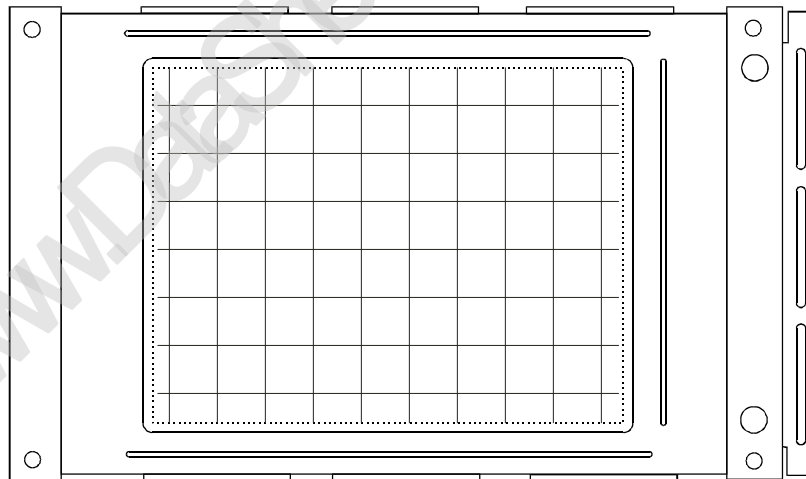


HANTRONIX

PRODUCT SPECIFICATION

HDM3224TS-1

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



HANTRONIX, INC.
10080 BUBB RD.
CUPERTINO, CA 95014

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JB

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1.0

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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)

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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	mAmps	
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.

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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℃	—	24.5	25.4	V
				0℃	—	23.1	24	
				25℃	21.7	22.4	23.2	
				50℃	20.7	21.2	—	
				70℃	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	—	V _{rms}
	Lamp Voltage	V _L			—	260	—	V _{rms}
	Brightness	B			—	26000	—	cd/m ²
	Color Degree	X			—	0.34	—	—
		Y			—	0.367	—	

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4.OPTICAL CHARACTERISTICS

AT V_{OP}

ITEM MODE		Cr(Contrast Ratio)		θ (Viewing Angle)		ϕ (Viewing Angle)	
		25℃		25℃		25℃	
		MIN.	TYP.	MIN.	TYP.	MIN.	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		

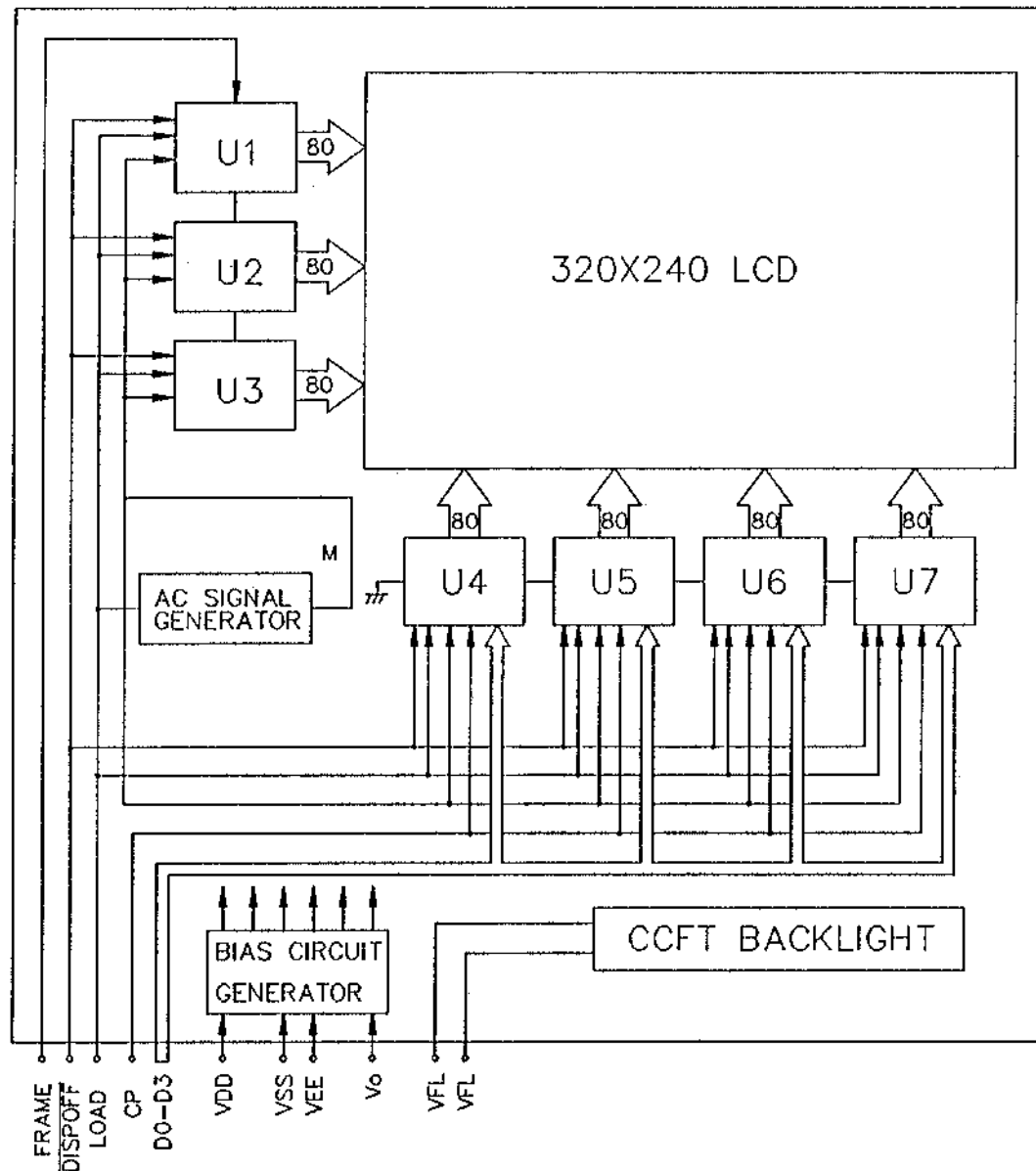
note:

