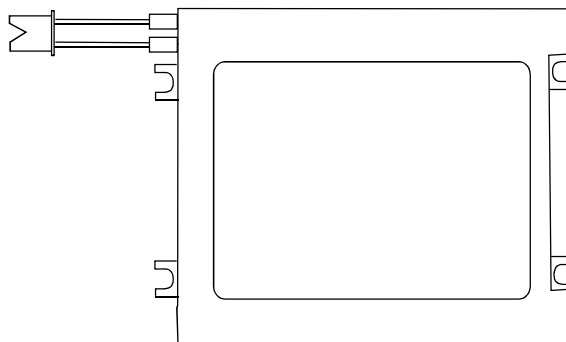




PRODUCT SPECIFICATION

HDM3224-Z

320 x 240 GRAPHICS
LCD DISPLAY MODULE



HANTRONIX, INC. 10080 BUBB RD. CUPERTINO, CA 95014	Q.A.: JK	REV.: 1.1	HDM3224-Z	SHEET 1 OF 18
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1. MECHANICAL DATA

(1) Product No.	HDM3224-Z
(2) Module Size	142.6 (W)mm x 92.6 (H)mm x MAX 7.5 (D)mm
(3) Dot Size	0.285 (W)mm x 0.285 (H)mm
(4) Dot Pitch	0.30 (W)mm x 0.30 (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 ☐ Other Mode FSTN: ☐ Black and White(Normal White/Positive Image) ☐ Black and White(Normal Black/Negative Image) Rear Polarizer: ☐ Transflective(Normal) ☐ Transmissive ☐ Transflective(Medium Transparency) ☐ Transflective(High Transparency) ☐ Reflective
(8) Viewing Direction	☐ 6 O'clock ☐ 12 O'clock ☐ ____O'clock
(9) Backlight	☐ CCFT ☐ W/O B.L
(10) Recommended FL Inverter	TDK CORP. CXA-L10L For CCFT
(11) Weight	120 g (approx.)

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	6.5	V	
Power Supply for LCM	VDD-VEE	0	27.0	V	
Input Voltage	VI	-0.3	VDD+0.3	V	
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 2, 4		Note 3, 4	

Note 2 Ta ≤ 70°C : 75%RH max

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

Note 3 Ta at -30°C will be < 48hrs, at 80°C will be < 120hrs

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

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3. ELECTRICAL CHARACTERISTICS

ITEM		SYMBOL	CONDITION		MIN.	TYP.	MAX.	UNIT
Power Supply for Logic		VDD-VSS	-		4.5	5.0	5.5	V
					2.7	3.0	3.3	
Recommended LC Driving Voltage		VDD-VEE	Duty=1/240 Bias=1/13	-20℃	24.3	24.7	25.1	V
				0℃	23.0	23.4	23.8	
				25℃	22.2	22.6	23.0	
				50℃	20.9	21.3	21.7	
				70℃	20.3	20.7	21.1	
Input Voltage		V _H	H level		0.8VDD	-	VDD	V
		V _L	L level		0	-	0.2VDD	V
Power Supply Current		I _{DD}	FLM = 70 Hz VDD = 5.0 V VDD-VEE = 22.6 V		-	6.4	9	mA
		I _{EE}	PATTERN : □ ■ □ ■ □ ■ ■ □ ■ □ ■ □		-	6.0	9	mA
CCFL LAMP	Starting Voltage	V _s			-	420	1000	V _{rms}
	Lamp Voltage	V _L			-	280	-	V _{rms}
	Lamp Current	I _L			4	5	6	mArms
	Lamp Consumption	P _L			-	1.4	-	W
	Lamp Frequency	F _L			-	35	-	KHz
	Lamp Life Time	L _L			-	20000	-	hrs
LCM	Surface Luminance	L(ALL ON)	Transmissive/Black		-	191	-	cd/m ²
		L(ALL OFF)			-	8.3	-	cd/m
		L(ALL ON)	Transflective/Normally white		-	23	-	cd/m
		L(ALL OFF)			-	97	-	cd/m
		L(ALL ON)	Transflective/BLUE		-	36	-	cd/m
		L(ALL OFF)			-	195	-	cd/m

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4.OPTICAL CHARACTERISTICS

ITEM MODE		Cr(Contrast Ratio)										θ(Viewing Angle)		θ(Viewing Angle)	
		-20℃		0℃		25℃		50℃		70℃		25℃		25℃	
		MIN.	TYP.	MIN.	TYP.	MIN.	TYP.	MIN.	TYP.	MIN.	TYP.	MIN.	TYP.	MIN.	TYP.
T	G,H	-	15	-	18	-	20	-	10	-	5	-	X-60	-	54-33
S	J	-	7	-	8	-	8	-	6	-	4	-	36-36	-	33-36
T	E	-	4	-	4	-	4.5	-	3.5	-	2.5	-	X-37	-	37-27
R	J	5	7	6	8	6	8	4	6	2.5	4	-	36-33	-	35-35
Note		NOTE 6										NOTE 5			

