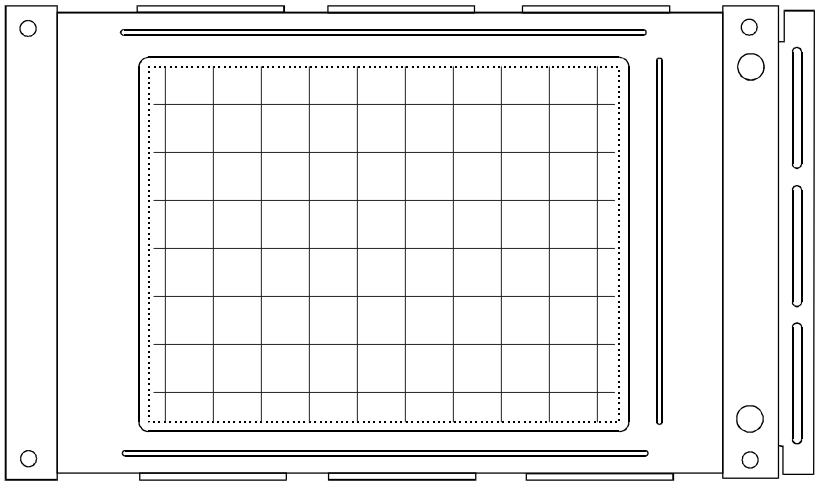
HANTRONIX

PRODUCT SPECIFICATION

HDM3224TS-1

320X240 (1/4 VGA) GRAPHICS
LCD DISPLAY MODULE
WITH TOUCH SCREEN



HANTRONIX, INC. 10080 BUBB RD. CUPERTINO, CA 95014	**Q.A.:** JB	**REV.:** 1.0	HDM3224TS-1	SHEET 1 OF 19 **DATE:** 12/12/97

1. MECHANICAL DATA

(1) Part Name		
(2) Module Size		167.1 (W)mm X 109.0 (H)mm X MAX 13.0 (D)mm
(3) Dot Size		0.33 (W)mm x 0.33 (H)mm
(4) Dot Pitch		0.36 (W)mm x 0.36 (H)mm
(5) Number of Dots		320 (W) x 240 (H)Dots
(6) Duty		1/240
(7) LCD Display Mode	STN:	☐ Gray Mode ☐ Yellow Mode ☐ Blue Mode
	FSTN:	☐ Black and White(Normal White/Positive Image)
		☐ Black and White(Normal Black/Negative Image)
	Rear Polarizer:	☐ Transflective ☐ Transmissive
(8) Viewing Direction		☐ 6 O'clock ☐ 12 O'clock ☐___O'clock
(9) Recommended FL Inverter		TDK CORP. CXA-L10L or CXA-L10L-F
(10) Backlight		CCFT
(11) Weight		240 g (With Touch Panel)

2. ABSOLUTE MAXIMUM RATINGS

(1) ELECTRICAL ABSOLUTE RATINGS

VSS=0V STANDARD

ITEM	SYMBOL	MIN	MAX	UNIT	COMMENT
Power Supply for Logic	VDD−VSS	−0.3	7.0	V	
Power Supply for LCM	VDD−VEE	0	30.0	V	
Input Voltage	VI	−0.3	VDD	V	
CCFL Driving Voltage	VFL	0	500	Vrms	
CCFL Input Current	IFL	−	7.0	mArms	
Static Electricity	−	−	−	−	Note 1

Note 1 LCM should be grounded during handling LCM.

(2) ENVIRONMENTAL ABSOLUTE MAXIMUM RATINGS

ITEM	OPERATING		STORAGE	
	MIN.	MAX.	MIN.	MAX.
Ambient Temperature	−20	70	−30	80
Humidity(Without Condensation)	Note 1,3		Note 2,3	

Note 1 Ta ≦ 70°C : 75%RH max
Ta > 70°C : Absolute humidity must be lower than the humidity of 75%RH at 70°C

Note 2 Ta at −30°C will be < 48hrs, at 80°C will be < 120hrs

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

3. ELECTRICAL CHARACTERISTICS

(VDD = 5V±5%)

ITEM		SYMBOL	CONDITION		MIN.	TYP.	MAX.	UNIT
Power Supply for Logic		VDD−VSS	−		4.75	5.0	5.25	V
Recommended LC Driving Voltage		VDD−VO	Duty=1/240 Bias=1/13	−20°C	−	24.5	25.4	V
				0°C	−	23.1	24	
				25°C	21.7	22.4	23.2	
				50°C	20.7	21.2	−	
				70°C	20.5	21.3	−	
Input Voltage		VIH	H level		0.8VDD	−	VDD	V
		VIL	L level		0	−	0.2VDD	V
Power Supply Current		IDD	FLM = 70 Hz VDD = 5.0 V VEE = −24.0 V VDD−VO = 22.4 V PATTERN :		−	7.7	−	mA
		IEE			−	3.9	−	mA
CCFL LAMP	Open Voltage	V_{Open}	Lamp Current = 5 mArms Frequency = 35 KHz		−	420	−	Vrms
	Lamp Voltage	V_L			−	260	−	Vrms
	Brightness	B			−	26000	−	cd/m²
	Color Degree	X			−	0.34	−	−
		Y			−	0.367	−	

4. OPTICAL CHARACTERISTICS

AT V_{OP}

ITEM / MODE		Cr(Contrast Ratio) 25℃ MIN.	Cr(Contrast Ratio) 25℃ TYP	θ(Viewing Angle) 25℃ MIN.	θ(Viewing Angle) 25℃ TYP.	φ(Viewing Angle) 25℃ MIN.	φ(Viewing Angle) 25℃ TYP.
R	A	–	–	–	–	–	–
	C	–	–	–	–	–	–
	J	–	–	–	–	–	–
S	A	–	–	–	–	–	–
	C	–	–	–	–	–	–
	J	–	–	–	–	–	–
T	E,F	4.0	6.0	35	65	20	30
	G,H	5.0	7.0	40	70	25	35
note		NOTE6		NOTE5			