R: REFLECTIVE
S: TRANSFLECTIVE
T: TRANSMISSIVE
A: GRAY

C: YELLOW
E,F: BLUE
G,H: NORMALLY BLACK
J: NORMALLY WHITE

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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	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	VFL	—	POWER SUPPLY FOR CCFL DRIVE
2	NC	—	—
3	NC	—	—
4	VFL	—	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

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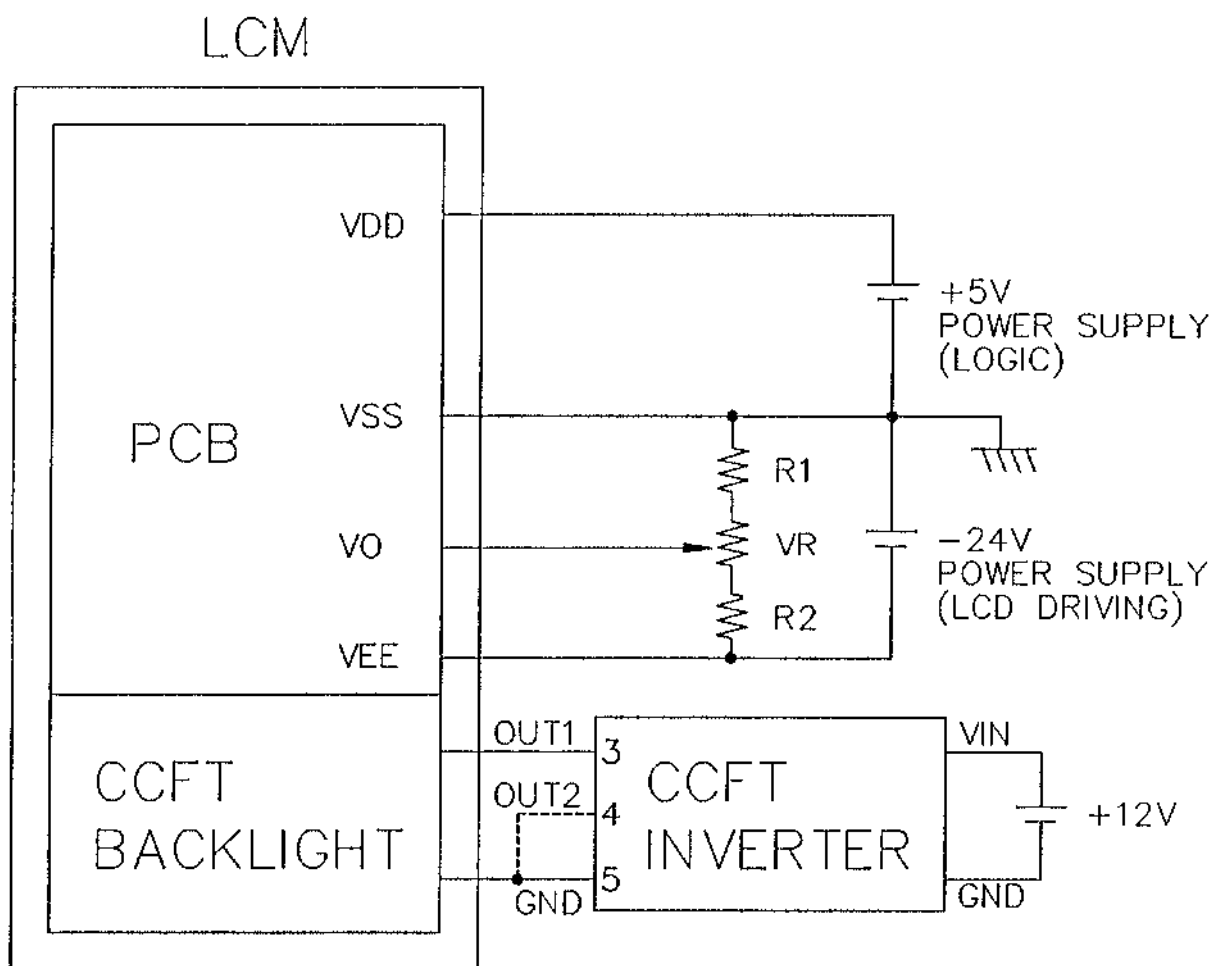
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7. POWER SUPPLY