Note:

R: REFLECTIVE

S: TRANSFLECTIVE(NORMAL)

T: TRANSMISSIVE

P: TRANSFLECTIVE(MEDIUM TRANSPARENCY)

A: GRAY

C: YELLOW

E,F: BLUE

G,H: NORMALLY BLACK

J: NORMALLY WHITE

Z: OTHER

ITEM		SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Response Time (rise)		Tr	-20℃	1700	3400	5100	ms	NOTE 2
			0℃	400	800	1200		
			25℃	100	200	300		
			50℃	50	100	150		
			70℃	35	70	105		
Response Time (fall)		Tf	-20℃	1000	2000	3000	ms	NOTE 2
			0℃	180	350	520		
			25℃	60	120	180		
			50℃	35	70	105		
			70℃	25	50	75		

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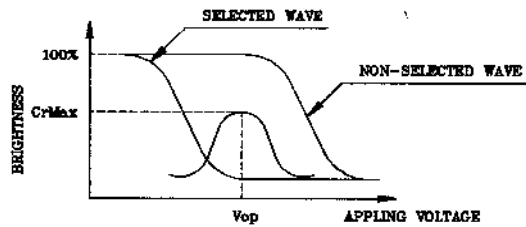
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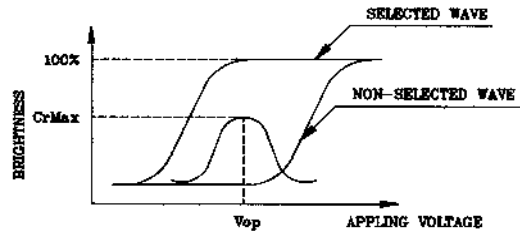
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(NOTE 1)

Definition of Operation Voltage(V_{op})



(positive type)



(negative type)

*Conditions

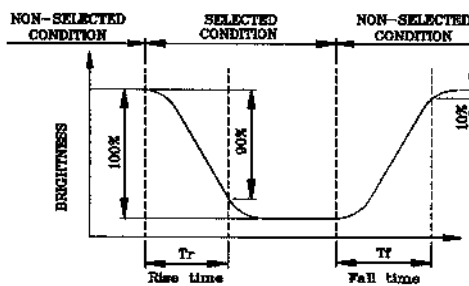
Viewing Angle : 0

Frame Frequency : 70Hz

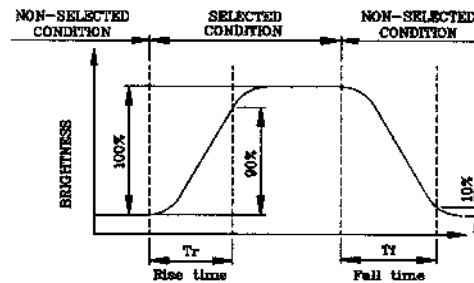
Applying Waveform : 1/N duty 1/a bias

(NOTE 2)

Definition of Response Time(T_r, T_f)



(positive type)



(negative type)

*Conditions

Operating Voltage : V_{op}

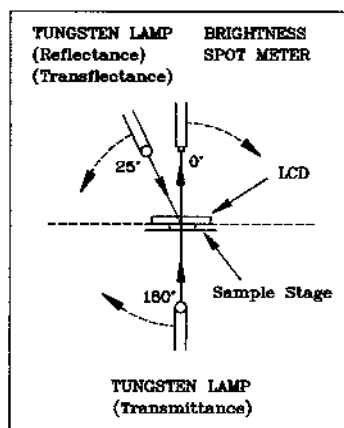
Viewing Angle (θ, ϕ) : (0,0)

Frame Frequency : 70Hz

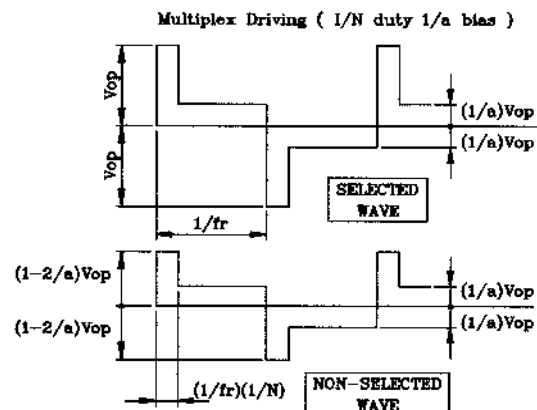
Applying Waveform : 1/N duty 1/a bias

(NOTE 3)