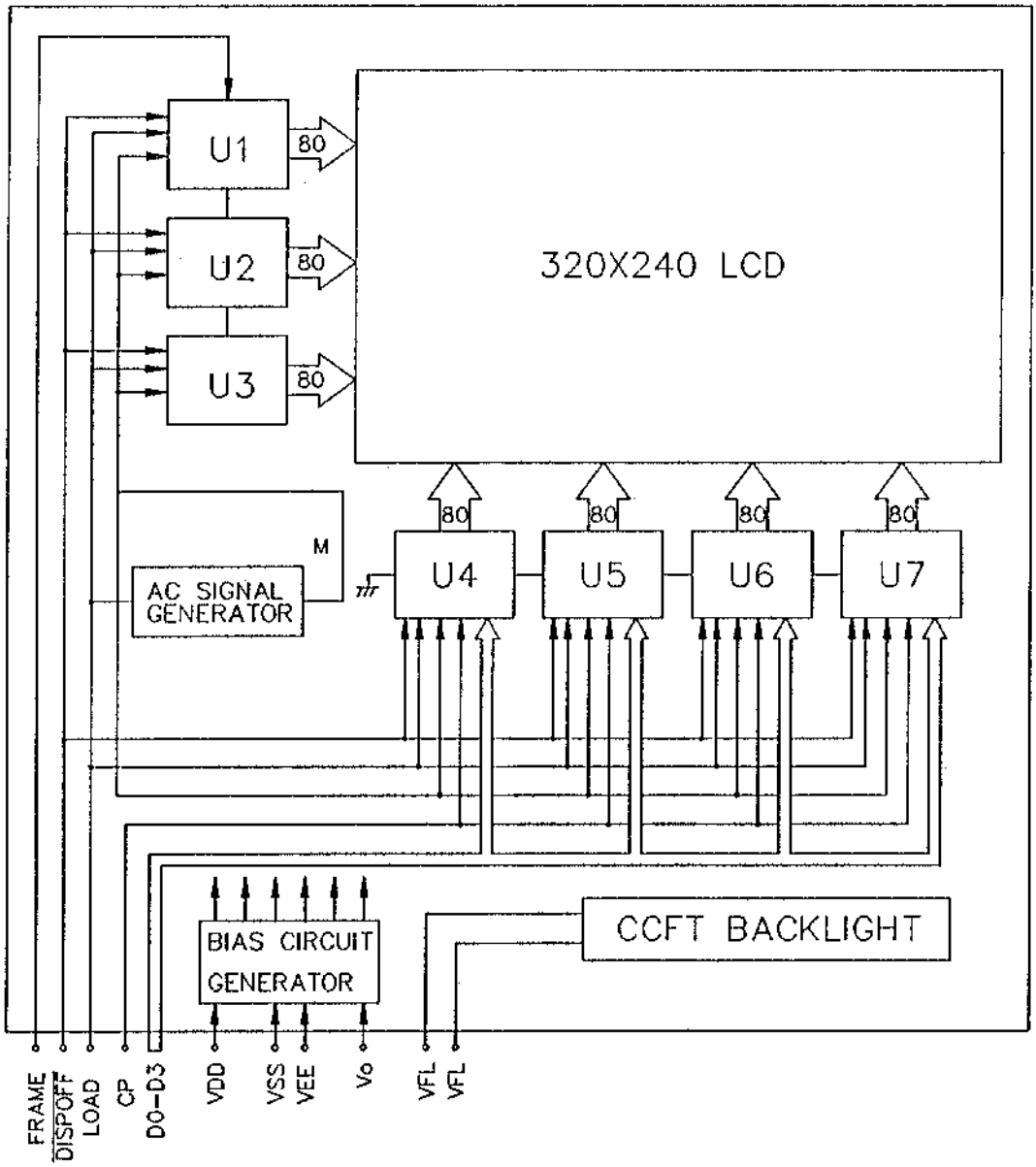
AT $\phi=0^\circ$ $\theta=0^\circ$

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Response Time (rise)	Tr	−20℃	–	1000	2000	ms	NOTE 2
		0℃	–	820	1640		
		25℃	–	200	400		
		50℃	–	160	320		
		70℃	–	80	160		
Response Time (fall)	Tf	−20℃	–	500	1000	ms	NOTE 2
		0℃	–	360	720		
		25℃	–	210	420		
		50℃	–	70	140		
		70℃	–	50	100		

note:

R: REFLECTIVE
S: TRANSFLECTIVE
T: TRANSMISSIVE
A: GRAY
C: YELLOW
E,F: BLUE
G,H: NORMALLY BLACK
J: NORMALLY WHITE

5. BLOCK DIAGRAM



* AC SIGNAL SETTING

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

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6. INTERNAL PIN CONNECTION

PIN NO.	SYMBOL	LEVEL	FUNCTION
1	D0	H/L	DISPLAY DATA
2	D1		
3	D2		
4	D3		
5	$\overline{\text{DISPOFF}}$	H/L	H: ON/L: OFF
6	FRAME	H	FIRST LINE MARKER
7	NC	–	NO CONNECTION
8	LOAD	H/L	DATA LATCH
9	CP	H/L	DATA SHIFT
10	VDD	–	POWER SUPPLY FOR LOGIC
11	VSS	–	GND
12	VEE	–	POWER SUPPLY FOR LC
13	VO	–	OPERATING VOLTAGE LC DRIVING
14	FGND	–	FRONT PANEL GROUND

