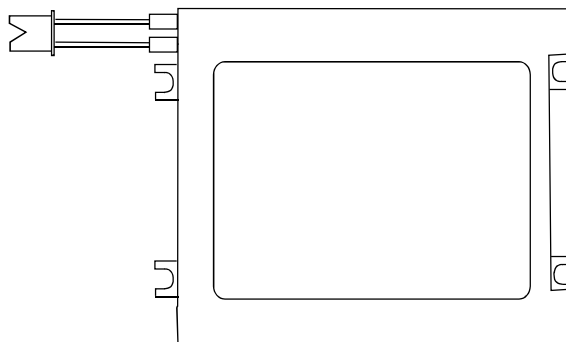




## PRODUCT SPECIFICATION

# HDM3224-Z

320 x 240 GRAPHICS  
LCD DISPLAY MODULE



<b>HANTRONIX, INC.</b> 10080 BUBB RD. CUPERTINO, CA 95014	<b>Q.A.:</b>	<b>REV.:</b>	<b>HDM3224-Z</b>	<b>SHEET 1 OF 18</b>
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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.)

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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	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°C	24.3	24.7	25.1	V
				0°C	23.0	23.4	23.8	
				25°C	22.2	22.6	23.0	
				50°C	20.9	21.3	21.7	
				70°C	20.3	20.7	21.1	
Input Voltage		VH	H level	0.8VDD	-	VDD	V	
		VL	L level	0	-	0.2VDD	V	
Power Supply Current		IDD	FLM = 70 Hz VDD = 5.0 V VDD-VEE = 22.6 V	-	6.4	9	mA	
		IEE	PATTERN : □ ■ □ ■ □ ■ ■ □ ■ □ ■ □	-	6.0	9	mA	
CCFL LAMP	Starting Voltage	Vs		-	420	1000	Vrms	
	Lamp Voltage	VL		-	280	-	Vrms	
	Lamp Current	IL		4	5	6	mArms	
	Lamp Consumption	PL		-	1.4	-	W	
	Lamp Frequency	FL		-	35	-	KHz	
	Lamp Life Time	LL		-	20000	-	hrs	
LCM	Surface Luminance		L(ALL ON)	Transmissive/Black	-	191	-	cd/m <sup>2</sup>
			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

AT Vop

ITEM		Cr(Contrast Ratio)										$\theta$ (Viewing Angle)		$\theta$ (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

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

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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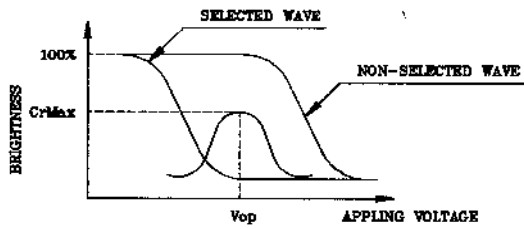
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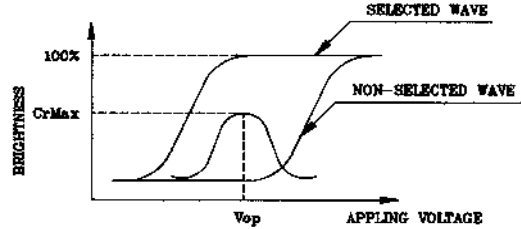
DATE:  
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(NOTE 1)

Definition of Operation Voltage ( $V_{op}$ )



(positive type)



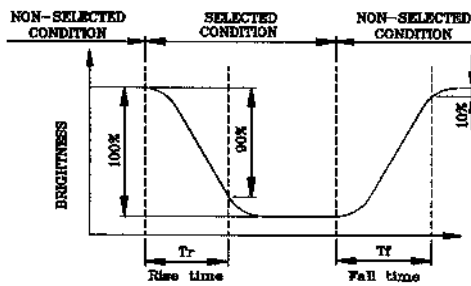
(negative type)

\*Conditions

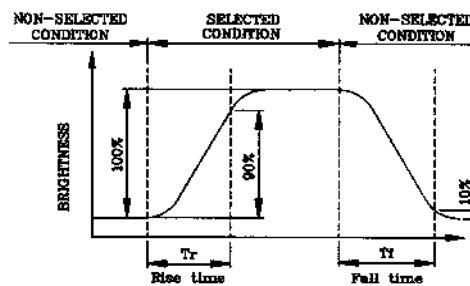
- Viewing Angle : 0
- Frame Frequency : 70Hz
- Applying Waveform : 1/N duty 1/a bias