Description of Measuring Equipment and Driving Waveforms

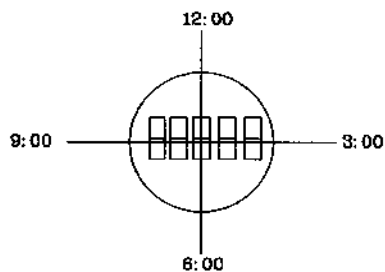


CONST.
TEMP.
CHAMBER



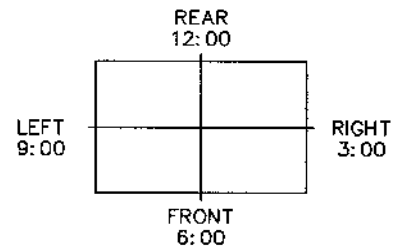
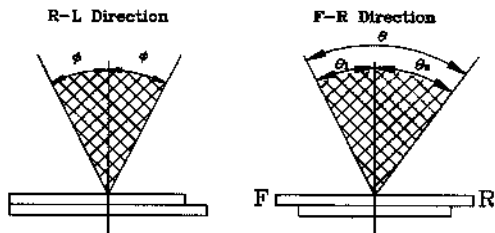
(NOTE 4)

Definition of Viewing Direction



(NOTE 5)

Definition of Viewing Angle



*For This Product

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

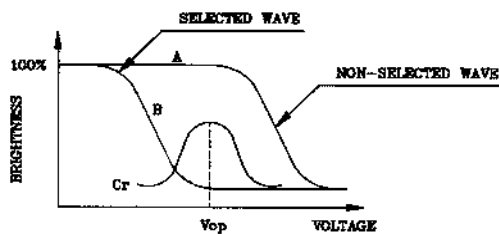
$$\theta = \theta_1 + \theta_2$$

*Conditions

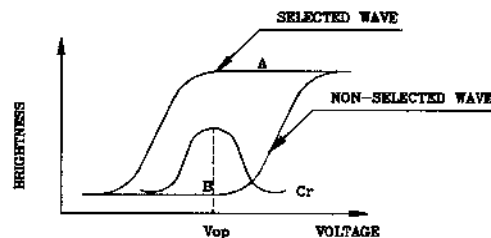
Operating Voltage : Vop
Frame Frequency : 70Hz
Applying Waveform : 1/N duty 1/a bias
Contrast Ratio : larger than 2

(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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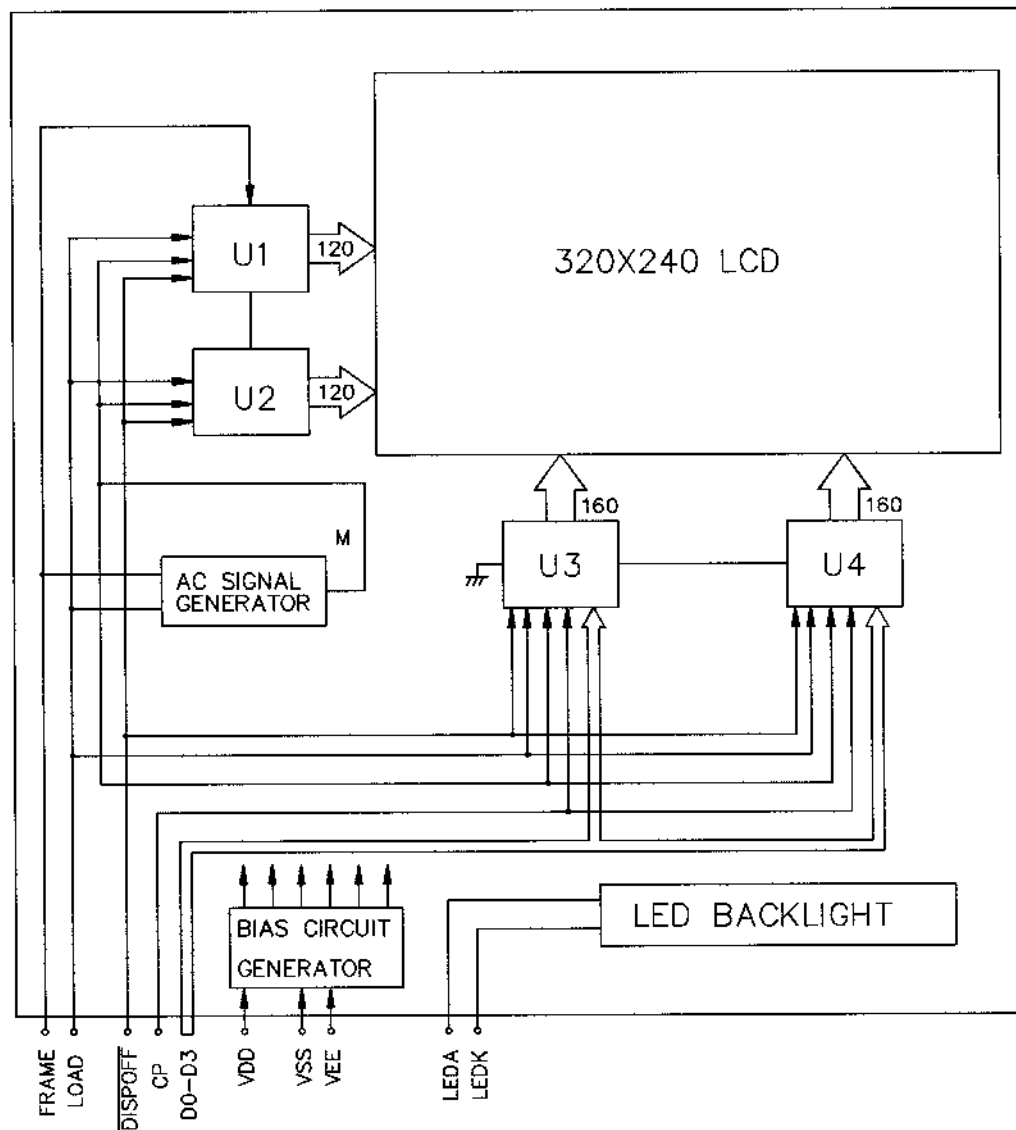
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5. BLOCK DIAGRAM



