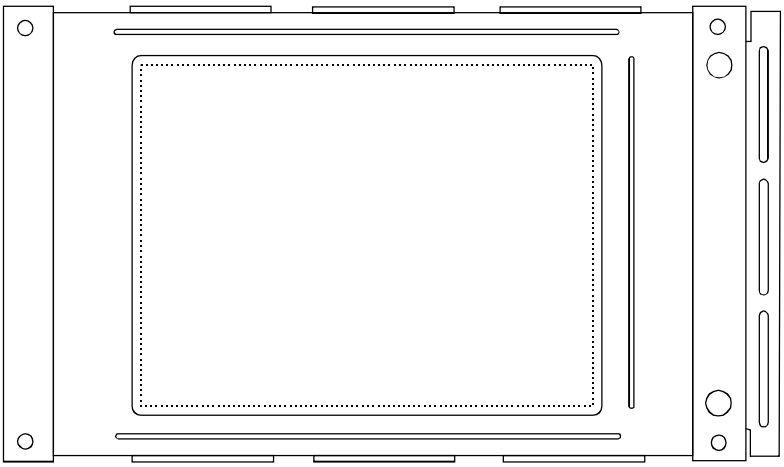
HANTRONIX

PRODUCT SPECIFICATION

HDM3224-1

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



HANTRONIX, INC. 10080 BUBB RD. CUPERTINO, CA 95014	Q.A.: JK	REV.: 3.2	HDM3224-1	SHEET 1 OF 16 DATE: 6/7/02

1. MECHANICAL DATA

(1) Product No.		**HDM3224-1**
(2) Module Size		167.1 (W)mm x 109.0 (H)mm x MAX 11.0 (D)mm (CCFT B.L.)
(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	FSTN:	Black and White(Normally Black)
	Rear Polarizer:	Transmissive
(8) Viewing Direction		6 O'clock
(9) Backlight		CCFT
(10) Recommended CCFL Inverter		TDK CORP. CXA-L10L
(11) Weight		198 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	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

(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 1 LCM should be grounded during handling LCM.

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.

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 (High Contrast Ratio LC LCM)		VDD−VO	Duty=1/240 Bias=1/13	−20°C	−	25.0	25.4	V
				0°C	−	23.6	24.0	
				25°C	−	22.9	23.3	
				50°C	−	21.5	21.9	
				70°C	−	20.9	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 = 22.9 V PATTERN :		−	4.7	10.0	mA
		IEE			−	4.2	8.0	mA
CCFL LAMP	Starting Voltage	Vs	−		−	450	1000	Vrms
	Lamp Voltage	V_L			−	260	−	Vrms
	Lamp Current	I_L			4	5	6	mArms
	Lamp Consumption	P_L			−	1.3	−	W
	Lamp Frequency	F_L			−	35	−	KHz
	Lamp Life	L_L			−	20000	−	hr
LCM	Surface Luminance	L	ALL ON		−	154.2	−	cd/m²
			ALL OFF		−	7.8	−	

4.OPTICAL CHARACTERISTICS

AT V_{OP}

ITEM / MODE		Cr(Contrast Ratio)										θ(Viewing Angle)		φ(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	–	–	–	8.0	–	8.0	–	6.5	–	–	–	76	–	±62
note		NOTE6										NOTE5			

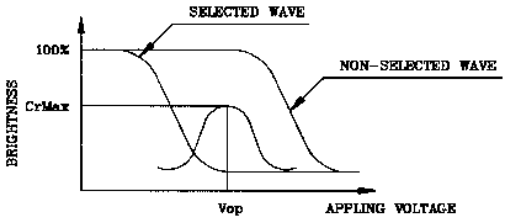
note: T : TRANSMISSIVE G : NORMALLY BLACK

AT ø=0° θ=0°

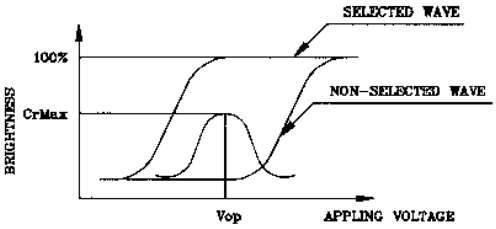
ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Response Time (rise)	Tr	-20℃	–	3700	5500	ms	NOTE 2
		0℃	–	660	900		
		25℃	–	160	240		
		50℃	–	110	165		
		70℃	–	75	110		
Response Time (fall)	Tf	-20℃	–	2600	3900	ms	NOTE 2
		0℃	–	560	840		
		25℃	–	90	140		
		50℃	–	75	110		
		70℃	–	50	70		