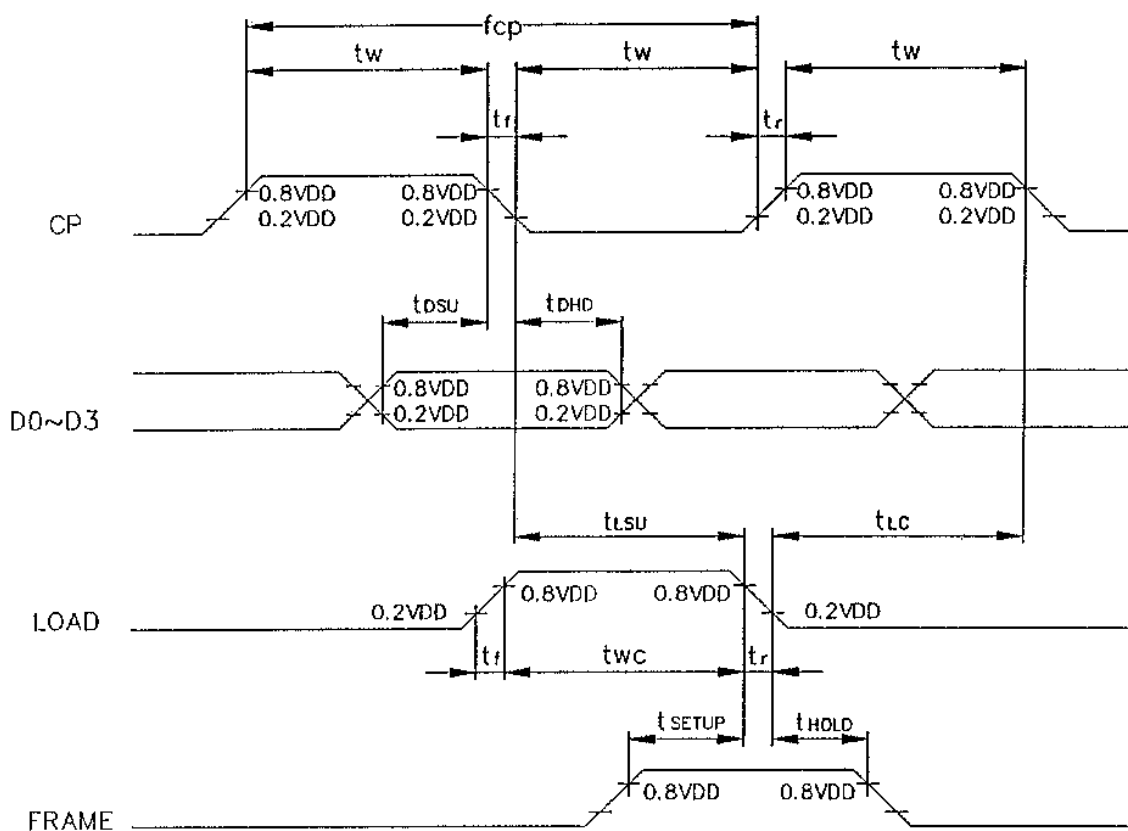
1. $R1 + VR + R2 = 10K \sim 20K \Omega$

2. RECOMMENDED CCFT INVERTER : CXA-L10L(TDK)

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8.1 TIMING CHARACTERISTICS

ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT
CLOCK FREQUENCY	f_{cp}	—	—	6.5	MHZ