(NOTE 2)

Definition of Response Time ( $T_r, T_f$ )



(positive type)



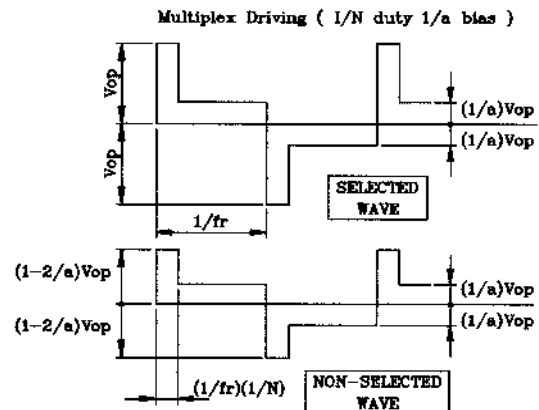
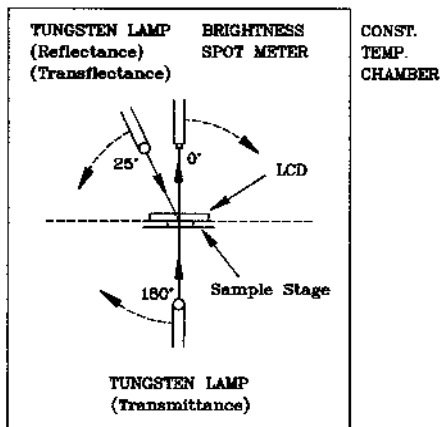
(negative type)

\*Conditions

- Operating Voltage :  $V_{op}$
- Viewing Angle ( $\theta, \phi$ ) : (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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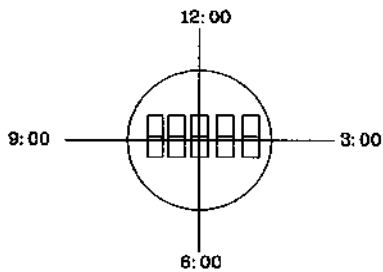
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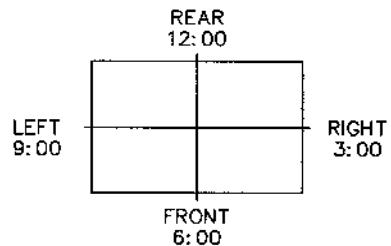
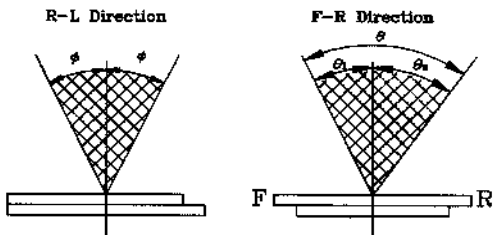
(NOTE 4)

Definition of Viewing Direction



(NOTE 5)

Definition of Viewing Angle



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

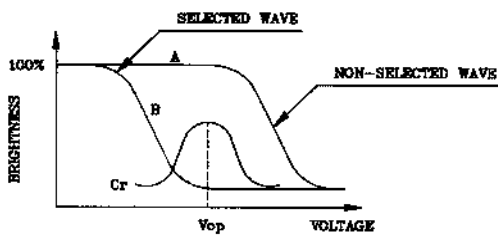
$$\theta = \theta_1 + \theta_2$$

\*Conditions

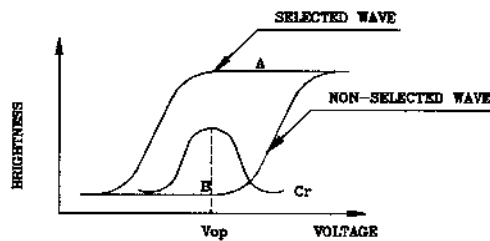
Operating Voltage :  $V_{op}$   
Frame Frequency : 70Hz  
Applying Waveform : 1/N duty 1/a bias  
Contrast Ratio : larger than 2

(NOTE 6)

Definition of Contrast Ratio (Cr)



(positive type)



(negative type)