(NOTE 1)

Definition of Operation Voltage(Vop)



(positive type)



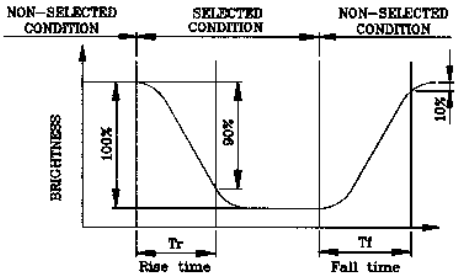
(negative type)

*Conditions

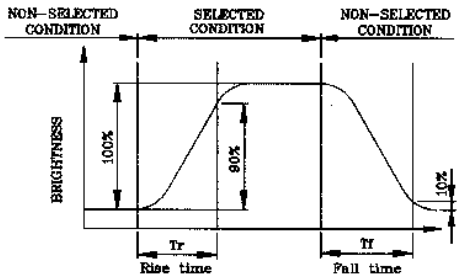
Viewing Angle : 0
Frame Frequency : 70Hz
Appling Waveform : I/N duty 1/a bias

(NOTE 2)

Definition of Response Time(Tr,Tf)



(positive type)



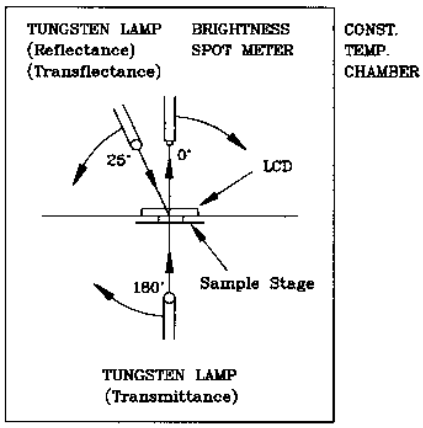
(negative type)

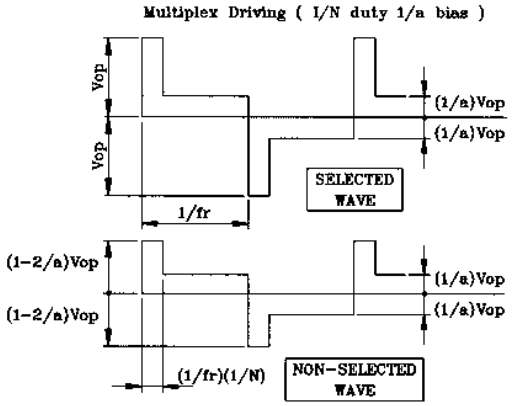
*Conditions

Operating Voltage : Vop
Viewing Angle (θ,ϕ) : (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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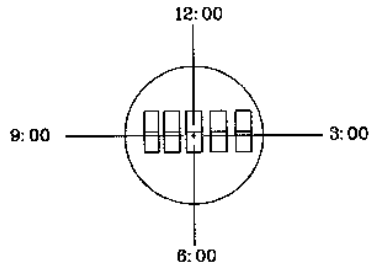
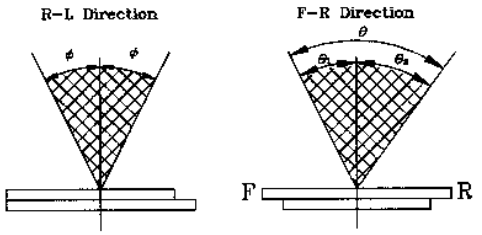
(NOTE 4)

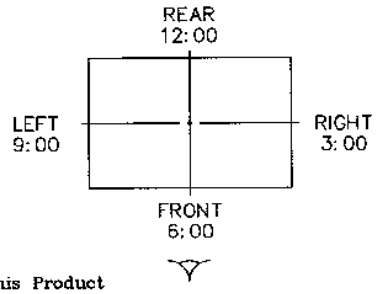
Definition of Viewing Direction



(NOTE 5)

