

NAN YA PLASTICS CORPORATION

SPECIFICATION OF
LCD MODULE
PRODUCT NO.: LT_75_227_13_

SPEC. NO.: LM227-13-△

CUSTOMER
APPROVED BY
DATE:

LCD DEPARTMENT
ELECTRONIC MATERIALS DIVISION
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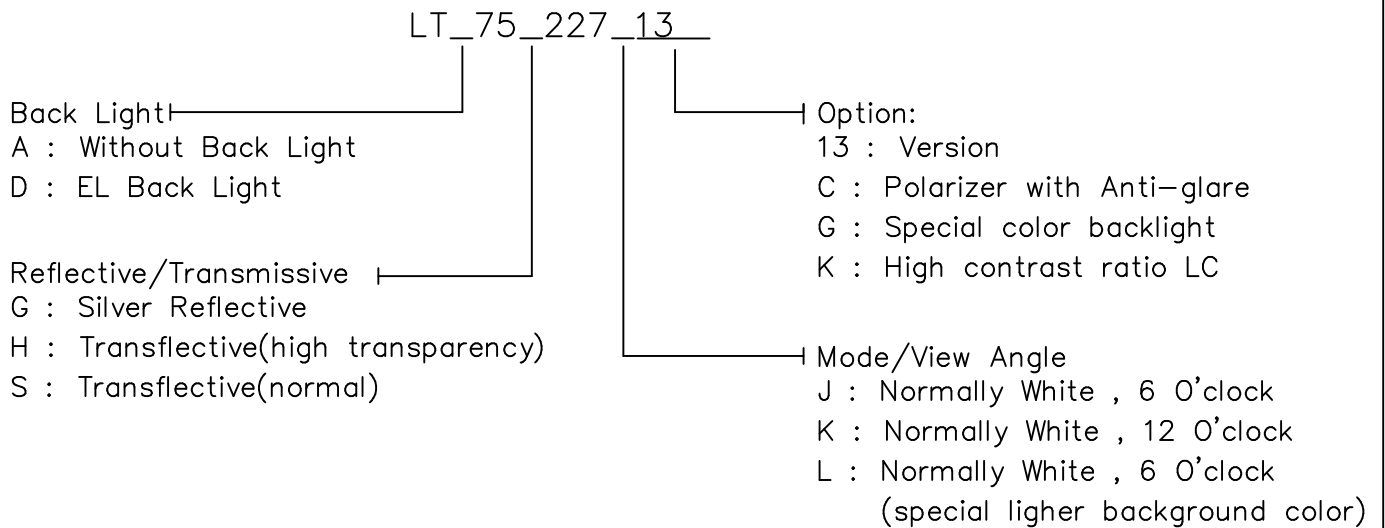
EDITED ON : Mar. 13, 2001

DESIGN MANAGER	DESIGN CHECK	DESIGNER
		J.Y.LIN

1. MECHANICAL DATA

- (1) Product No. LT_75_227_13_
- (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 Transflective Transmissive
- (8) Viewing Direction 6 O'clock 12 O'clock
- (9) Backlight W/O EL (White) EL (Blue Green) LED
- (10) Weight W/O B/L : 26 g (Approx.)
 EL B/L : 28 g (Approx.)
- (11) Controller Excluded
- (12) DC/DC Converter Excluded

Note :



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 ² (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	
Supply voltage for logic			VDD-VSS	-	2.97	3.3	3.63	V	
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	0°C	21.7	22.0	22.3	V
					25°C	20.1	20.4	20.7	
					50°C	18.0	18.3	18.6	
Power Supply Current			IDD	VDD=3.3V VSS=0V VEE-VSS=20.4V FLM=70Hz	-	0.55	0.83	mA	
			IEE	PATTERN : □ ■ □ ■ □ ■ ■ □ ■ □ ■ □	-	0.8	1.2		
EL Power Supply Current			I EL	65Vrms 250HZ	-	4.7	7.1	mA	
LCM	Surface Luminance	L	VDD=3.3V VSS=0V VEE-VSS=20.4V 65Vrms 250HZ	S227J	PATTERN: (Dots All On) ■ ■ ■ ■ ■ ■ ■ ■ ■ ■	-	0.4	-	cd/m ²
				H227K		-	0.9	-	
				H227KG		-	1.2	-	
				S227J	PATTERN: (Dots All Off) □ □ □ □ □ □ □ □ □ □	-	1.9	-	
				H227K		-	3.2	-	
				H227KG		-	4.2	-	

3.1 CHARACTERISTICS OF TOUCH SCREEN ELECTRICAL AND MECHANICAL TERMS

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Applied Rating Voltage	V _R	-	-	-	5.0	V
Applied Rating Current	I _R	At Contact Point of Top Layer with Bottom Layer	-	-	1.0	mA
Operating Temperature	T _{OPR}	20%~85% R.H. Max. Avoid Dew Condensation at Any Time	-10	-	60	°C
Storage Temperature	T _{STO}		-20	-	70	
Resistance of Terminal Electrodes	R _{ETD}	X Electrode	200	320	650	Ω
		Y Electrode	350	500	950	
Linearity	L	-	-	-	1.5	%
Insulation Resistance	R _{OFF}	V _{DC} =25V	20	-	-	MΩ
Activation Force	F _{ON}	NOTE 1	10	-	80	g
Transparency	T	According to JIS-K7015	-	83	-	%
Surface Hardness	S _H	According to JIS-K5400	3	-	-	H

NOTE 1 : The force is given with R0.8 Polyacetal pen or R3, HS60 silicon rubber and the analog output could be detected stably.

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	-	±37
S	J	-	8.0	-	7.5	-	6.0	-	70	-	±35
H	K	-	8.0	-	6.5	-	5.0	-	68	-	±33
NOTE		NOTE 6						NOTE 5			

NOTE :

G : SILVER REFLECTIVE

S : TRANSFLECTIVE(normal)

H : TRANSFLECTIVE
(high transparency)

L : NORMALLY WHITE 6 O'CLOCK

J : NORMALLY WHITE 6 O'CLOCK

(special lighter background color)