Contrast Ratio :  $Cr = A/B$

\*Conditions

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

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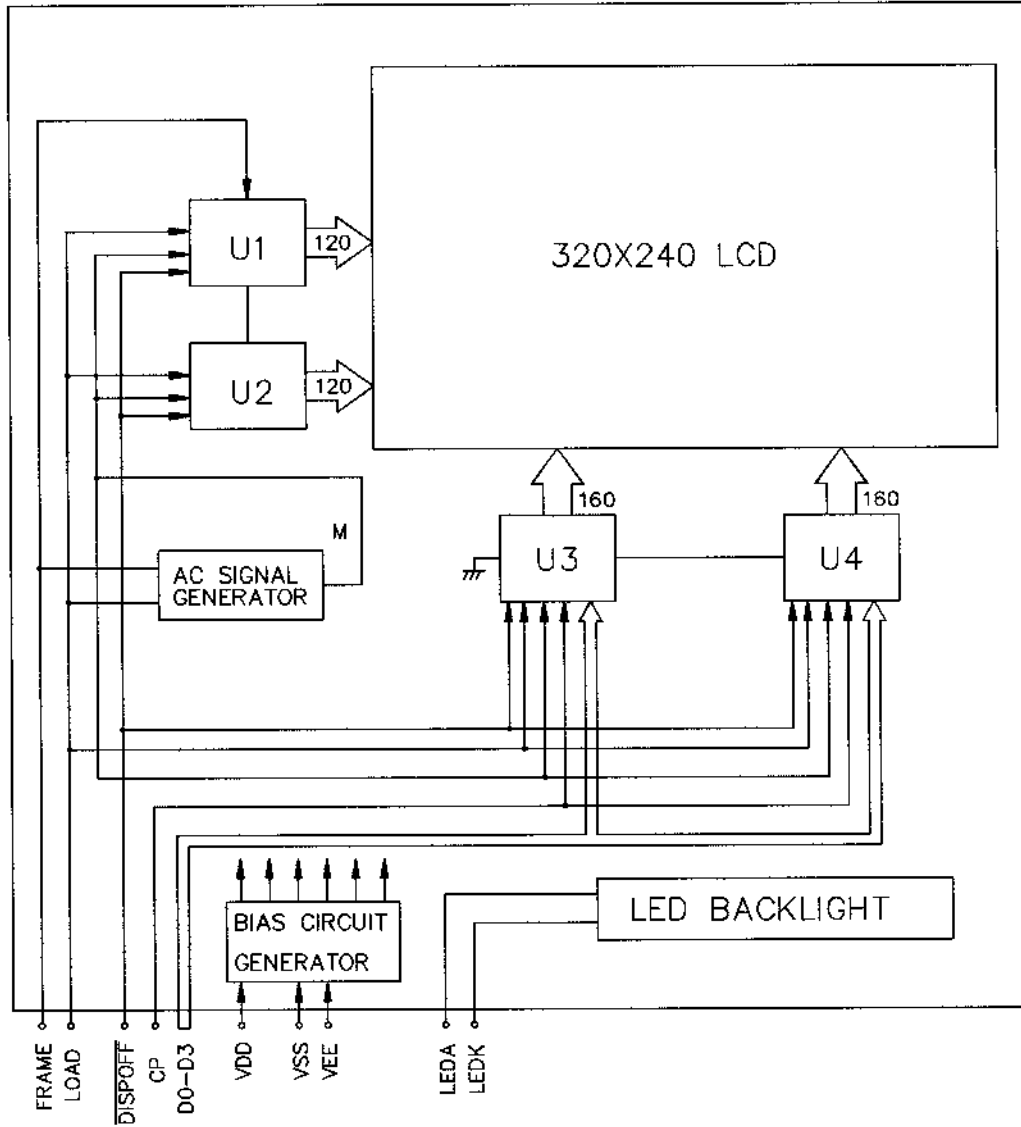
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# 5. BLOCK DIAGRAM