CLOCK PULSE WIDTH	t_w	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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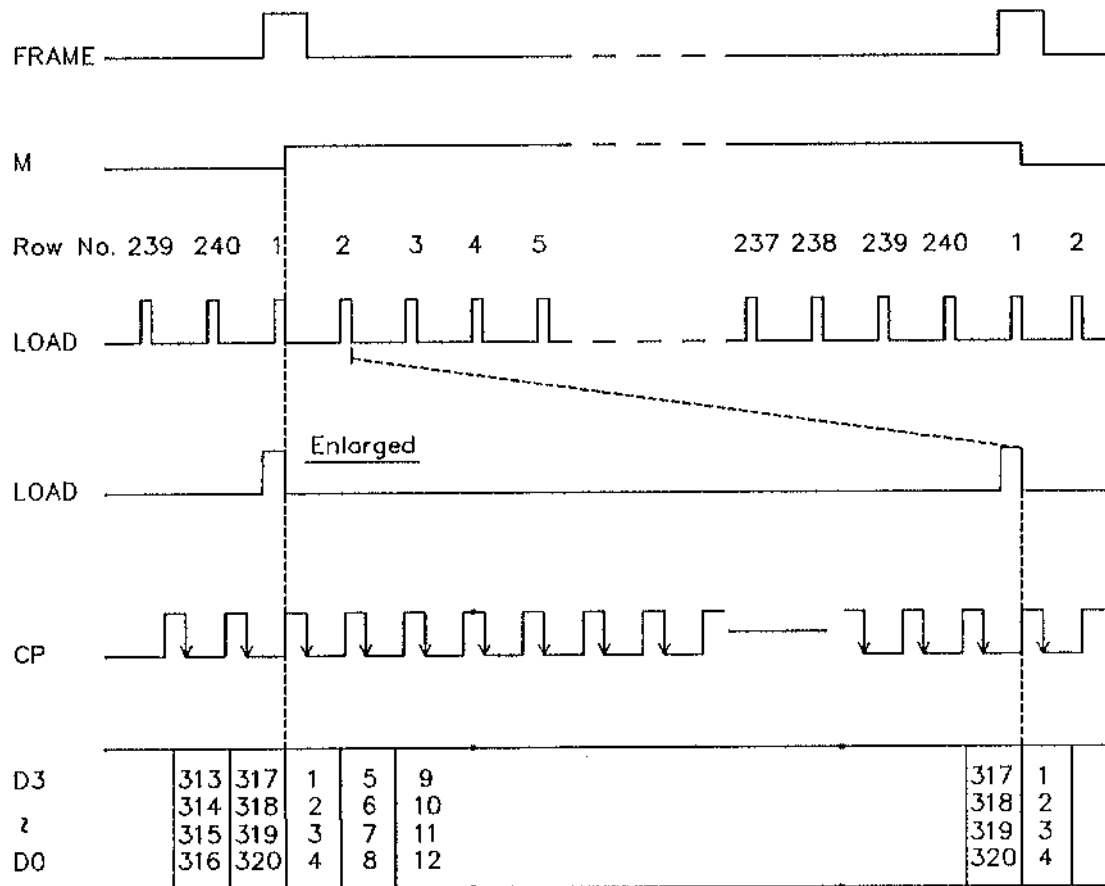
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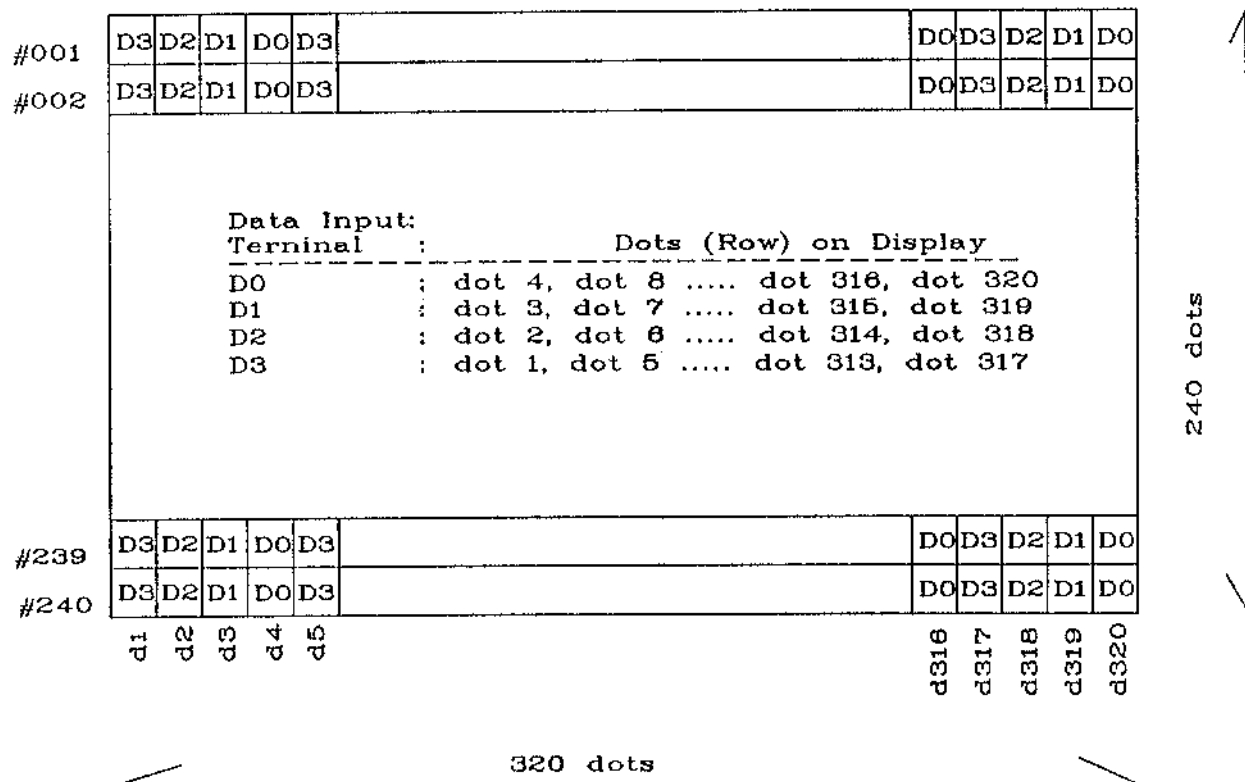
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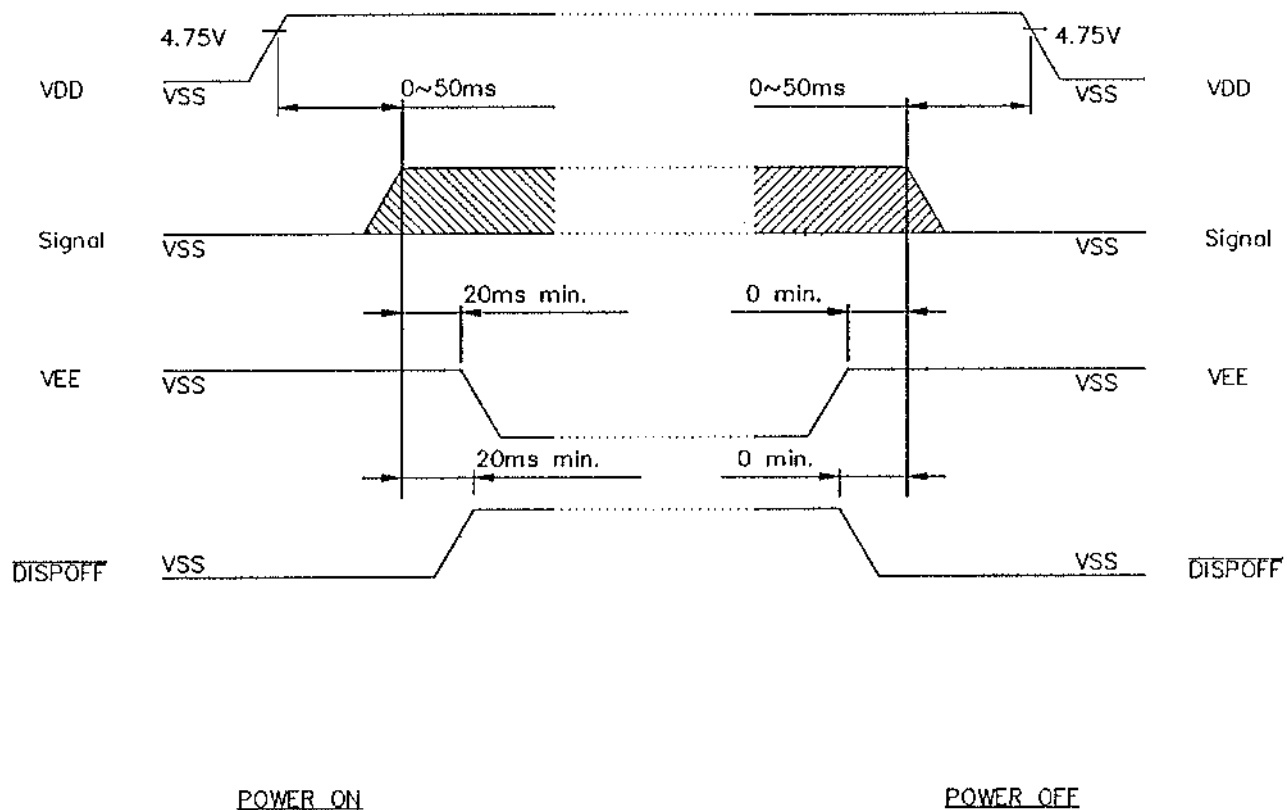
8.2TIMING CHART OF INPUT SIGNALS



