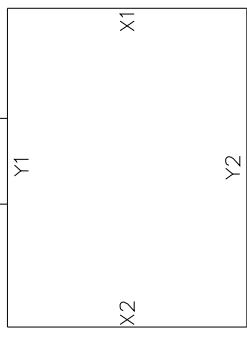
- 1.Acceptance inspection period  
The period is within one month after the arrival of contracted commodity at the buyer's factory site.
- 2.Applicable warrant period  
The period is within twelve months since the date of shipping out under normal using and storage conditions.

REV/DATE	R0/ 12.01.98'	R1/ 04.02.99'				APP	CHK	BY
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② TABLET CONNECTION

No.	Symbol
1	Y2
2	X1
3	Y1
4	X2



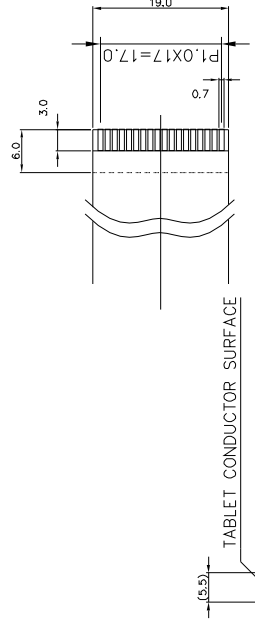
① LCD CONNECTION

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

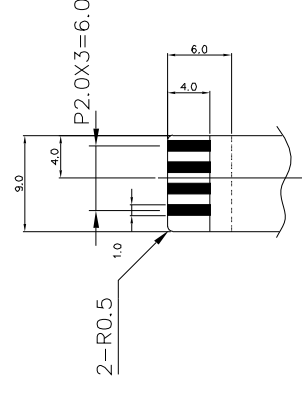
TOLERANCE LIST(S)

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

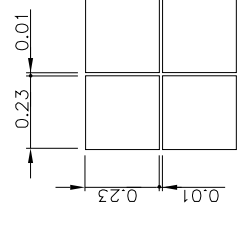
NOTE : 1.RESOLUTION : 240X160 DOTS



C.DETAILED (透視圖)  
SCALE=1/1



B.DETAILED (透視圖)  
SCALE=1.5/1



A.DETAILED

產品編號	LTA75G227L	DATE	南亞塑膠工業股份有限公司
APPROVE	NAME		NAN YA PLASTICS CORPORATION
CHECK			製晶圖
DESIGN			DWG-NO TAAG227L Rev.A
DRAW	MAY PING	88.03.30	UNIT : mm
			SCALE : 1/1