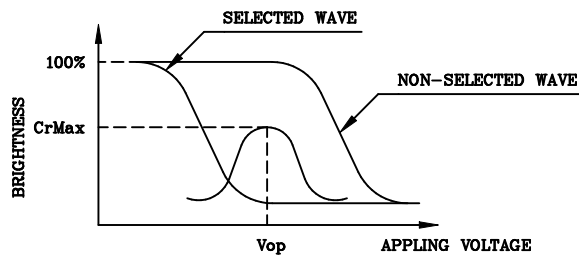
K : NORMALLY WHITE 6 O'CLOCK

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

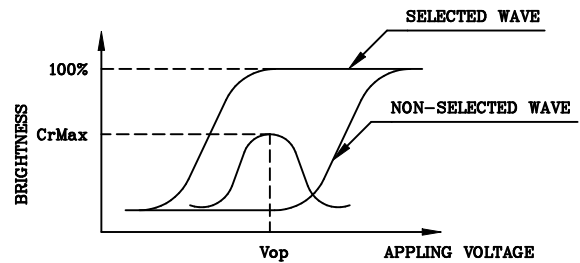
ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Response Time (rise)	Tr	0°C	-	800	-	ms	NOTE 2
		25°C	-	230	-		
		50°C	-	100	-		
Response Time (fall)	Tf	0°C	-	300	-	ms	NOTE 2
		25°C	-	115	-		
		50°C	-	65	-		

(NOTE 1)

Definition of Operation Voltage(Vop)



(positive type)



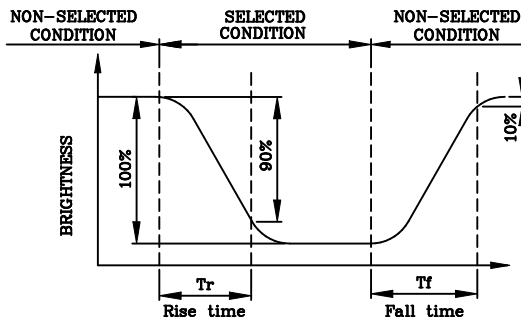
(negative type)

*Conditions

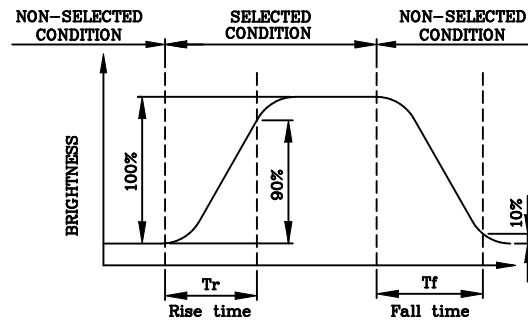
Viewing Angle : 0
 Frame Frequency : 70Hz
 Applying Waveform : 1/N duty 1/a bias

(NOTE 2)

Definition of Response Time(Tr,Tf)



(positive type)



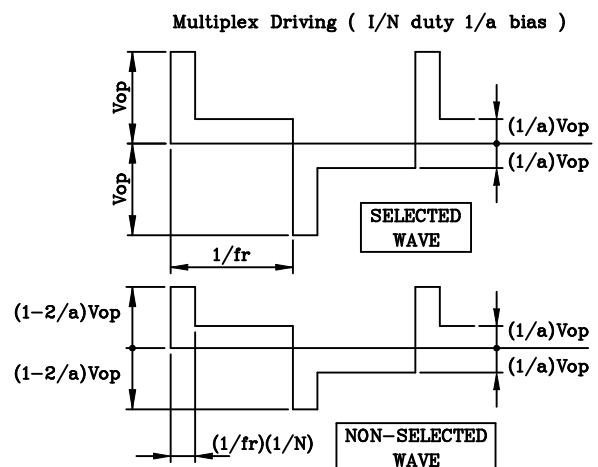
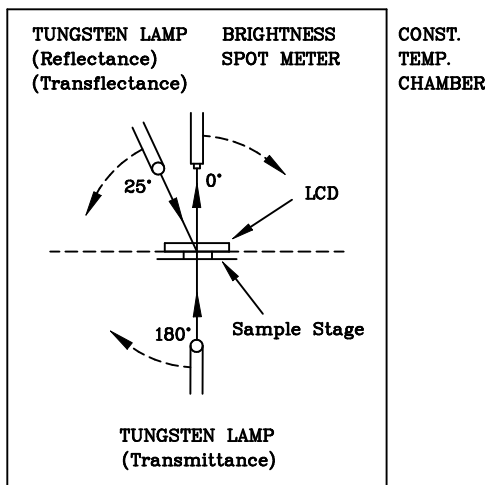
(negative type)

*Conditions

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

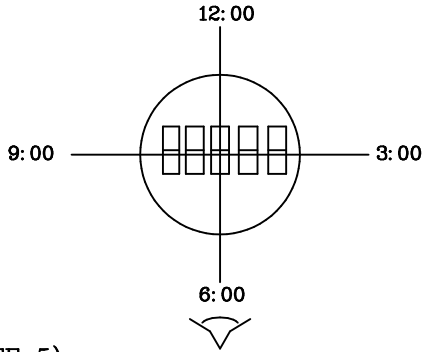
(NOTE 3)

Description of Measuring Equipment and Driving Waveforms



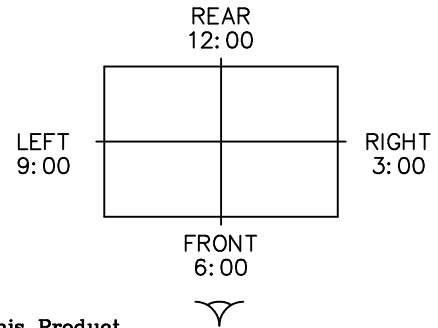
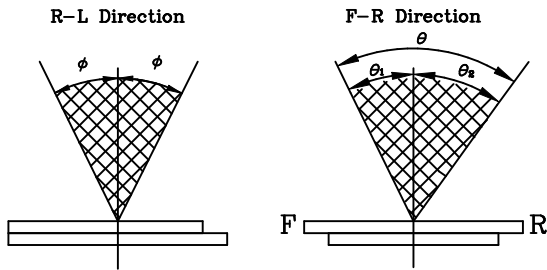
(NOTE 4)

Definition of Viewing Direction



(NOTE 5)

Definition of Viewing Angle



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

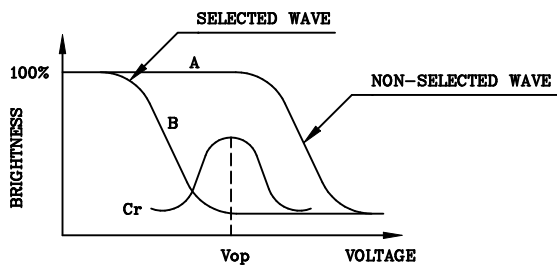
$$\theta = \theta_1 + \theta_2$$

*Conditions

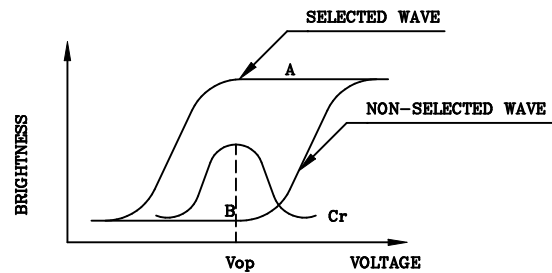
Operating Voltage : V_{op}
 Frame Frequency : 70Hz
 Applying Waveform : 1/N duty 1/a bias
 Contrast Ratio : larger than 2