\* 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

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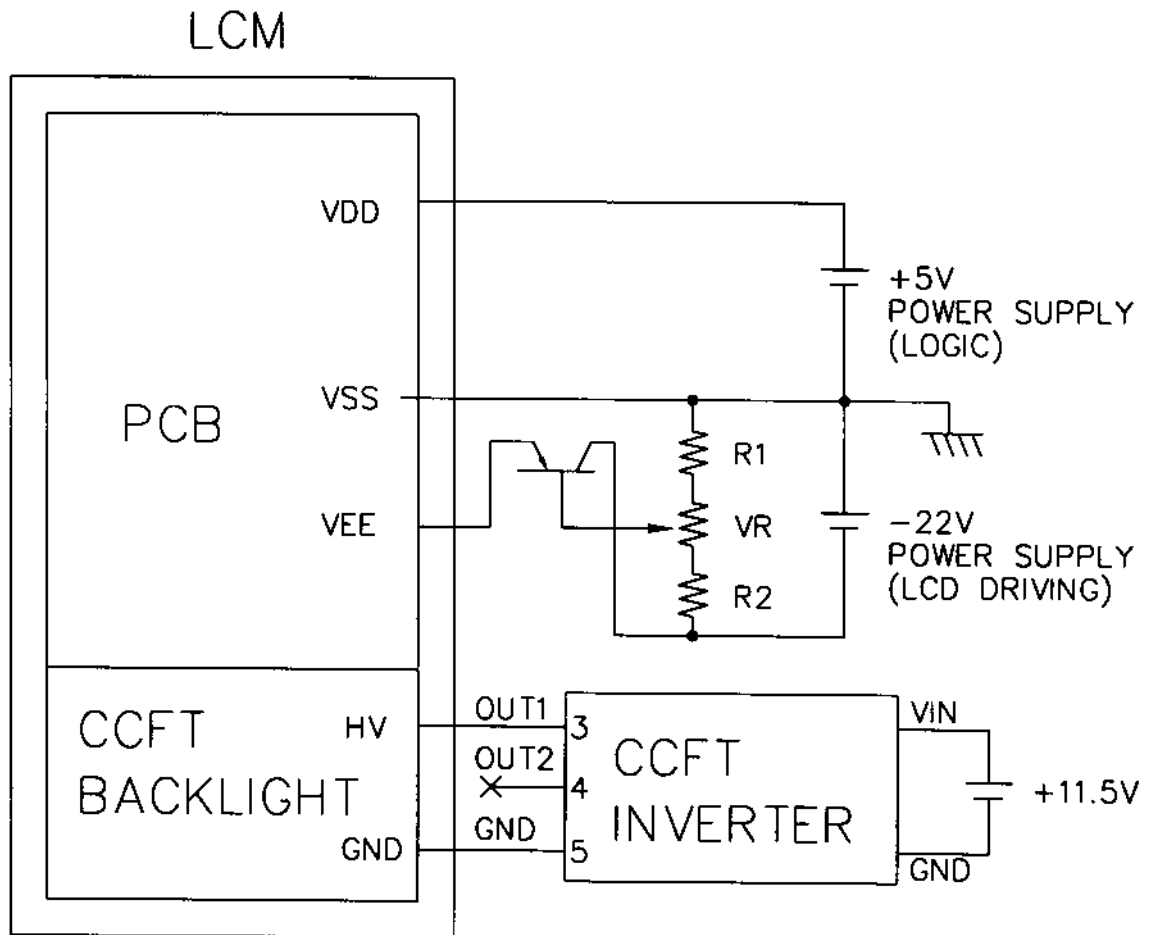
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# 7. POWER SUPPLY



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

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

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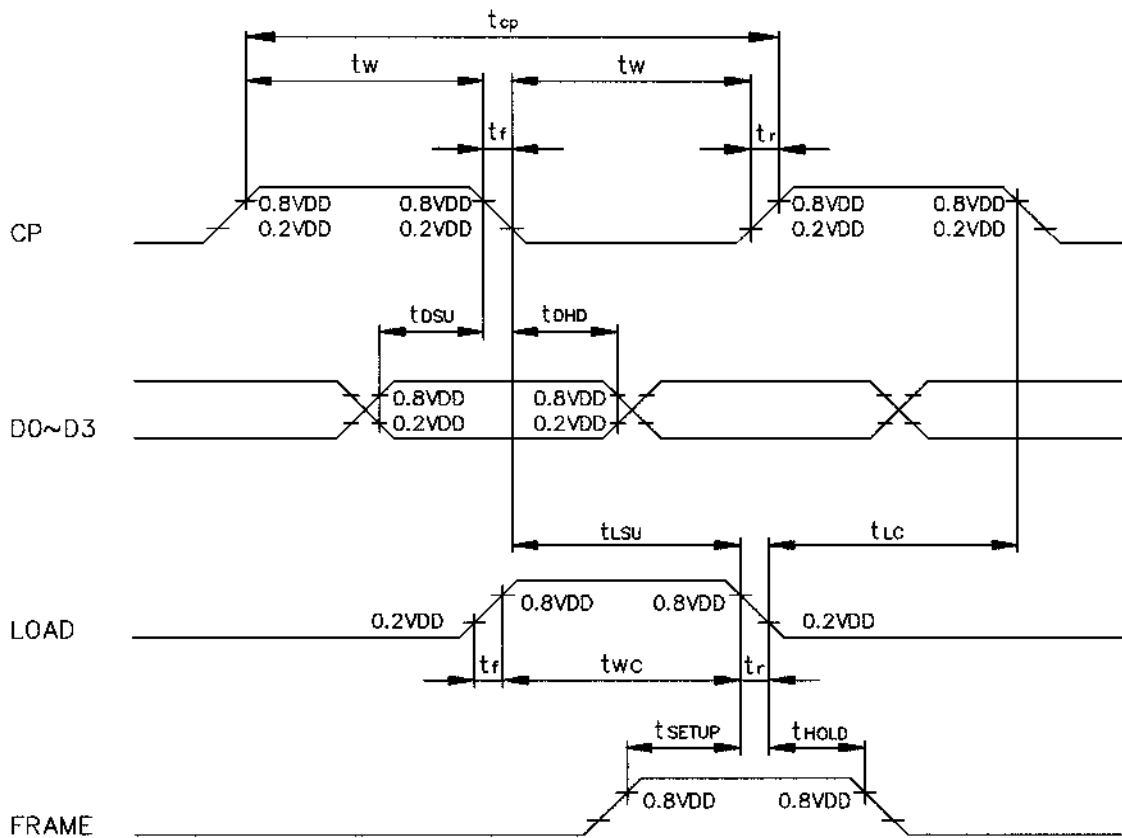
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# 8. TIMING CHARACTERISTICS