8.3 DISPLAY PATTERN



8.4 POWER ON/OFF TIMING



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

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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

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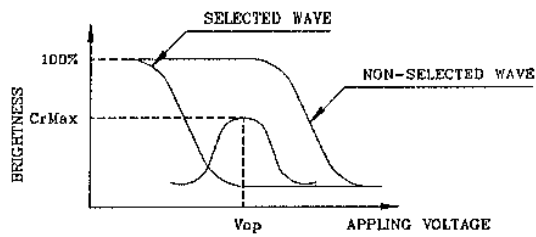
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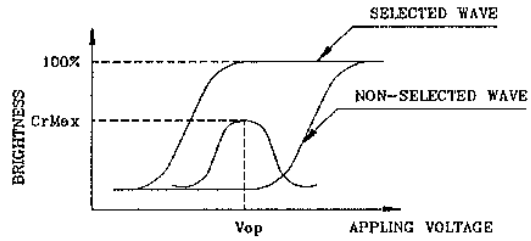
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(NOTE 1)

Definition of Operation Voltage(V_{op})



(positive type)



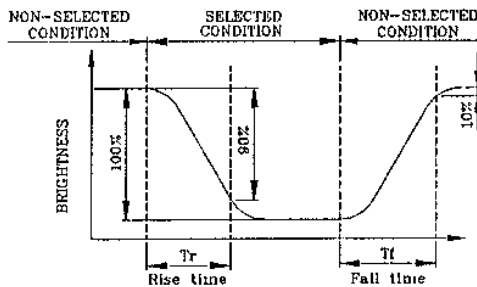
(negative type)