Definition of Viewing Angle





*For This Product

The Viewing Direction Is 6 O'clock

So $\theta 1 > \theta 2$

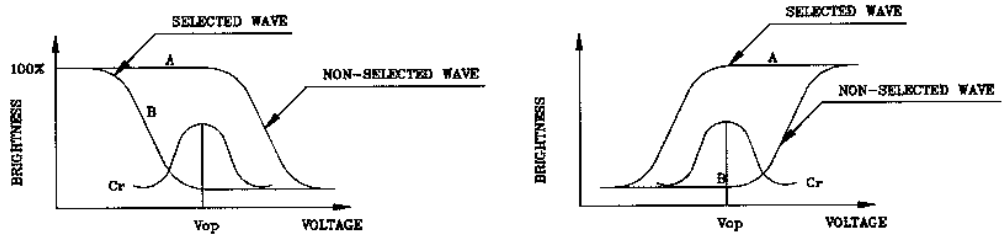
$\theta = \theta_1 + \theta_2$

*Conditions

Operating Voltage : Vop
Frame Frequency : 70Hz
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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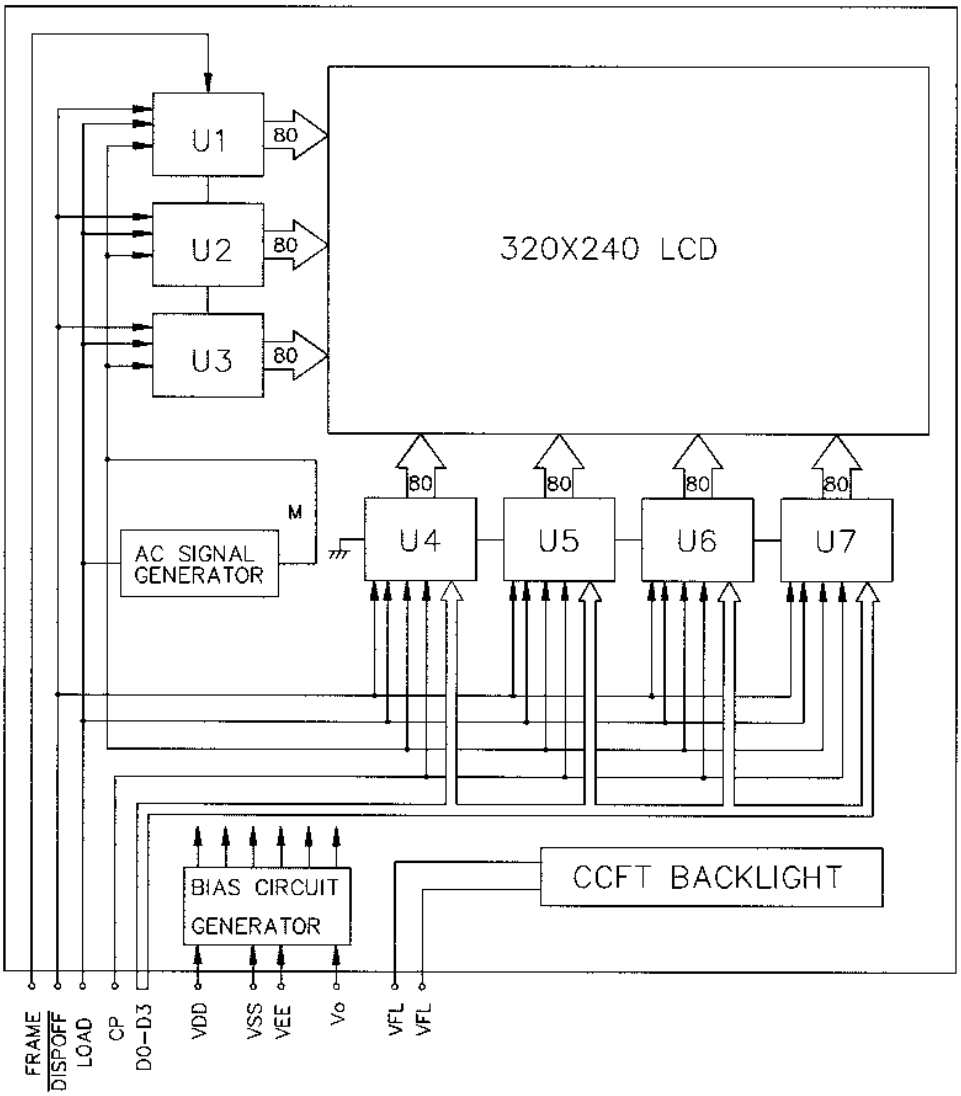
5. BLOCK DIAGRAM



* 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

CN1; CN2; CN4 :

Pin No.	Symbol	Level	Function
1	D0	H/L	Display Data Signal
2	D1		
3	D2		
4	D3		
5	$\overline{\text{Display}}$	H/L	H: On ; L: Off
6	Frame	H	Scan Start-Up Signal
7	DF	H/L	AC Signal for LCD
8	Load	H→L	Input Data Latch Signal
9	CP	H→L	Data Input Clock Signal
10	VDD	–	Power Supply for Logic (+5V)
11	VSS	–	Signal Ground (0V)
12	VEE	–	Power Supply for LCD
13	V0	–	LCD Contrast Adjust Voltage
14	FGND	–	Front Panel Ground