(NOTE 6)

Definition of Contrast Ratio (Cr)



(positive type)



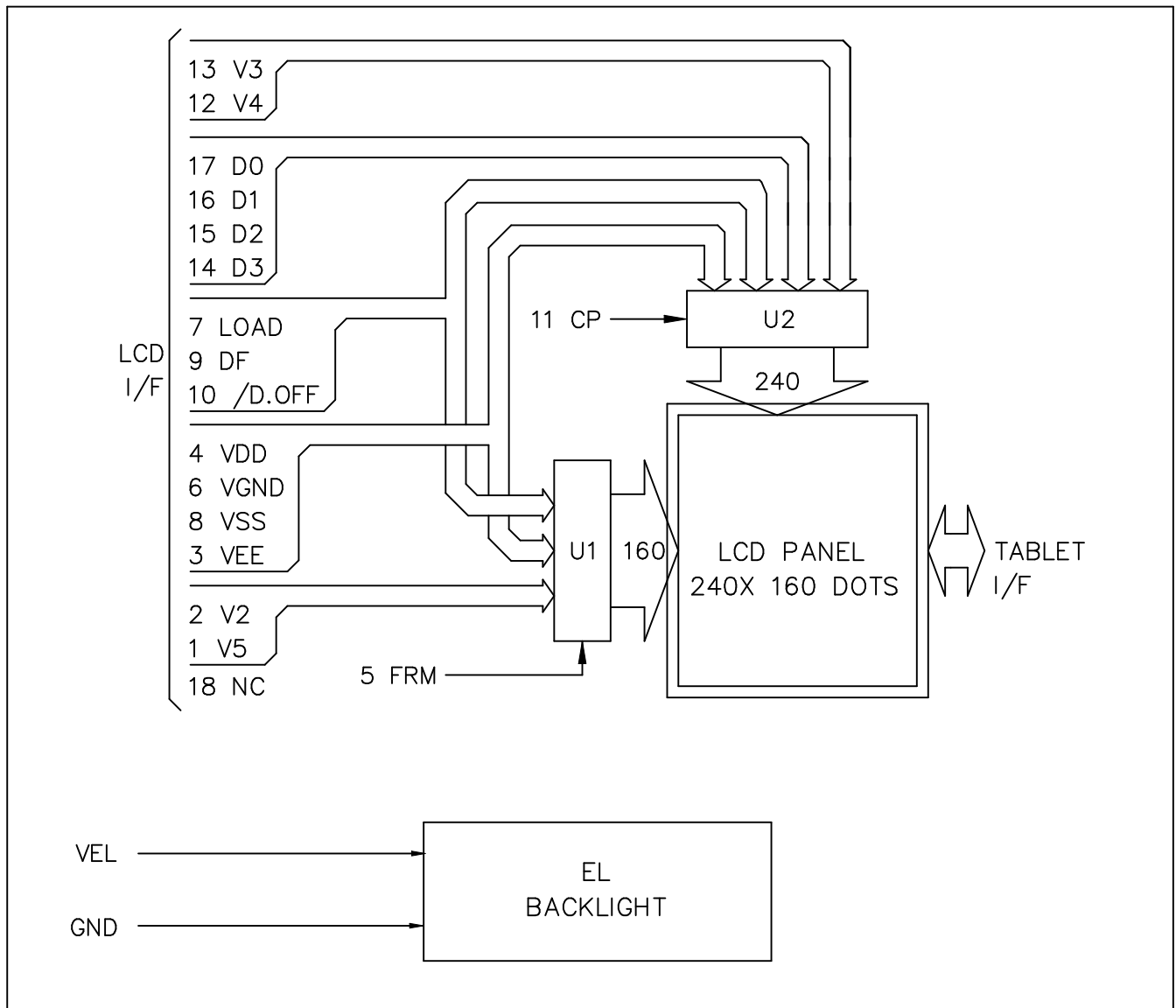
(negative type)

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

*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, $VOP = VEE - VSS = 20.4 \text{ V}$.

6. INTERNAL PIN CONNECTION

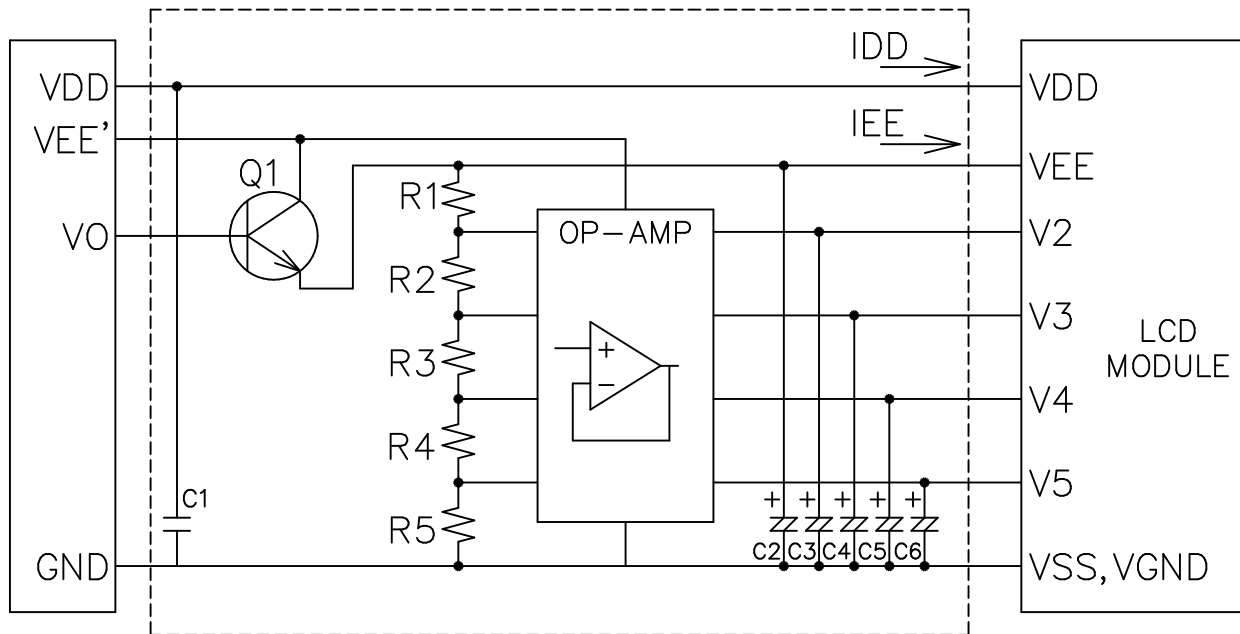
LCD

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

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).