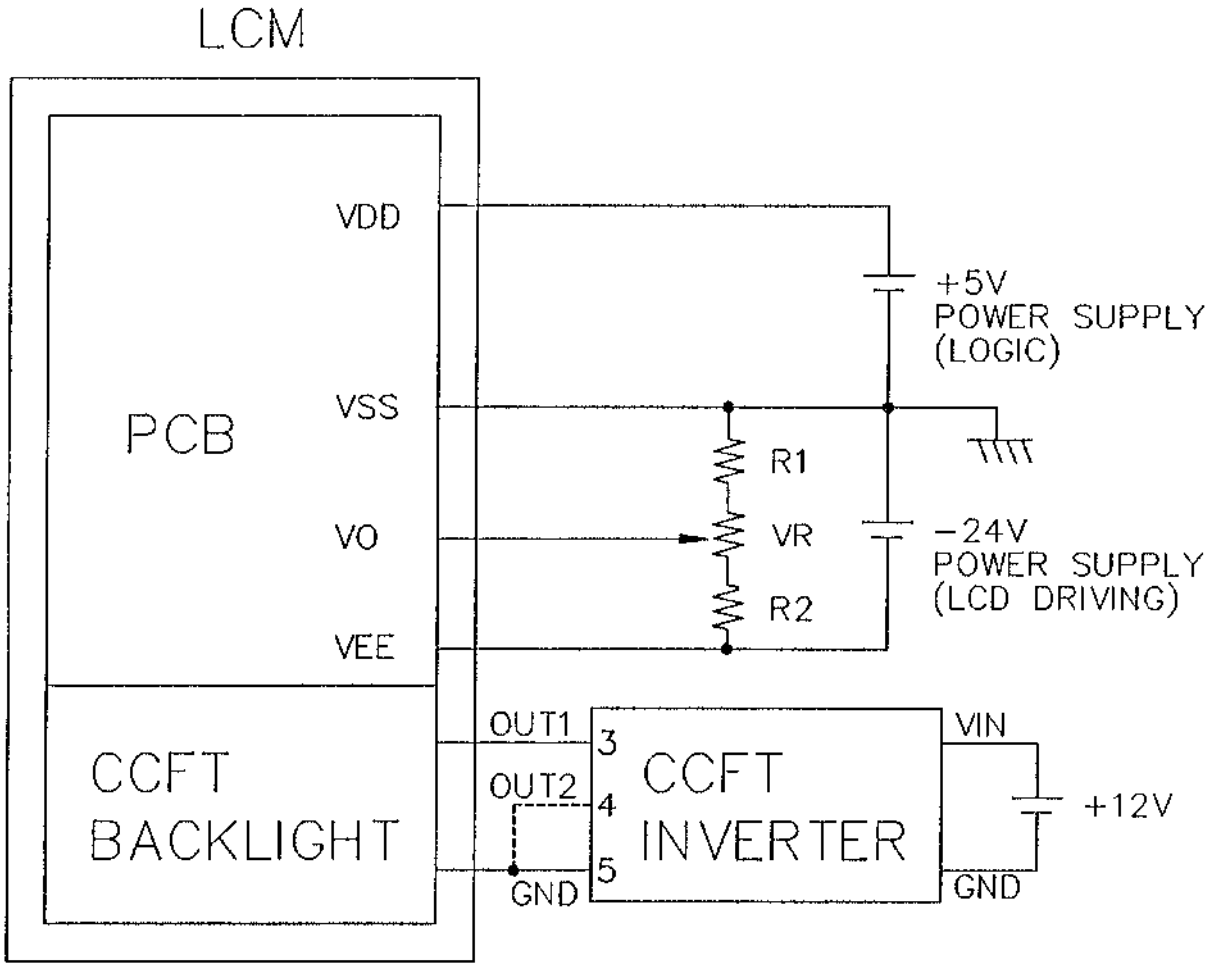
FL CONNECTOR : J.A.E./IL-G-4S-S3C2

PIN NO.	SYMBOL	LEVEL	FUNCTION
1	V_{FL}	–	POWER SUPPLY FOR CCFL DRIVE
2	NC	–	–
3	NC	–	–
4	V_{FL}	–	POWER SUPPLY FOR CCFL DRIVE

TOUCH PANEL

PIN NO.	SYMBOL	PIN NO.	SYMBOL	PIN NO.	SYMBOL	PIN NO.	SYMBOL	PIN NO.	SYMBOL
1	N.C	5	C7	9	R2	13	R6	17	C2
2	C10	6	C6	10	R3	14	R7	18	C3
3	C9	7	N.C	11	R4	15	N.C	19	C4
4	C8	8	R1	12	R5	16	C1	20	C5