@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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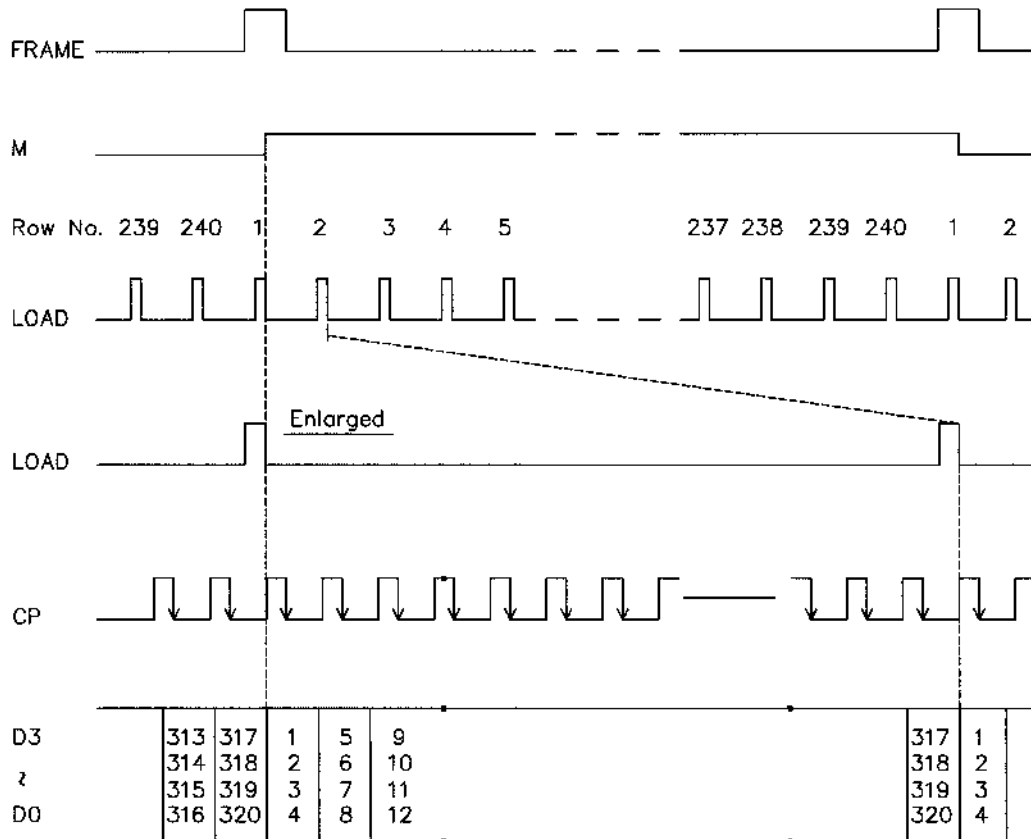
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