Note 2 : EL Driving Method

- a. Constant Voltage Source Driving : AC 100 Vrms 400 Hz
- b. Inverter IC Driving : HV823 (Supertex) or SP4428CN(Sipex)

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 _C	Fig.a	82	-	-	ns
CP Pulse Width	t _{SWH} ,t _{SWL}	Fig.a	28	-	-	ns
CP Rise/Fall Time	t _{CR} ,t _{CF}	Fig.a	-	-	50	ns
Data Set Up Time	t _{DSU}	Fig.a , Fig.b	20	-	-	ns
Data Hold Time	t _{DHD}	Fig.a , Fig.b	23	-	-	ns
LOAD Cycle Time	t _L	Fig.b	250	-	-	ns
LOAD "H" Pulse Width	t _{LWH}	Fig.a , Fig.b	30	-	-	ns
LOAD Rise/Fall Time	t _{LR} ,t _{LF}	Fig.b	-	-	50	ns
CP To LOAD Delay Time	t _{CL}	Fig.a	30	-	-	ns
LOAD To CP Delay Time	t _{LC}	Fig.a	65	-	-	ns
FRM TO LOAD SETUP TIME	t _{FLS}	Fig.b	30	-	-	ns
FRM TO LOAD HOLD TIME	t _{FLH}	Fig.b	50	-	-	ns

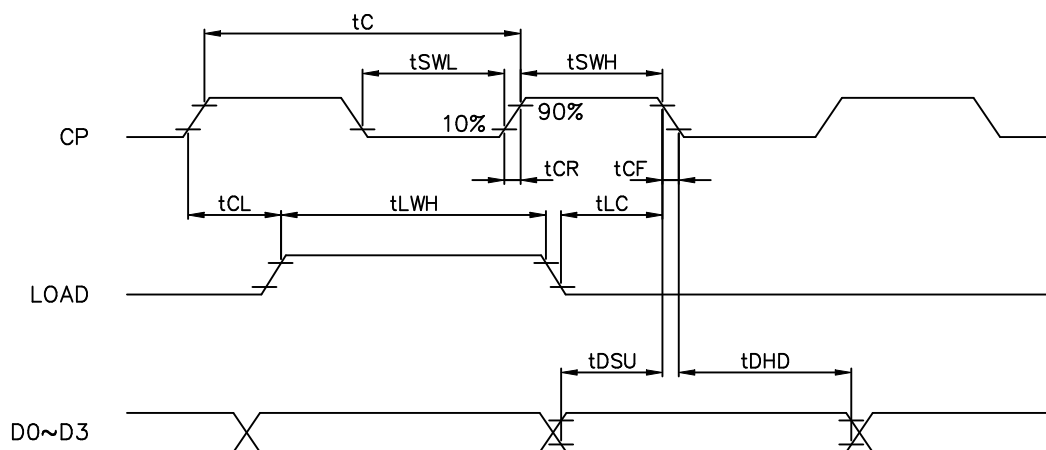


Fig . a Interface timing (SEGMENT)