Conditions

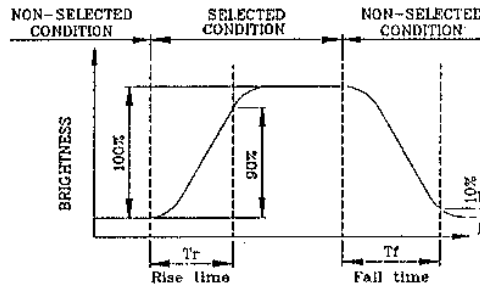
Viewing Angle : 0
Frame Frequency : 70Hz
Applying Waveform : 1/N duty 1/a bias

(NOTE 2)

Definition of Response Time(T_r, T_f)



(positive type)



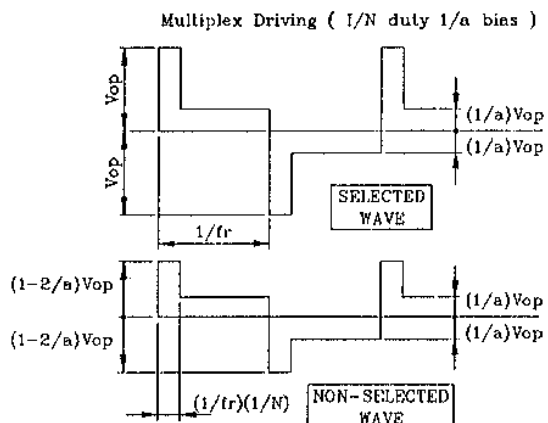
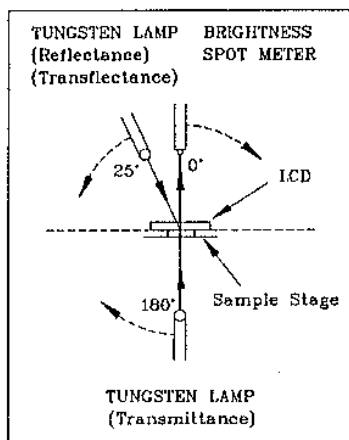
(negative type)

Conditions

Operating Voltage : V_{op}
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



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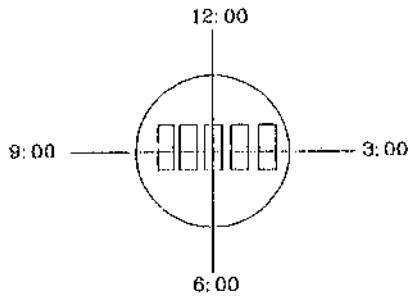
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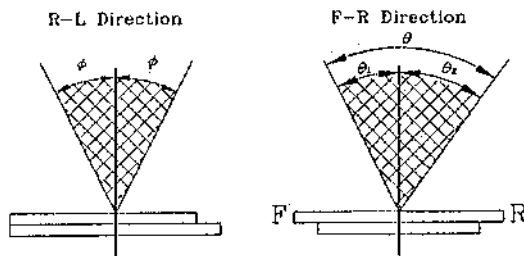
(NOTE 4)

Definition of Viewing Direction



(NOTE 5)

Definition of Viewing Angle



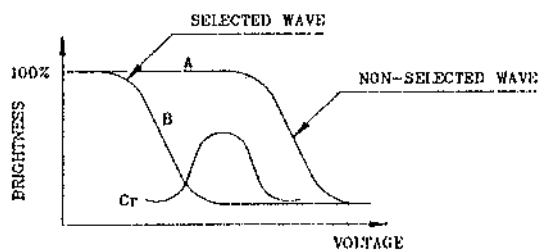
$$\theta = \theta_1 + \theta_2$$

Conditions

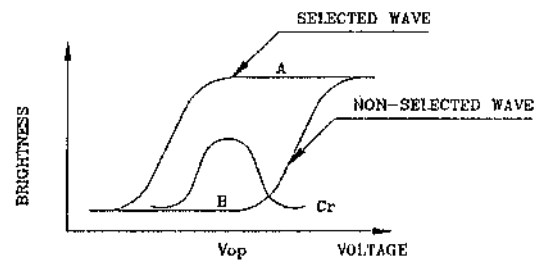
Operating Voltage : V_{op}
 Frame Frequency : 70Hz
 Applying Waveform : 1/N duty 1/a bias
 Contrast Ratio : larger than 2