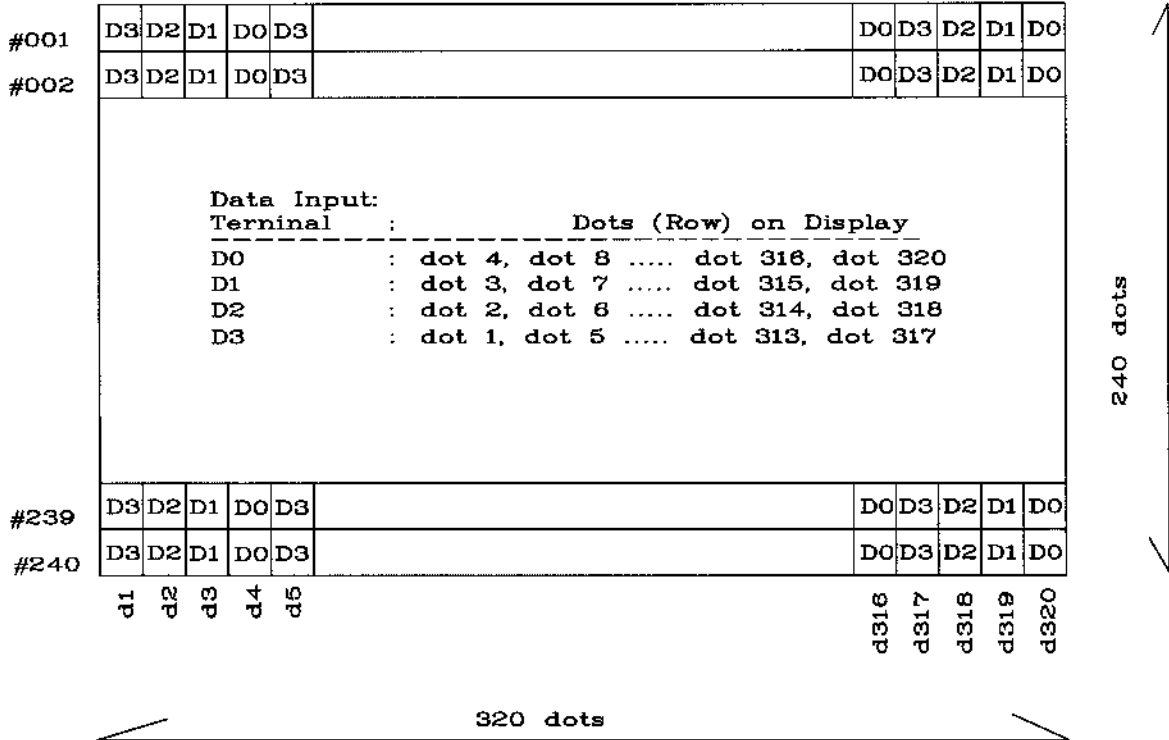
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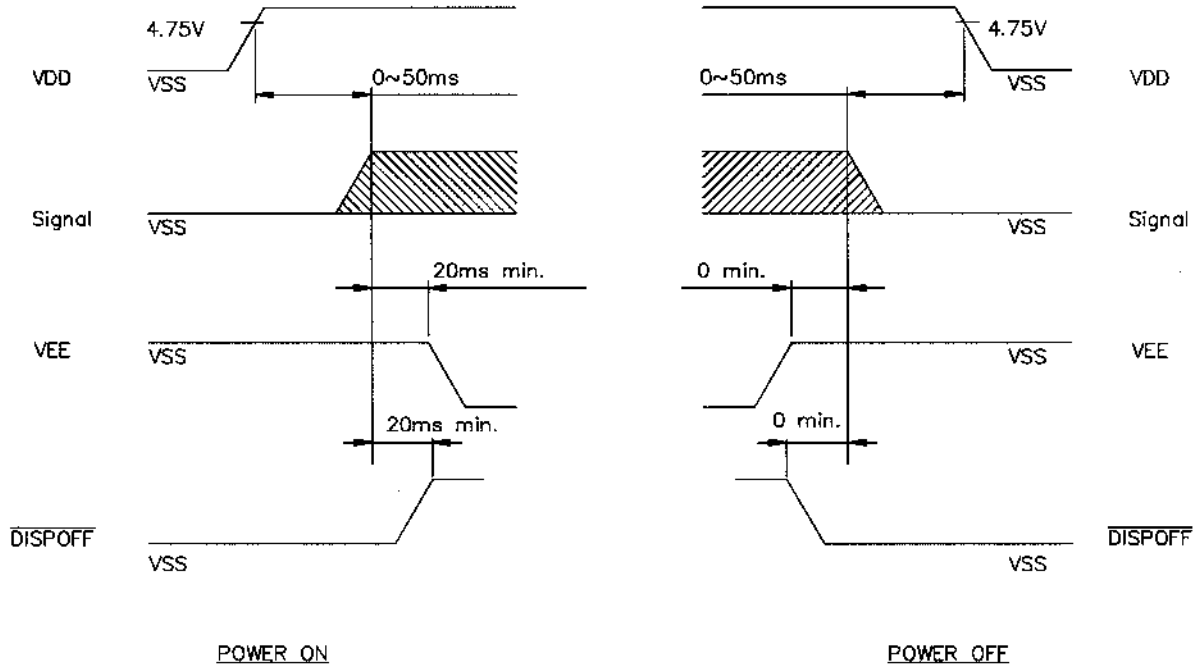
# 8.2 TIMING CHART OF INPUT SIGNALS