* AC SIGNAL SETTING

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

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6.INTERNAL PIN CONNECTION

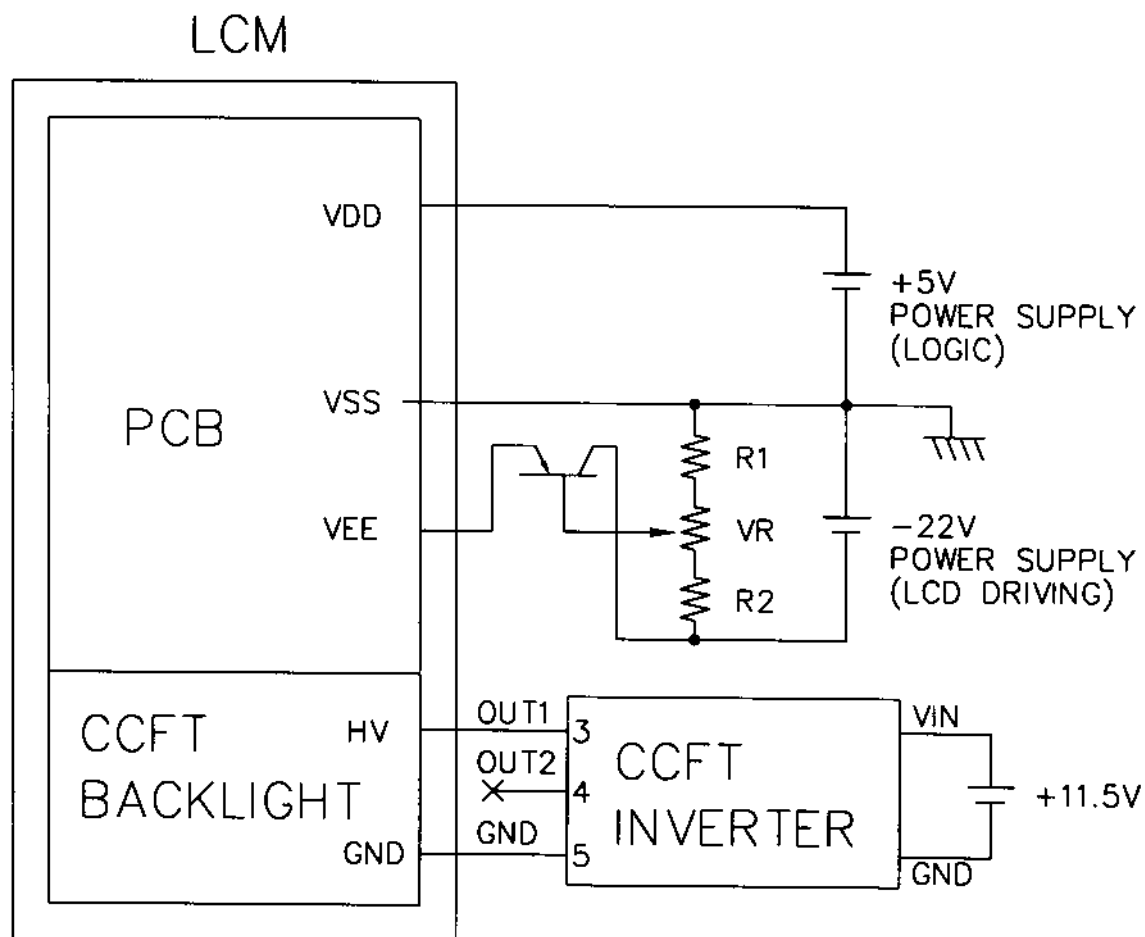
PIN CONNECTOR : ELCO 6224-12P-S-A OR EQUIVALENT