7. POWER SUPPLY



1. R1+VR+R2=10K~20KΩ
2. RECOMMENDED CCFT INVERTER : CXA-L10L(TDK)

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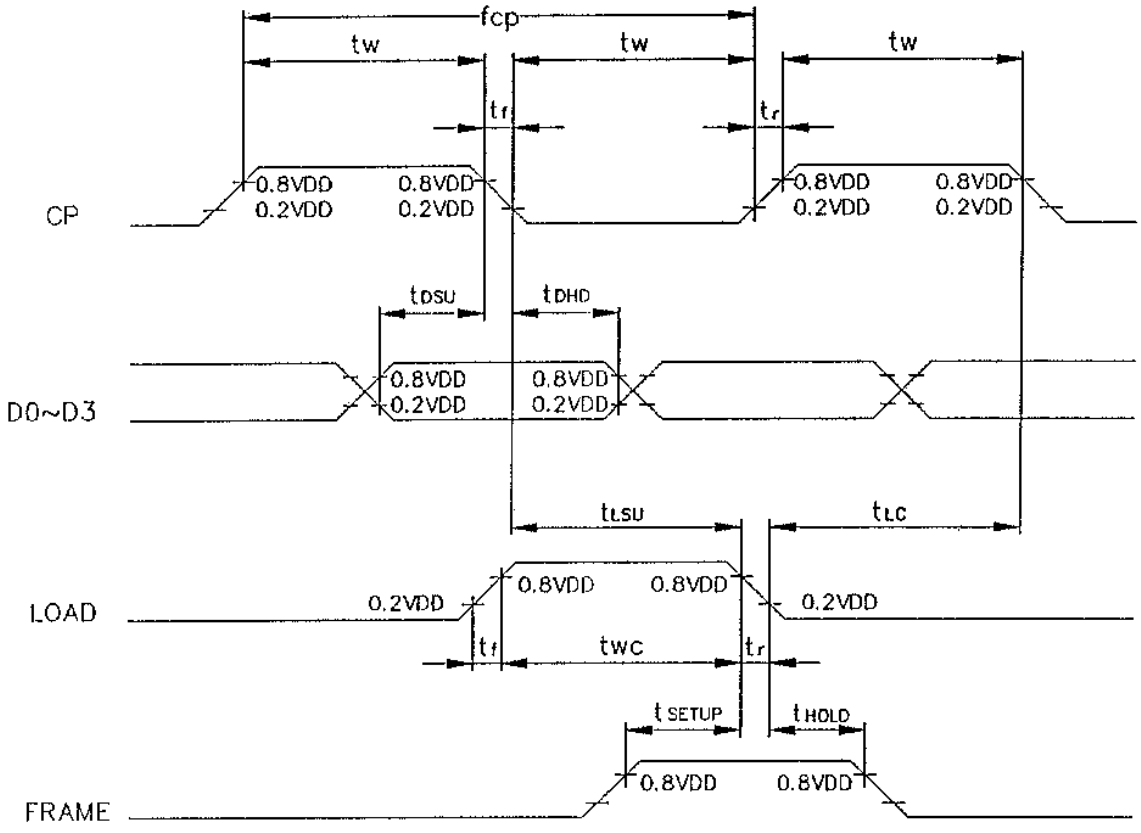
8.1TIMING CHARACTERISTICS

ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT
CLOCK FREQUENCY	fcp	–	–	6.5	MHZ
CLOCK PULSE WIDTH	tw	63	–	–	ns
CLOCK RISE,FALL TIME	t_r , t_f	–	–	20	ns
DATA SET UP TIME	t_{DSU}	50	–	–	ns
DATA HOLD TIME	t_{DHD}	50	–	–	ns
LOAD SET UP TIME	t_{LSU}	80	–	–	ns
LOAD → CLOCK TIME	t_{LC}	80	–	–	ns
"FRAME" SET UP TIME	t_{SETUP}	100	–	–	ns
"FRAME" HOLD TIME	t_{HOLD}	100	–	–	ns
"LOAD" PULSE WIDTH	t_{WC}	125	–	–	ns



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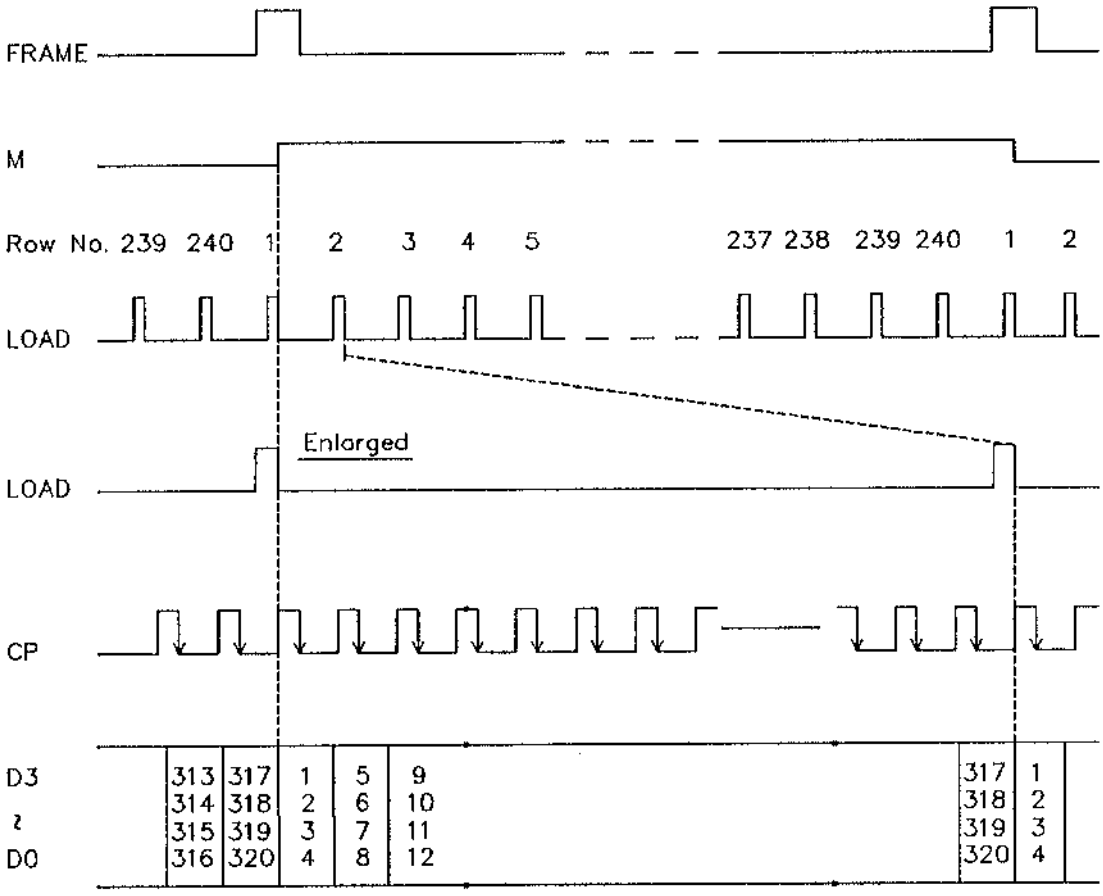
8.2TIMING CHART OF INPUT SIGNALS