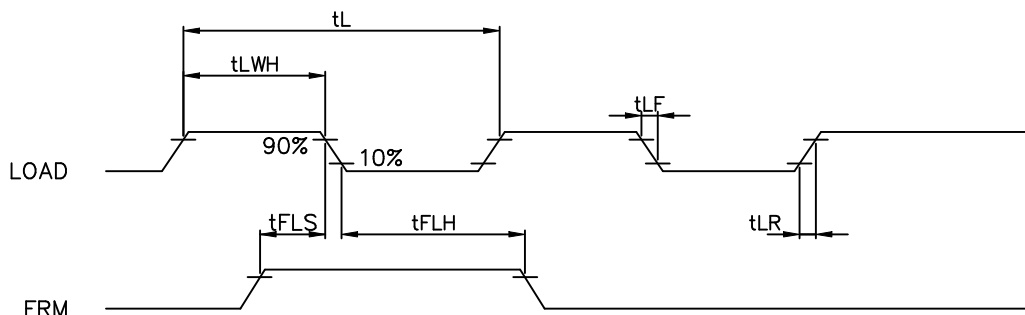
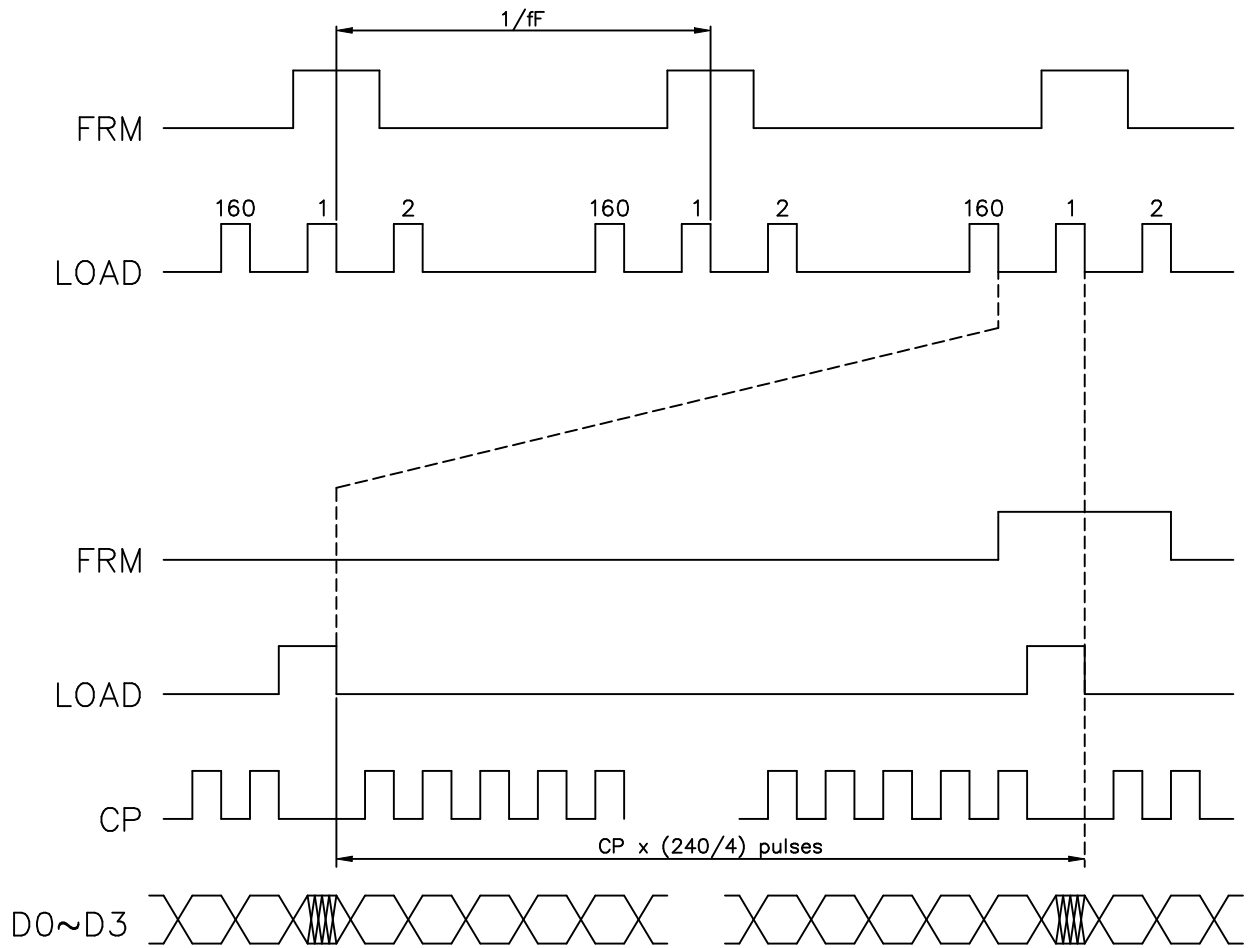
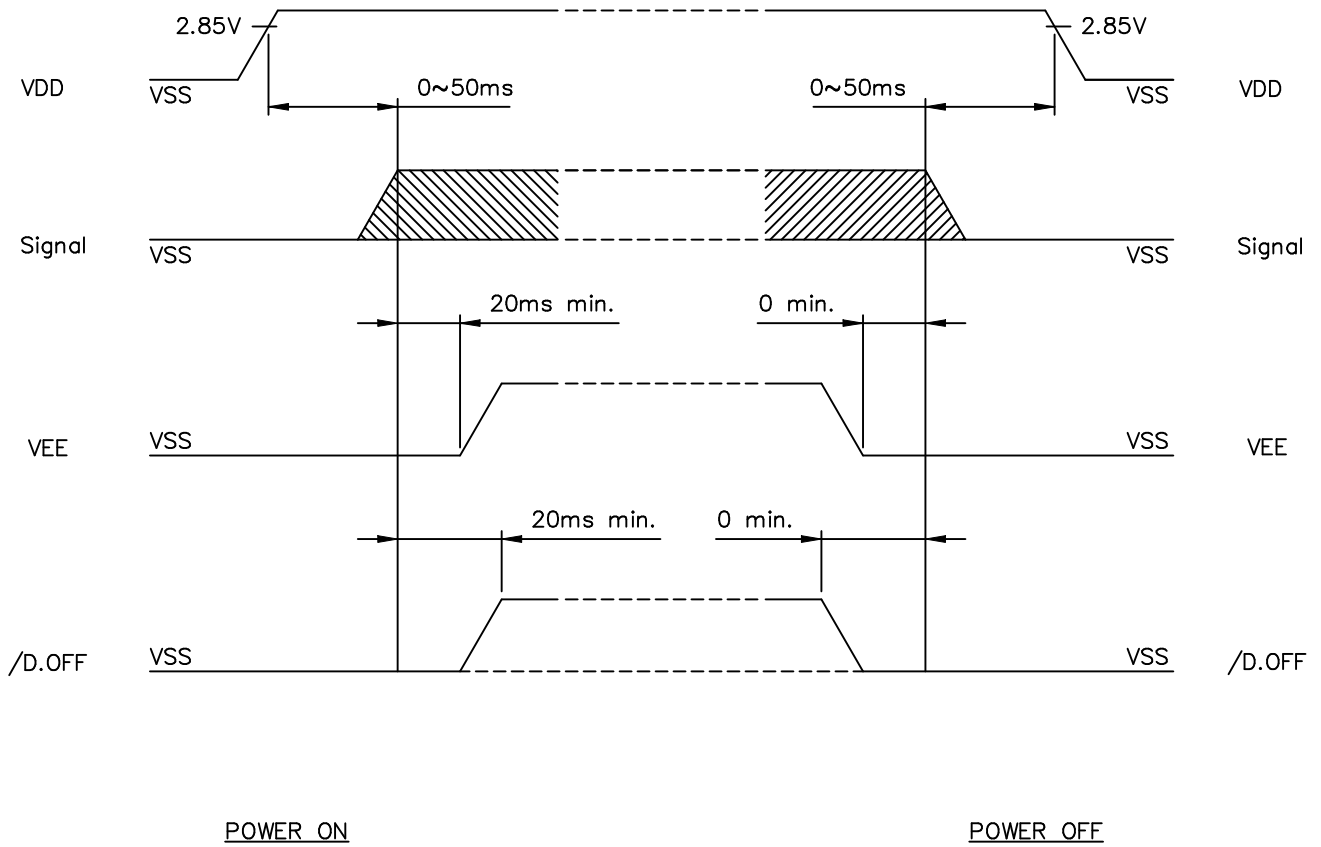


Fig . b Interface timing (COMMON)