(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

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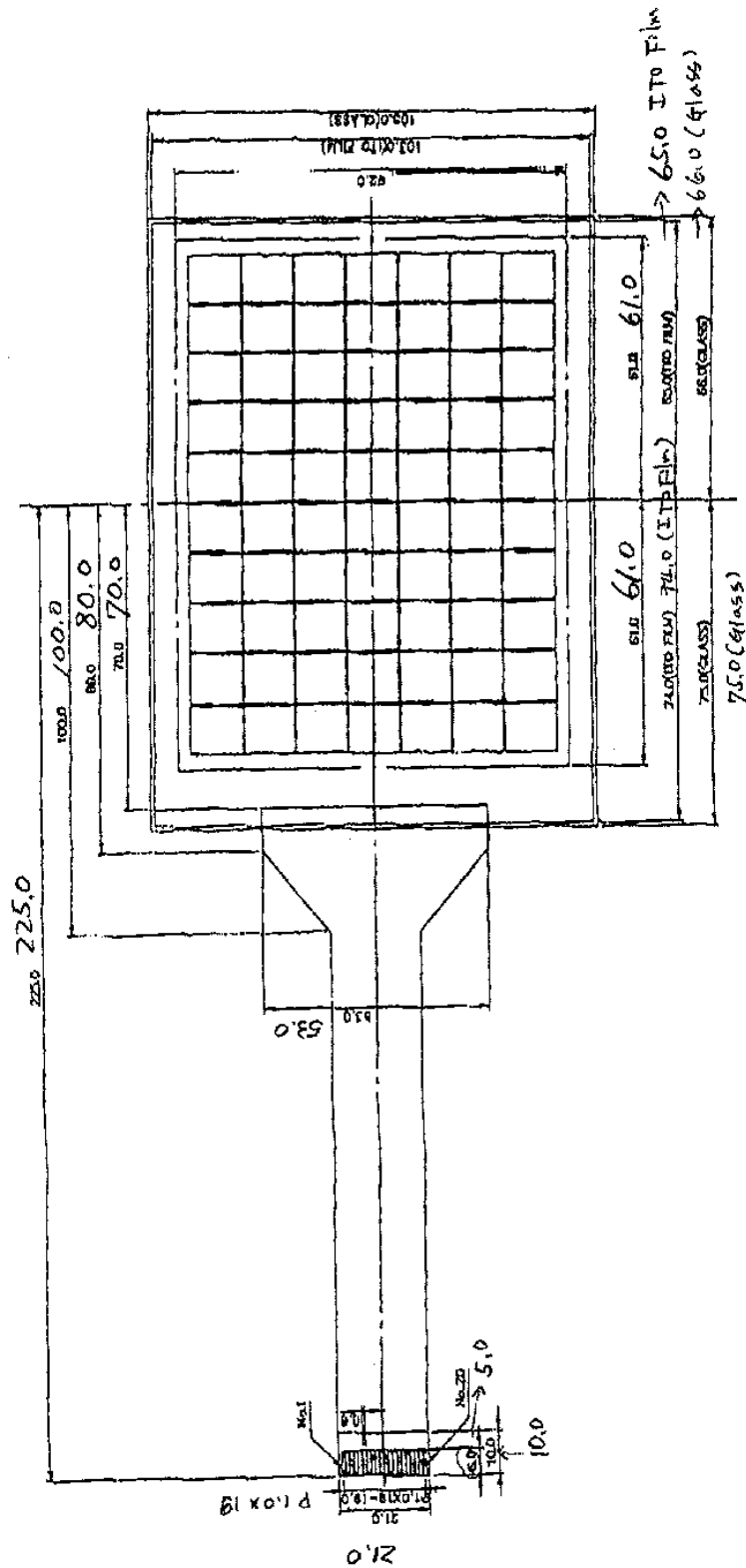
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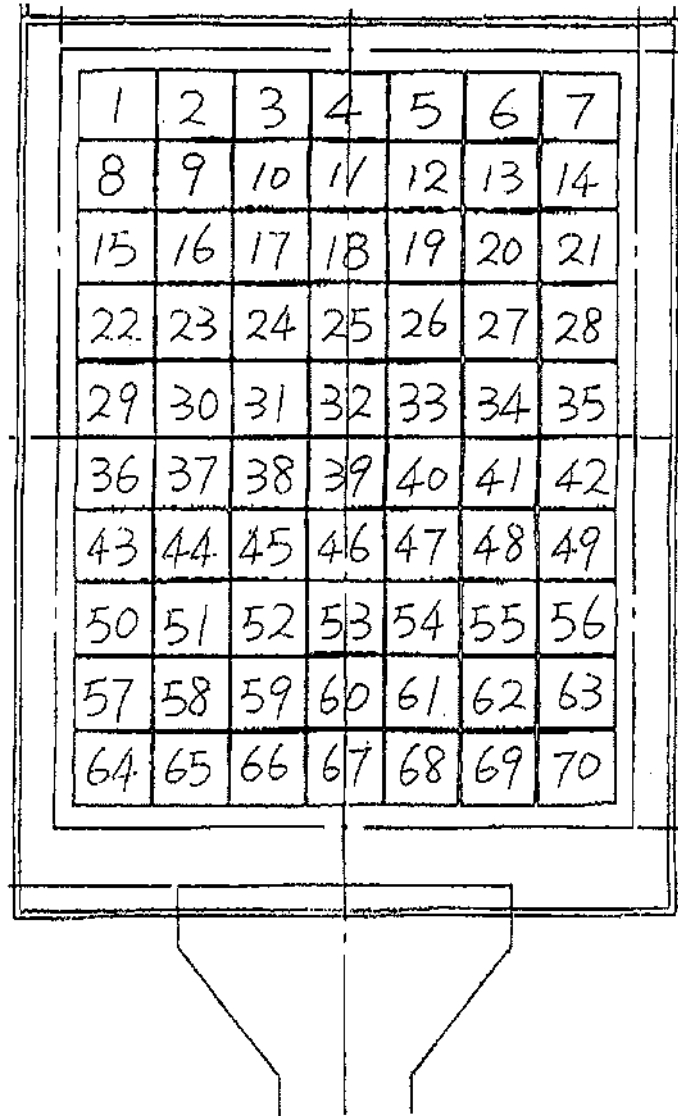
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5. ELECTRICAL PROPERTIES TEST