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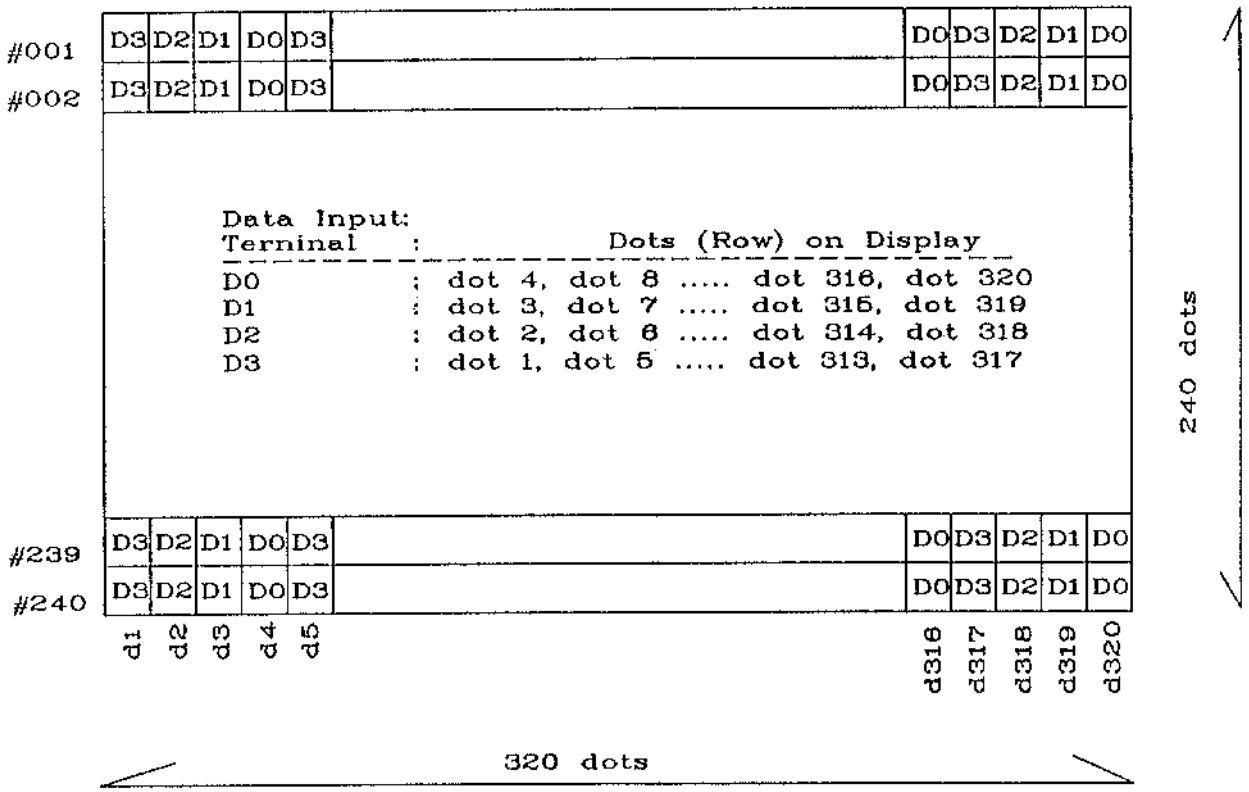
8.3DISPLAY PATTERN



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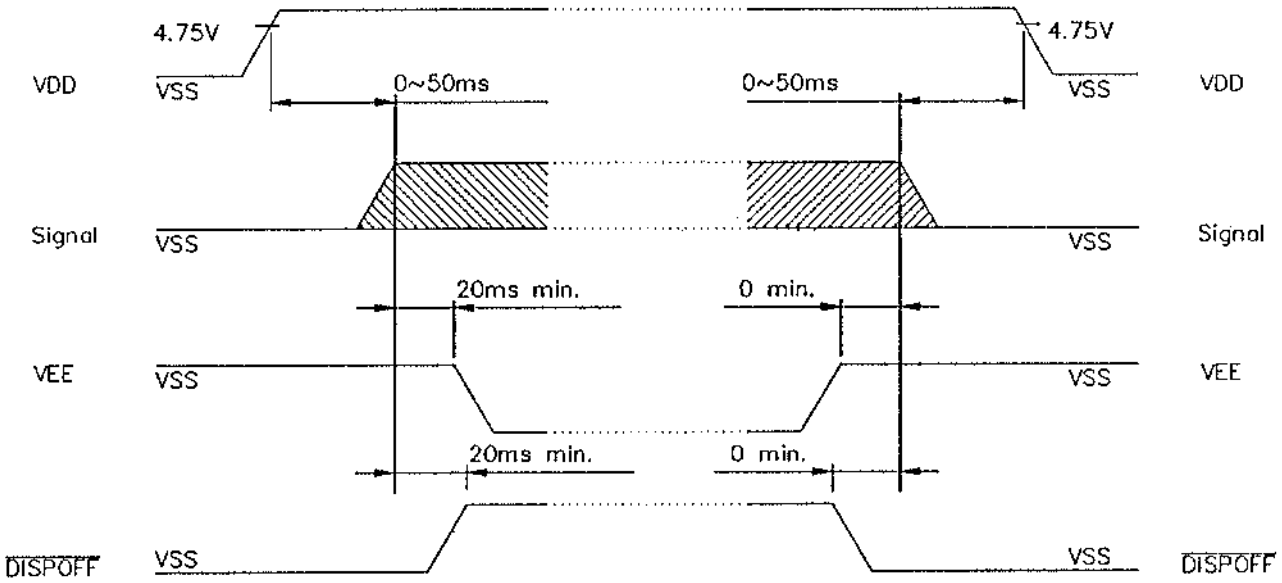
8.4POWER ON/OFF TIMING



POWER ON

POWER OFF

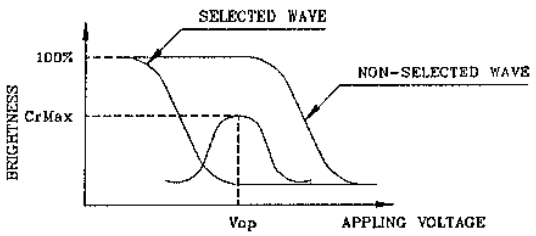
The missing pixels may occur when the LCM is driven beyond above power interface timing sequence.