PIN NO.	SYMBOL	LEVEL	FUNCTION
1	FRAME	H	FIRST LINE MARKER
2	LOAD	H→L	DATA LATCH
3	CP	H→L	DATA SHIFT
4	VDD	—	POWER SUPPLY FOR LOGIC
5	VSS	—	GND
6	VEE	—	POWER SUPPLY FOR LC
7	D0	H/L	DISPLAY DATA
8	D1		
9	D2		
10	D3		
11	$\overline{\text{DISPOFF}}$	H/L	H: ON/L: OFF
12	NC	—	—

CCFL CONNECTOR : MITSUMI/M63M83-04 OR EQUIVALENT

PIN NO.	SYMBOL	LEVEL	FUNCTION
1	GND	—	GND FOR CCFT BACKLIGHT
2	NC	—	—
3	NC	—	—
4	HV	—	POWER SUPPLY FOR CCFT BACKLIGHT

7. POWER SUPPLY



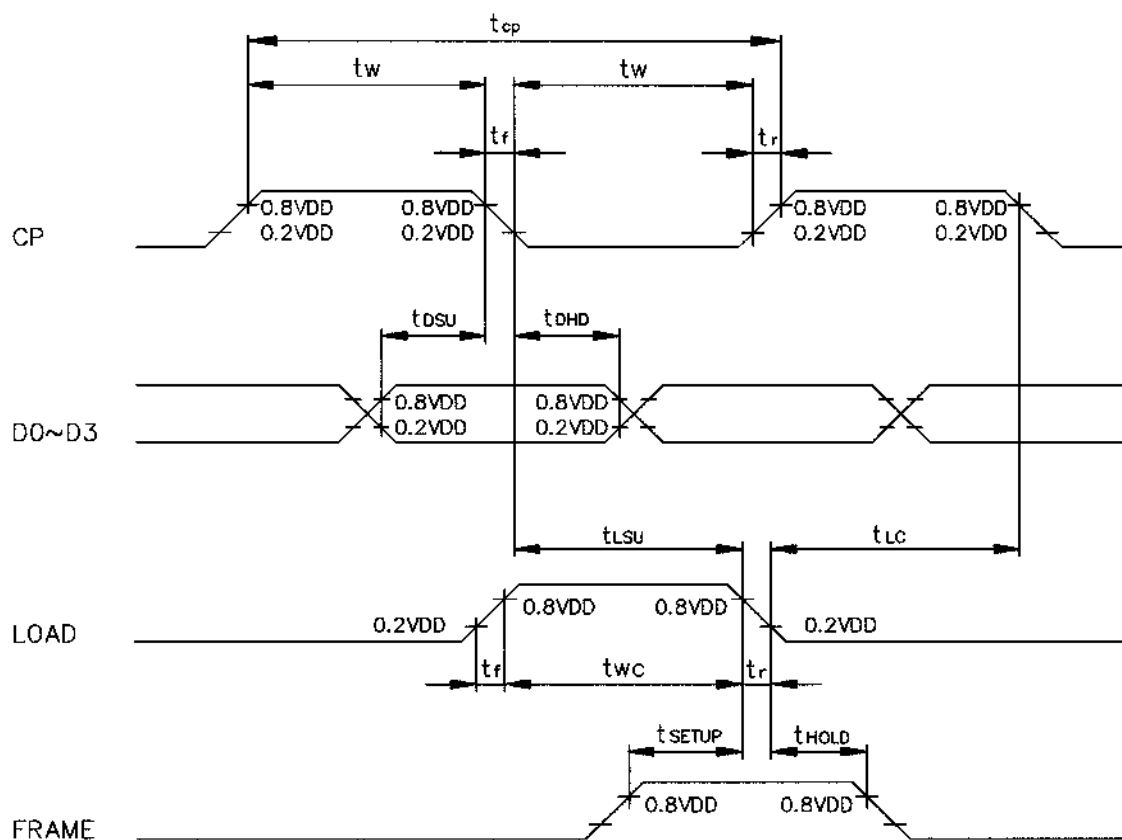
1. $R1 + VR + R2 = 10K \sim 20K \Omega$

2. RECOMMENDED CCFT INVERTER : CXA-L10L(TDK)
(OPERATING TEMP. $-10^{\circ} \sim 60^{\circ}C$)