8-2 TIMING CHART OF INPUT SIGNAL

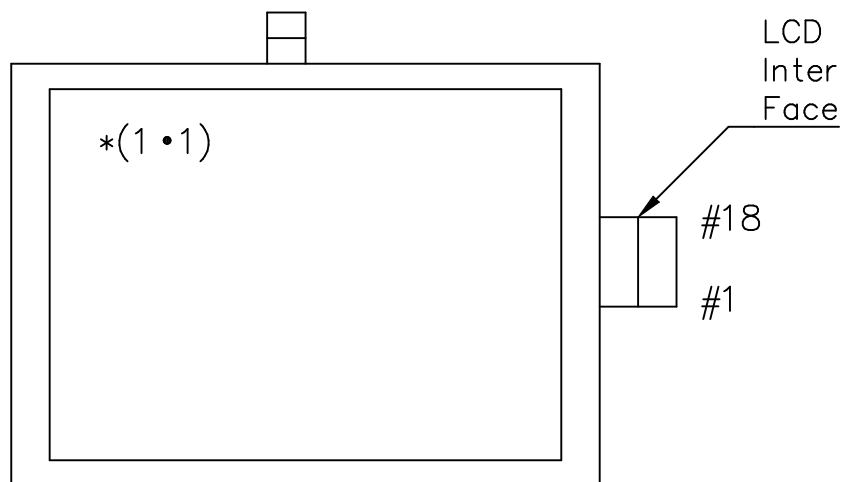
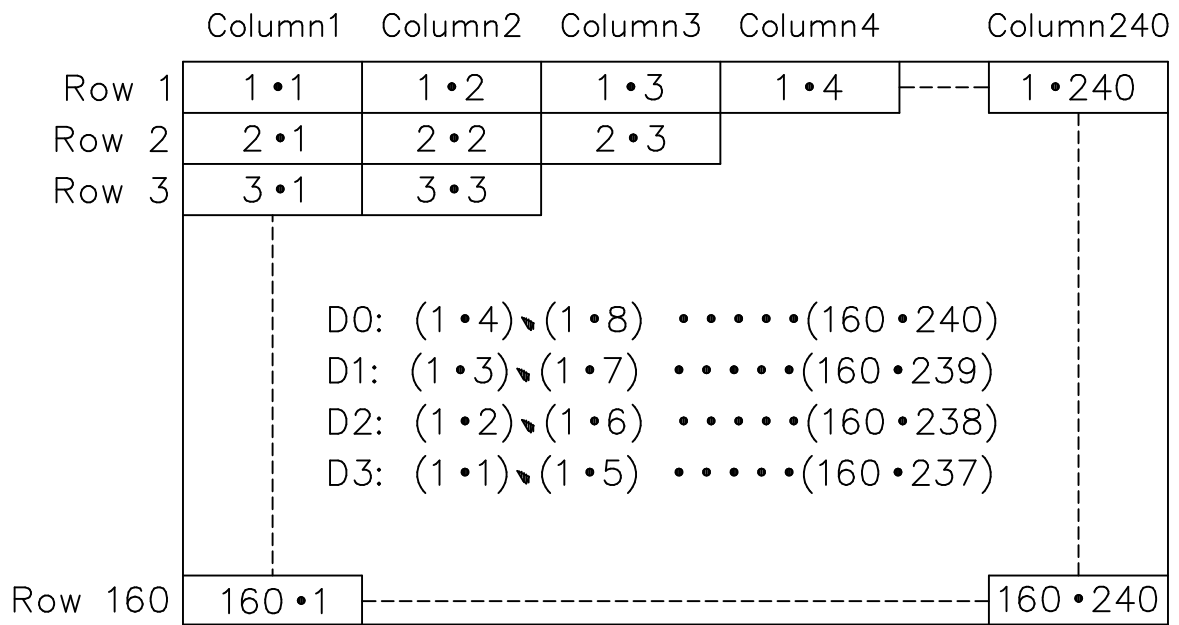


8-3 POWER ON/OFF TIMING



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

8-4 DISPLAY PATTERN



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

Inspection Provision

1. Purpose

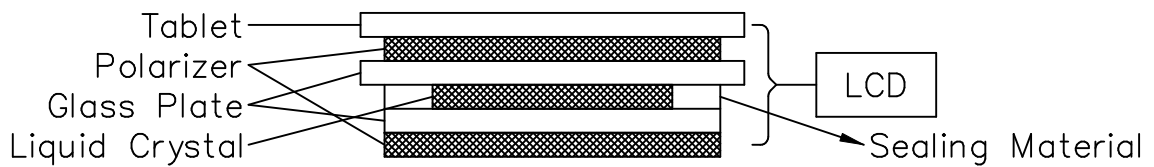
The NAN YA inspection provision provides outgoing inspection provision and its expected quality level based on our outgoing inspection of NAN YA LCD produces.

2. Applicable Scope

The NAN YA inspection provision is applicable to the arrangement in regard to outgoing inspection and quality assurance after outgoing.

3. Technical Terms

3-1 NAN YA Technical Terms



4. Outgoing Inspection Provision

Outgoing inspection is according to the product inspection manual.
(Per 1-1, 1-2 & 1-3)

4-1 Inspection Method

MIL-STD-105D Level II Regular inspection

4-2 Inspection Standard

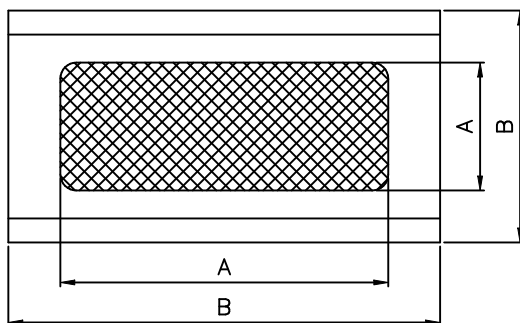
	Item		AQL(%)	Remarks
Major Defect	Dots	Opens Shorts Erroneous operation	0.4	faults which substantially lower the practicality and the initial purpose difficult to achieve.
	Solder appearance	Shorts Loose		
	Cracks	Display surface cracks		
	Tablet contact resistance			
	Tablet input load			

	Tablet lineality		0.4	
	Dimensions	External from Dimensions	0.4	
Minor Defect	Inside the glass	Black spots	0.65	faults which appear to pose almost no obstacle to the practicality, effective use, and operation.
	Polarizing plate	Scratches, foreign Matter, air bubbles, and peeling		
	Dots	Pinhole, deformation		
	Color tone	Color unevenness		
	Solder appearance	Cold solder Solder projections		

4-3 Inspection Provisions

*Viewing Area Definition

Fig. 1



A : Zone Viewing Area
B : Zone Glass Plate Out Line

*Inspection place to be 500 to 1000 lux illuminance uniformly without glaring.

The distance between luminous source(daylight fluorescent lamp and cool white fluorescent lamp) and a sample to be 30cm to 50cm.

*Test and measurement are performed under the following conditions, unless otherwise specified.

Otherwise specified.

Temperature 20± 15°C
Humidity 65± 20%R.H..
Pressure 860~1060hPa(mmbar)

In case of doubtful judgment, it is performed under the following conditions.