9. RELIABILITY TEST

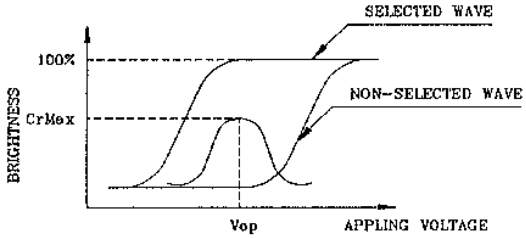
NO	ITEM	CONDITION			STANDARD	NOTE
1	High Temp. Leaving	70°C	120HR		Appearance without defect	
2	Low Temp. Leaving	−20°C	120HR		Appearance without defect	
3	High Temp. & High Humi. Leaving	40°C 90%RH	120HR		Appearance without defect	
4	Thermal Shock	−20°C,30min→25°C.5min →60°C,30min→25°C.5min (1cycle)			Appearance without defect	5 cycles

(NOTE 1)

Definition of Operation Voltage(Vop)



(positive type)



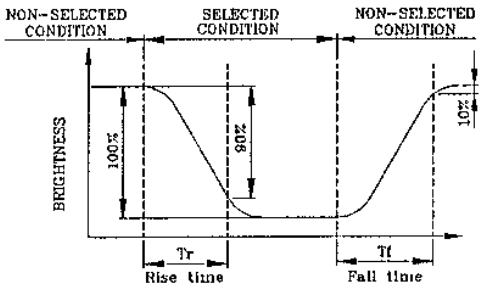
(negative type)

Conditions

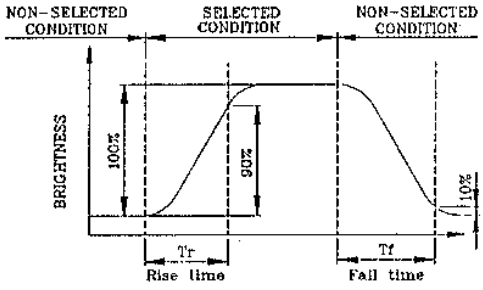
Viewing Angle : 0
Frame Frequency : 70Hz
Appling Waveform : I/N duty 1/a bias

(NOTE 2)

Definition of Response Time(Tr,Tf)



(positive type)



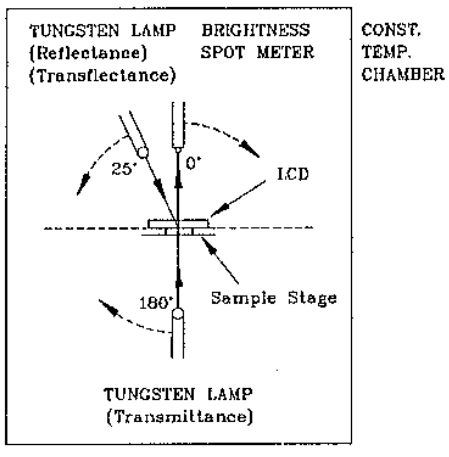
(negative type)

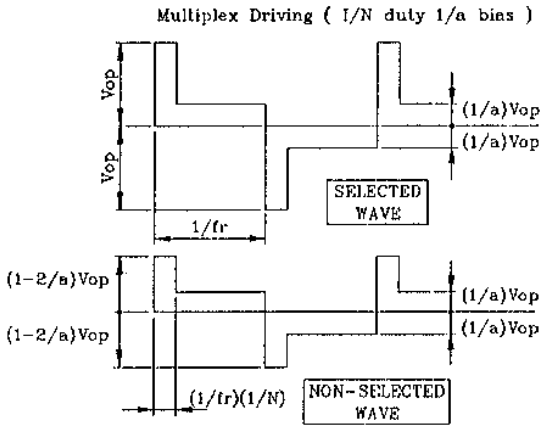
Conditions

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

(NOTE 3)

Description of Measuring Equipment and Driving Waveforms





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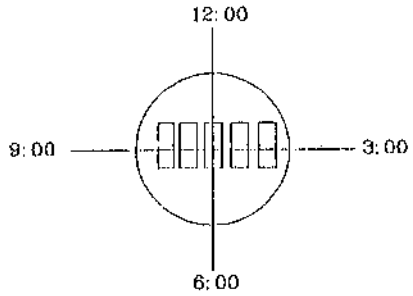
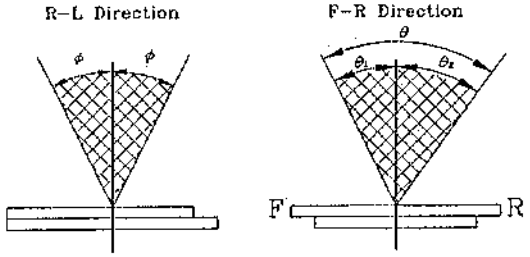
(NOTE 4)

Definition of Viewing Direction



(NOTE 5)

Definition of Viewing Angle



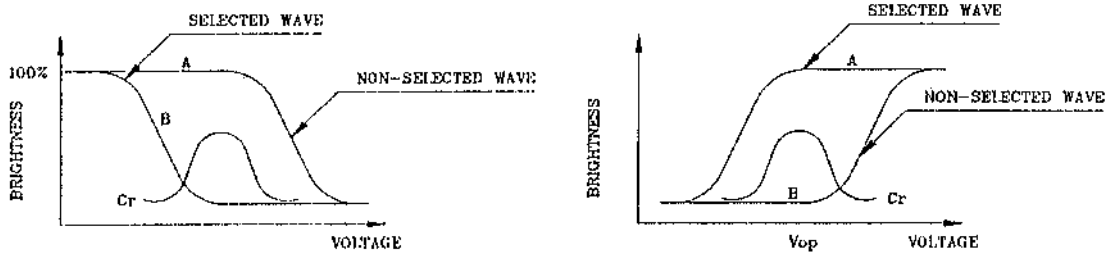
$\theta = \theta_1 + \theta_2$

Conditions

Operating Voltage : Vop
Frame Frequency : 70Hz
Appling 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
Appling Waveform : 1/N duty 1/a bias