# 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. 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

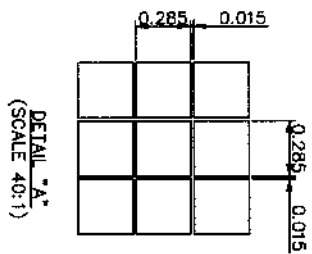
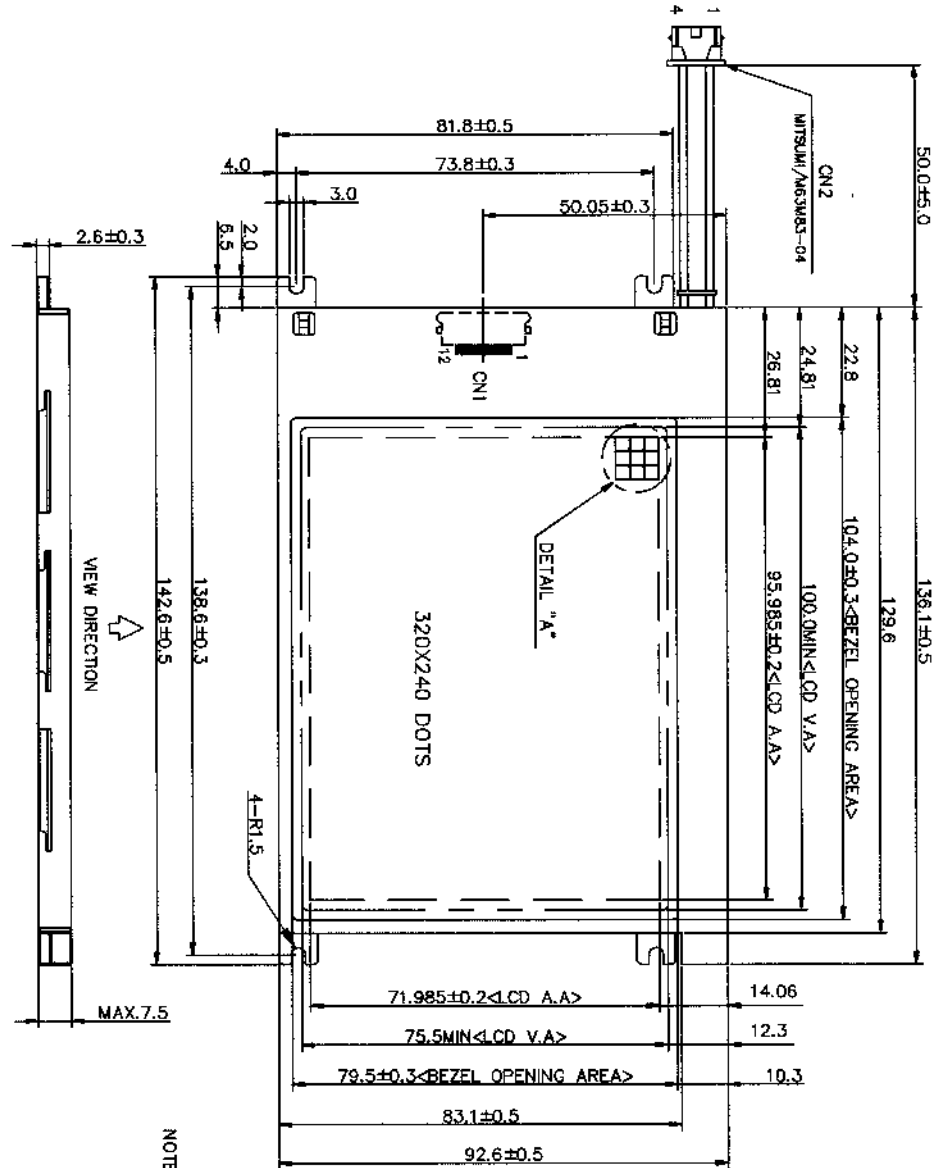
- 1.Acceptance inspection period  
The period is within one month after the arrival of contracted commodity at the buyer's factory site.
- 2.Applicable warrant period  
The period is within twelve months since the date of shipping out under normal using and storage conditions.