Temperature 20± 2°C
Humidity 65± 5%R.H..
Pressure 860~1060hPa(mmbar)

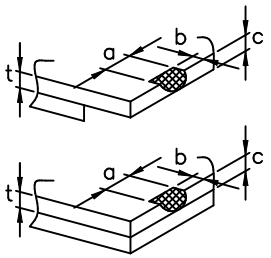
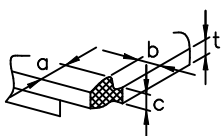
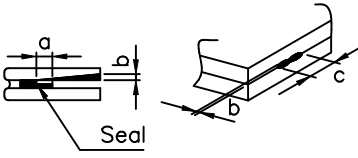
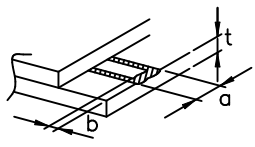
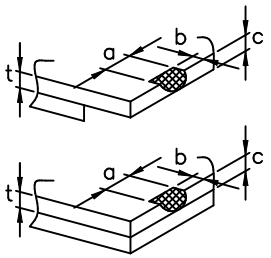
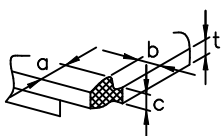
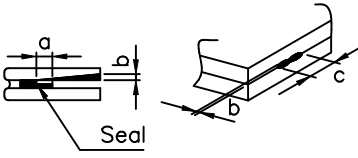
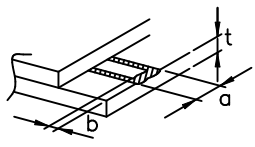
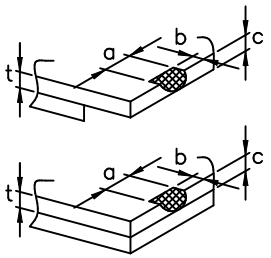
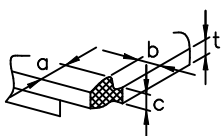
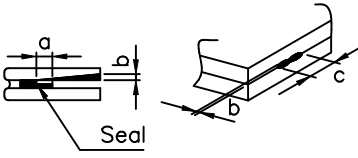
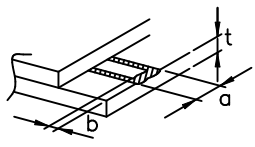
5.Specification for quality check
5-1 Electrical characteristics

NO.	Item	Criterion
1.	Non operational	Fail
2.	Miss operating	Fail
3.	Missing dot	Fail
4.	Contrast irregular	Not allowable
5.	Response time	Within Specified value
6.	Tablet contact resistance	Within Specified value
7.	Tablet input load	Within Specified value
8.	Tablet lineality	Within Specified value
9.	EL backlight turn on/off	Within Specified value

5-2 External Appearance Defect

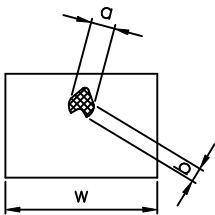
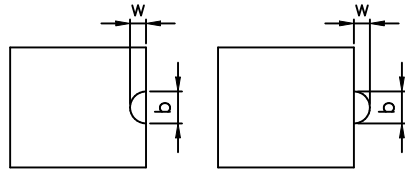
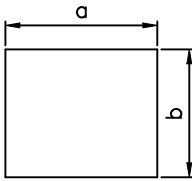
NO.	Item	Criterion																		
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2.	Scratches(Glass, reflection plates, and polarizing plates)	In accordance with black spots. (At non lighting condition)																								
3.	Color irregular	Not remarkable color irregular.																								

<p>4. Air bubbles polarizing plates, and reflection plates</p>	<table border="1" data-bbox="710 380 1225 672"> <tr> <th data-bbox="710 380 970 526">Average Diameter (mm):D</th> <th data-bbox="970 380 1225 526">Number of pieces permitted</th> <th data-bbox="1225 380 1476 672" rowspan="2">Average diameter = (Long diameter + Short diameter)/2</th> </tr> <tr> <td data-bbox="710 526 970 571">$D \leq 0.3$</td> <td data-bbox="970 526 1225 571">Ignore</td> </tr> <tr> <td data-bbox="710 571 970 672">$0.3 < D$</td> <td data-bbox="970 571 1225 672">0</td> </tr> </table> <p data-bbox="710 683 1476 779">Note that when there are 4 pieces or more, they are not to be concentrated.</p>		Average Diameter (mm):D	Number of pieces permitted	Average diameter = (Long diameter + Short diameter)/2	$D \leq 0.3$	Ignore	$0.3 < D$	0				
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<p>5. Cracks</p>	<table border="1" data-bbox="662 779 1476 1966"> <tr> <td data-bbox="662 779 1066 1176"> <p>(1)General crack</p>  </td> <td data-bbox="1066 779 1476 1176"> <p>$a \leq 5$ $b \leq 2$ $c \leq t$</p> <p>Where, a and b are ignored when less than or equal 0.5. The numbers of pieces are set at up to 5 pieces.</p> </td> </tr> <tr> <td data-bbox="662 1176 1066 1366"> <p>(2)Corner crack</p>  </td> <td data-bbox="1066 1176 1476 1366"> <p>$a \leq 2.5$ $b \leq 2.5$ $c \leq t$ $a+b \leq 4$</p> </td> </tr> <tr> <td data-bbox="662 1366 1066 1635"> <p>(3)Seal portion crack</p>  </td> <td data-bbox="1066 1366 1476 1635"> <p>$a \leq \text{The seal width} \times 1/3$ $b \leq t \times 2/3$ $c \leq 5$</p> <p>The numbers of pieces are set at up to 5 pieces.</p> </td> </tr> <tr> <td data-bbox="662 1635 1066 1870"> <p>(4)ITO Pin crack</p>  </td> <td data-bbox="1066 1635 1476 1870"> <p>$a \leq 5$ $b \leq 1/3 \text{ pin length}$ $c \leq t$</p> </td> </tr> <tr> <td data-bbox="662 1870 1066 1966"> <p>(5)Progressive cracks</p> </td> <td colspan="2" data-bbox="1066 1870 1476 1966"> <p>All taken to be unacceptable.</p> </td> </tr> </table>		<p>(1)General crack</p> 	<p>$a \leq 5$ $b \leq 2$ $c \leq t$</p> <p>Where, a and b are ignored when less than or equal 0.5. The numbers of pieces are set at up to 5 pieces.</p>	<p>(2)Corner crack</p> 	<p>$a \leq 2.5$ $b \leq 2.5$ $c \leq t$ $a+b \leq 4$</p>	<p>(3)Seal portion crack</p> 	<p>$a \leq \text{The seal width} \times 1/3$ $b \leq t \times 2/3$ $c \leq 5$</p> <p>The numbers of pieces are set at up to 5 pieces.</p>	<p>(4)ITO Pin crack</p> 	<p>$a \leq 5$ $b \leq 1/3 \text{ pin length}$ $c \leq t$</p>	<p>(5)Progressive cracks</p>	<p>All taken to be unacceptable.</p>	
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6.	Outer dimensions	Should be with in the tolerance.
7.	Newton ring	Orbicular of interference fringes. To be non. In case of doubtful judgenemt, agreement shall be reachment.
8.	Soldering	Should be no defective soldering such as shorting, loose terminal cold solder, peeling of printed circuit board pattern, improper mouting position, etc.