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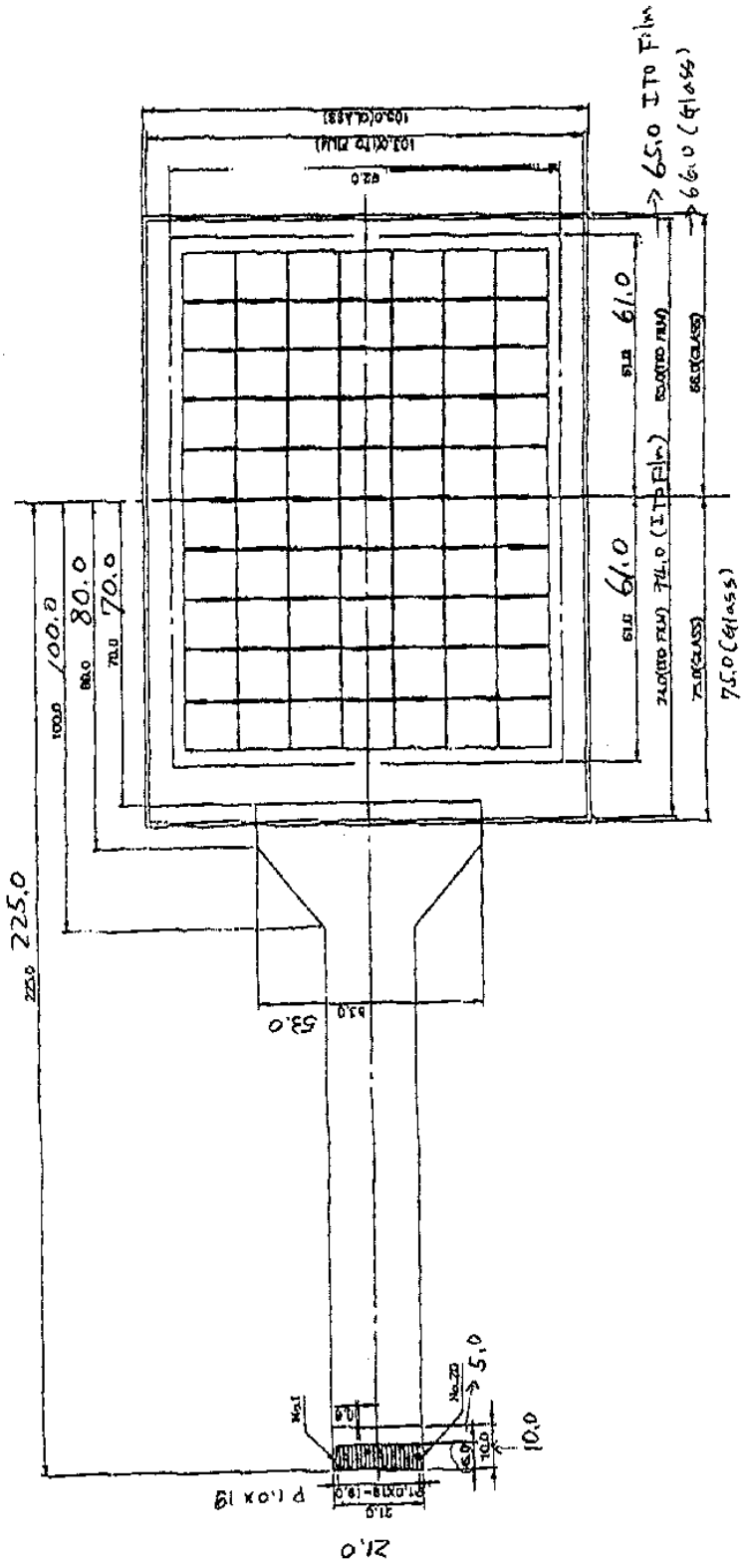

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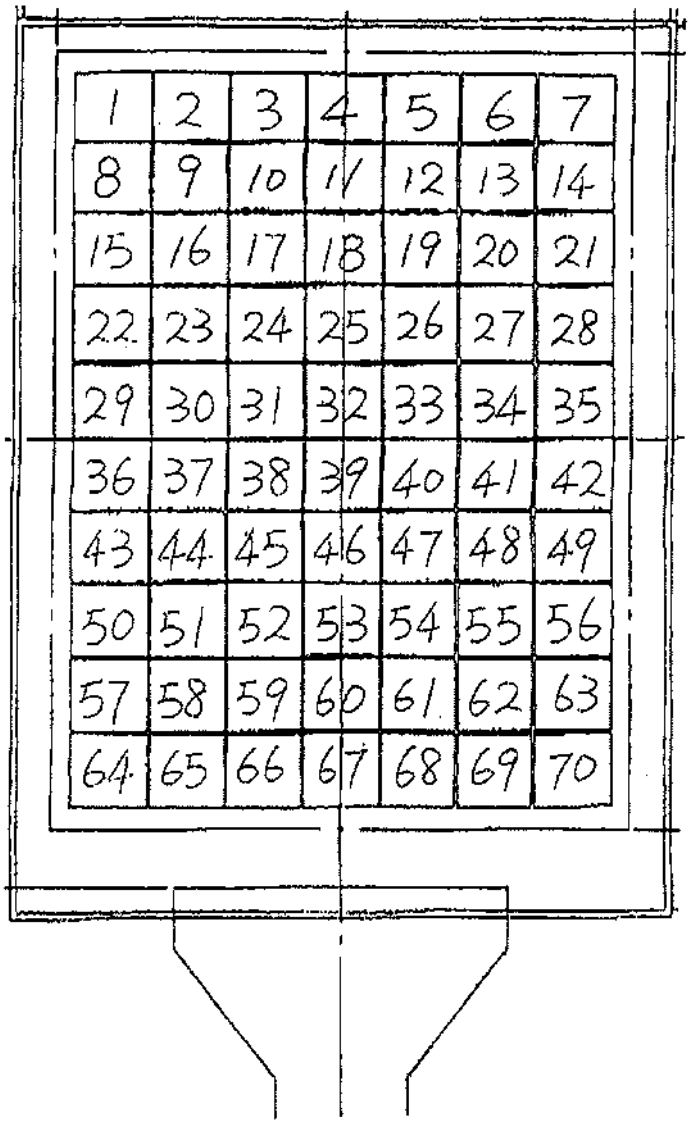