• 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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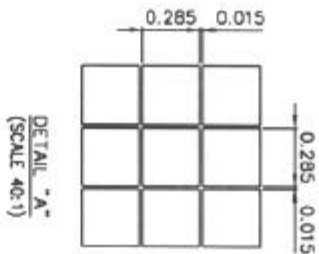
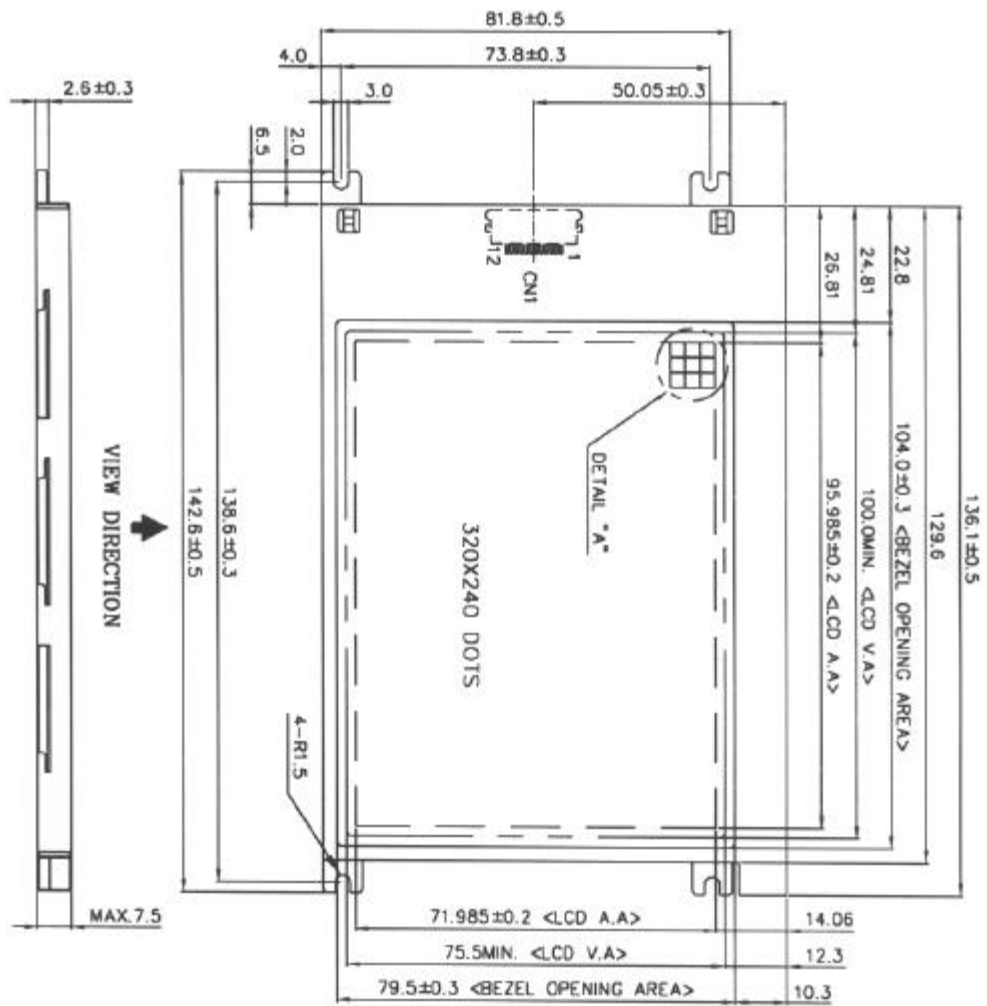




NOTES :

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

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NOTES:  
 1. RESOLUTION: 320 X 240 DOTS  
 2. FRAME: SUS 430  
 3. TOLERANCE: NO SPECIFIED: ±0.10mm

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