CONTACT RESISTANCE :

Specification :

KEY NO.	R ^K (ohm)		KEY NO.	R ^K (ohm)		KEY NO.	R ^K (ohm)		KEY NO.	R ^K (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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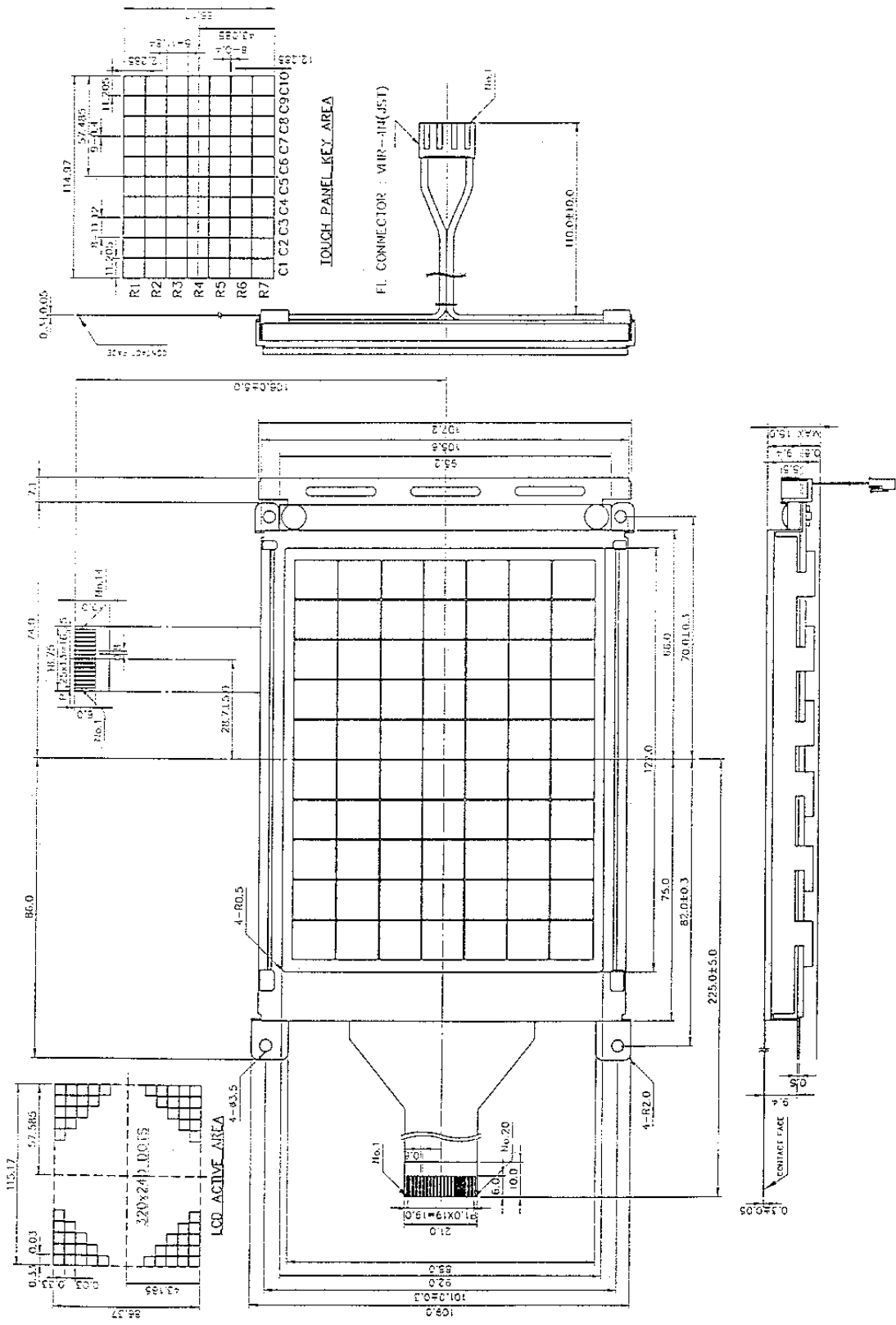
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