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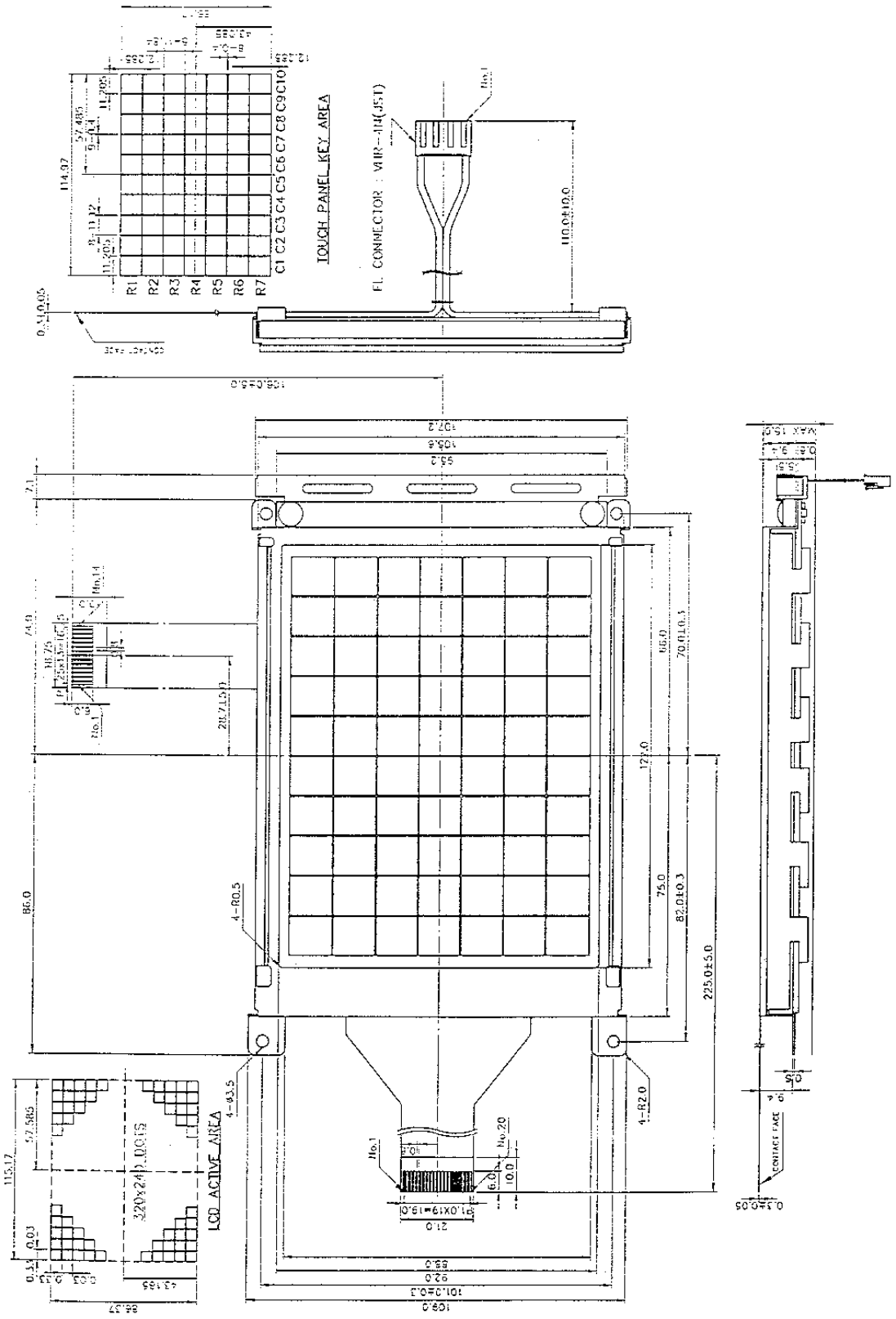
5. ELECTRICAL PROPERTIES TEST

CONTACT RESISTANCE : Specification :

KEY NO.	R(ohm)	KEY NO.	R(ohm)	KEY NO.	R(ohm)	KEY NO.	R(ohm)
1	2.9	23	12.3	45	8.1	67	0.88
2	3.3	24	12.3	46	8	68	0.8
3	3.3	25	12.5	47	7.7	69	0.95
4	3.5	26	12.5	48	7.8	70	1.2
5	3.62	27	13.2	49	7.5		
6	3.95	28	12.8	50	6.2		
7	3.8	29	10	51	6.2		
8	15.6	30	10.3	52	6		
9	16.1	31	10.3	53	6		
10	15.9	32	10.6	54	5.7		
11	16.3	33	10.6	55	6.3		
12	16.4	34	10.9	56	5.4		
13	16.6	35	10.9	57	4.1		
14	16.5	36	2.5	58	4		
15	13.7	37	2.5	59	3.9		
16	14.1	38	2.35	60	3.9		
17	14.1	39	2.26	61	3.6		
18	14.3	40	2	62	3.5		
19	14.4	41	2	63	3.3		
20	14.6	42	1.6	64	1.1		
21	14.6	43	8.3	65	0.94		
22	11.8	44	8.4	66	0.9		



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