8. TIMING CHARACTERISTICS

@VDD=2.5~5.5V

ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT
Shift Clock Period	t_{cp}	220	—	—	ns
"CP" PULSE WIDTH	t_w	90	—	—	ns
CLOCK RISE, FALL TIME	t_r, t_f	—	—	20	ns
DATA SETUP TIME	t_{dsu}	80	—	—	ns
DATA HOLD TIME	t_{dhd}	65	—	—	ns
"CP" → "LOAD" FALL TIME	t_{lsu}	100	—	—	ns
"LOAD" → "CP" FALL TIME	t_{lc}	100	—	—	ns
"FRAME" SETUP TIME	t_{setup}	100	—	—	ns
"FRAME" HOLD TIME	t_{hold}	100	—	—	ns
"LOAD" PULSE WIDTH	t_{wc}	110	—	—	ns



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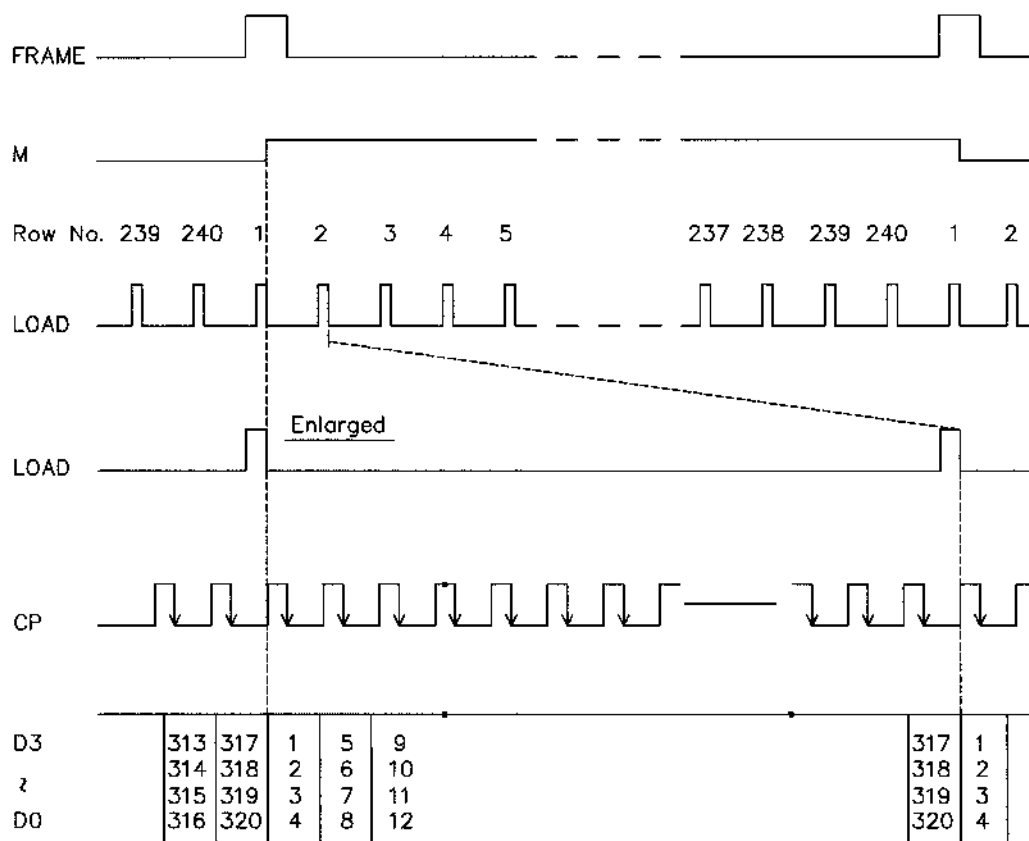
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8.2TIMING CHART OF INPUT SIGNALS