5-3 Dot Appearance Defect

NO.	Item	Criteria
1.	Plinhole	 <p>Dot display a and b are each $\leq 0.2\text{mm}$ The overall total is taken be with in 10 units. Note that they are not to be concentrated.</p>
2.	Missing	 <p>Dot display a and b are each $\leq 0.2\text{mm}$ The overall total is taken to be with in 10 units.</p>
3.	Thick and thin display	 <p>Taken to be within $\pm 1.5\%$ of display character width(a) and height(b).</p>

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

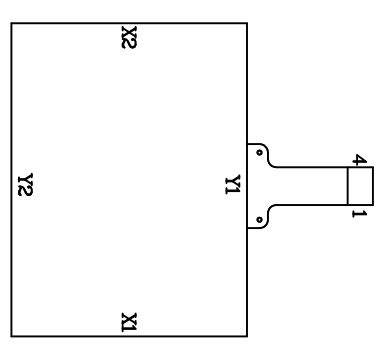
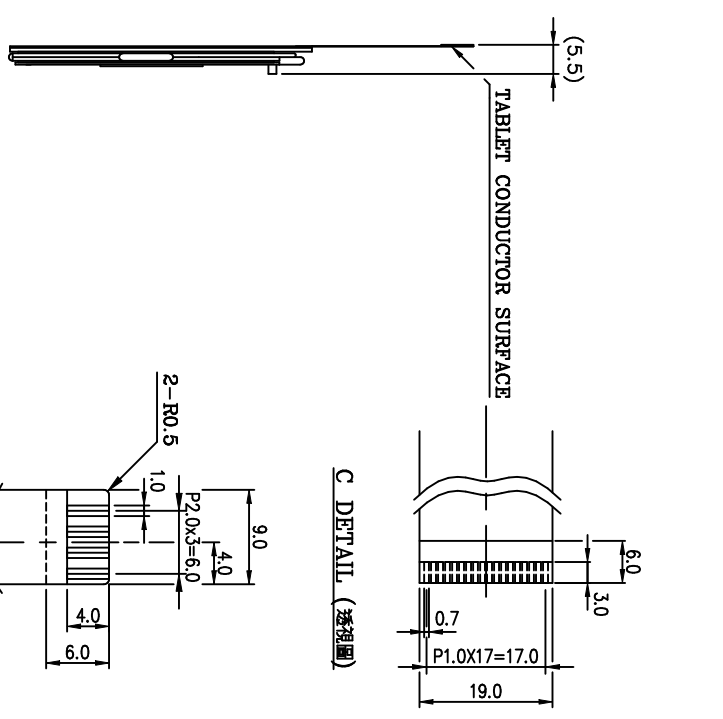
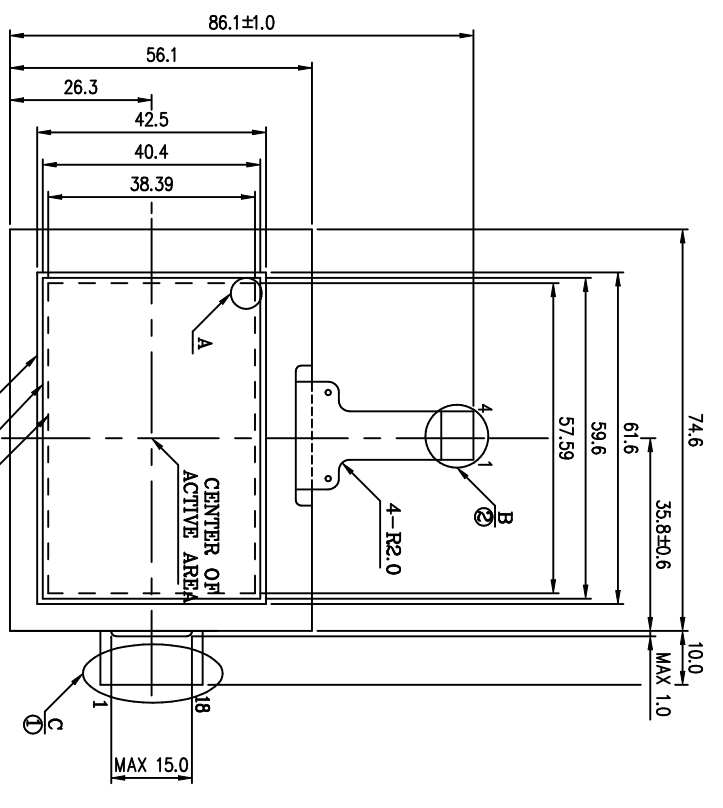
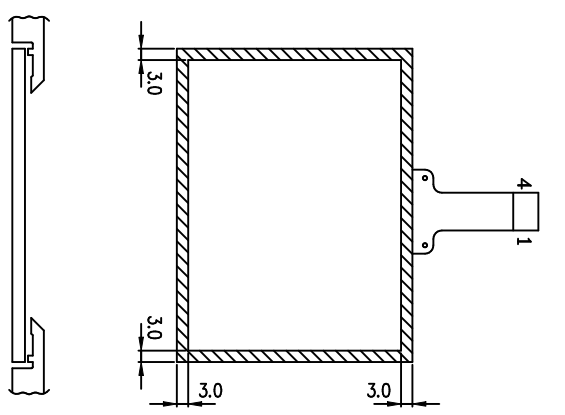
- 1.Store the panel or module in a dark place where the temperature is $25^{\circ}\text{C}\pm 5^{\circ}\text{C}$ and the humidity is below 65% RH.
- 2.Do not place the module near organics solvents or corrosive gases.
- 3.Do not crush, shake, or jolt the module.

- 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.

- THE OPERATING LIFE TIME OH BACK LIGHT

- EL : 2000hrs for AC 100Vrms, 400Hz, 20°C, 60%RH
(Operating life time is defined as follows : The final brightness is at 50% of original brightness.)



② TABLET CONNECTION

No.	Symbol
1	Y2
2	X1
3	Y1
4	X2

NOTE :

- RESOLUTION : 240X160 DOTS
- DROVER IC : 聯詠 NT7702H-TABF4

聯詠 NT7701H-TAB18

① LCD CONNECTION

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

REV. NO.	DESCRIPTION	DATE	DESIGN	CHECK	APPROVE

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

NAME	DATE	THIRD ANGLE P.
LTA75_227_13		

CHECK	DESIGN	PING PING	SCALE	UNIT
	J.YJUN	90.03.13		mm
	DRAWM	90.03.13		

DWG NO.	DATE	DESIGN	CHECK	APPROVE
M227-D13A				

南亞塑膠工業股份有限公司
NAN YA PLASTICS CORPORATION
製品圖