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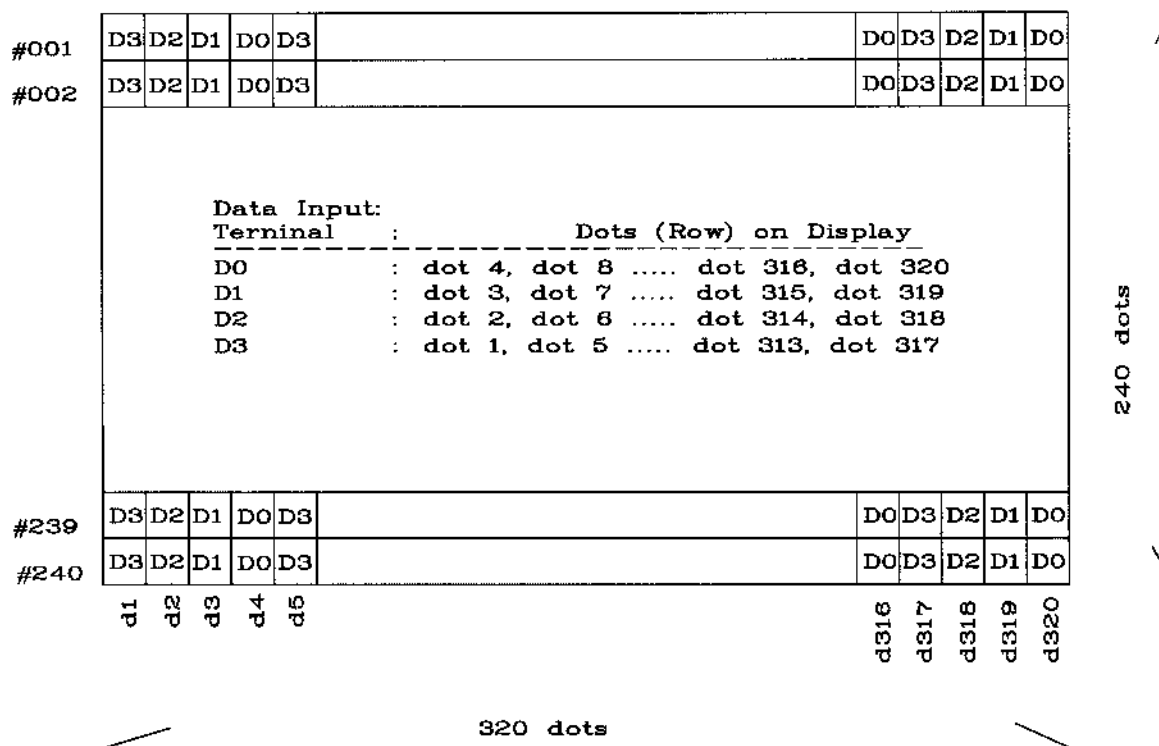
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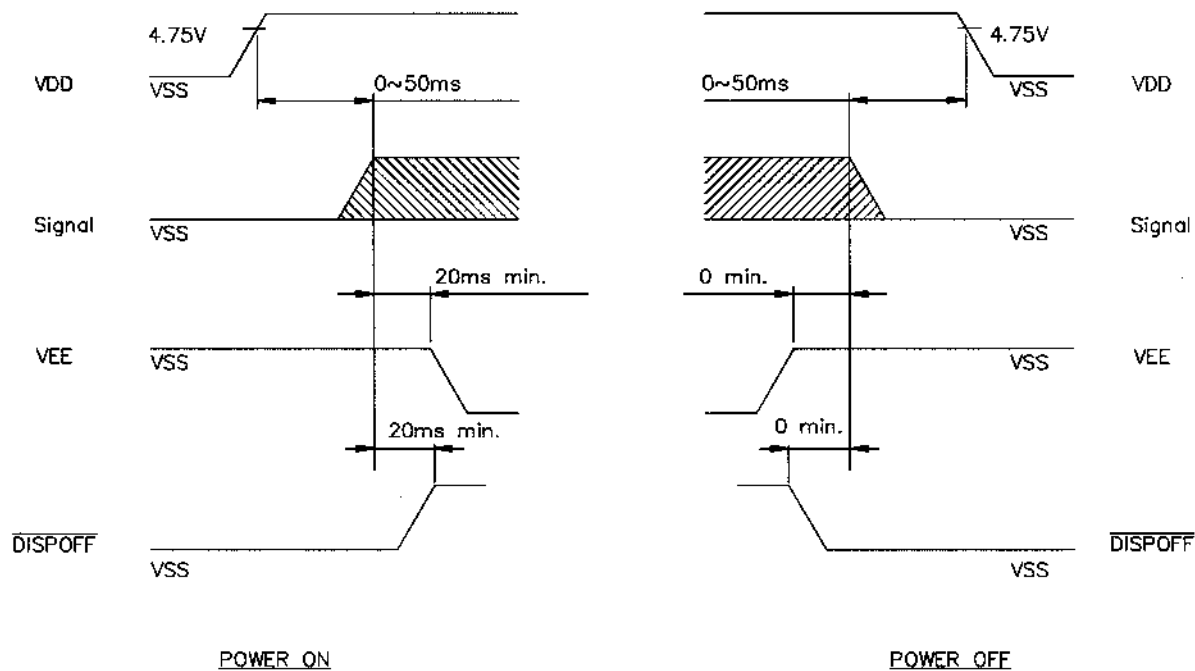
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8.3DISPLAY PATTERN



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. 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

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NOTICE:

- 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

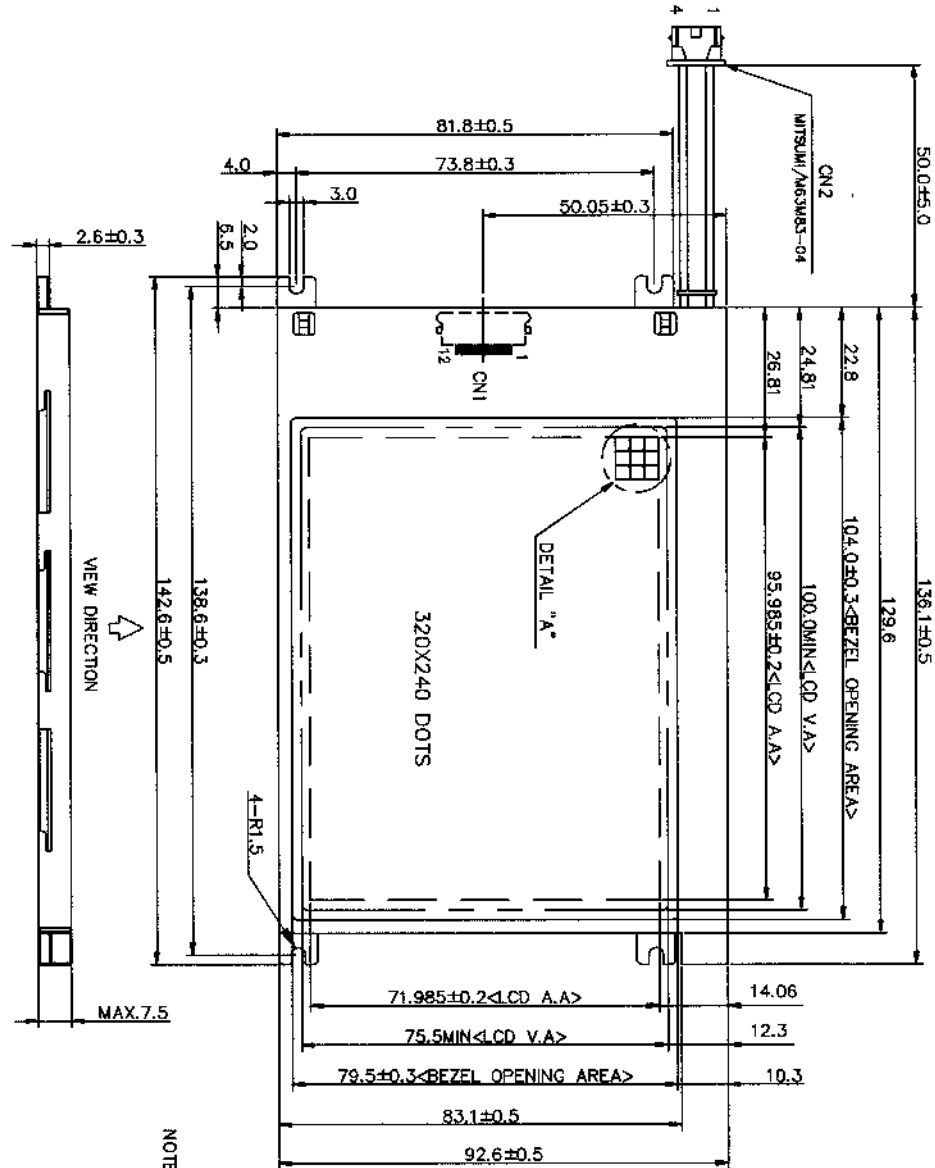
- 1.Acceptance inspection period
The period is within one month after the arrival of contracted commodity at the buyer's factory site.
- 2.Applicable warrant period
The period is within twelve months since the date of shipping out under normal using and storage conditions.

- THE OPERATING LIFE TIME OF BACK LIGHT

CCFT : 20,000hrs for lamp—current 5mA, 35KHz, 25°C

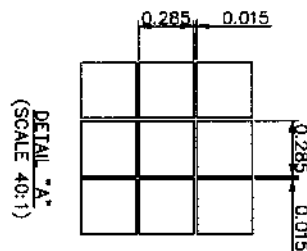
(Operating life time is defined as follows : The final brightness is at 50% of original brightness.)

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NOTES :

- 1.RESOLUTION : 320 X 240 DOTS
- 2.DRIVER IC : "OKI" MSM 6778 (COM)
MSM 6779 (SEC)
- 3.BACKLIGHT : CCFT (WHITE)
- 4.FRAME : SUS 430
- 5.TOLERANCE NO SPECIFIED : ±0.5mm



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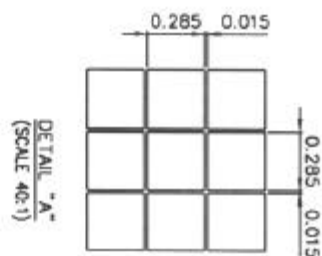
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DETAIL "A"
(SCALE 40:1)