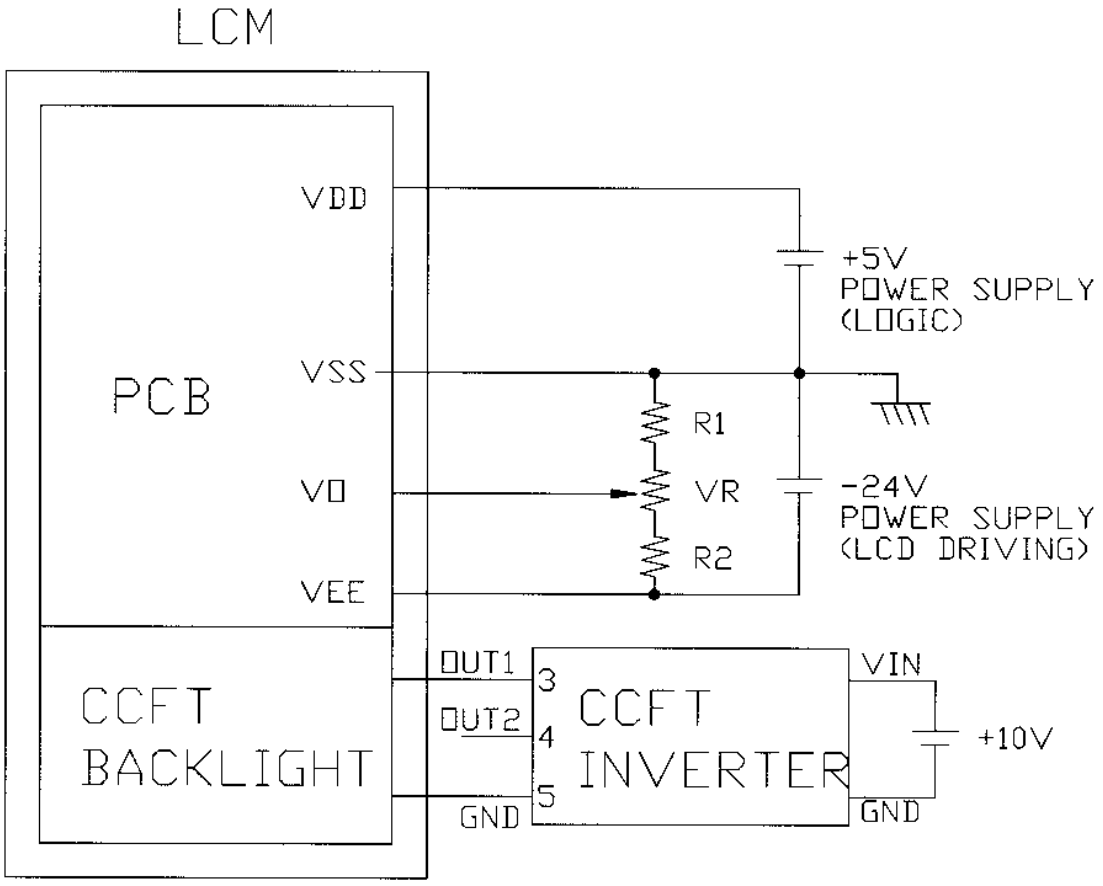
CN3 :

Pin No.	Symbol	Level	Function
1	Frame	H	Scan Start-Up Signal
2	DF	H/L	AC Signal for LCD
3	Load	H→L	Input Data Latch Signal
4	CP	H→L	Data Input Clock Signal
5	$\overline{\text{Display}}$	H/L	H: On ; L: Off
6	D0	H/L	Display Data Signal
7	D1		
8	D2		
9	D3		
10	VDD	–	Power Supply for Logic (+5V)
11	VSS	–	Signal Ground (0V)
12	VEE	–	Power Supply for LCD
13	V0	–	LCD Contrast Adjust Voltage
14	FGND	–	Front Panel Ground

CN5 :

Pin No.	Symbol	Level	Function
1	HV	–	Power Supply Voltage for CCFL
2	NC	–	No Connection
3	NC	–	No Connection
4	GND	–	Ground Line (From Inverter)

7.POWER SUPPLY



1.R1+VR+R2=10K~20KΩ

2.RECOMMENDED CCFT INVERTER : CXA-L10L(TDK)
(OPERATING TEMP. -10°~60°C)

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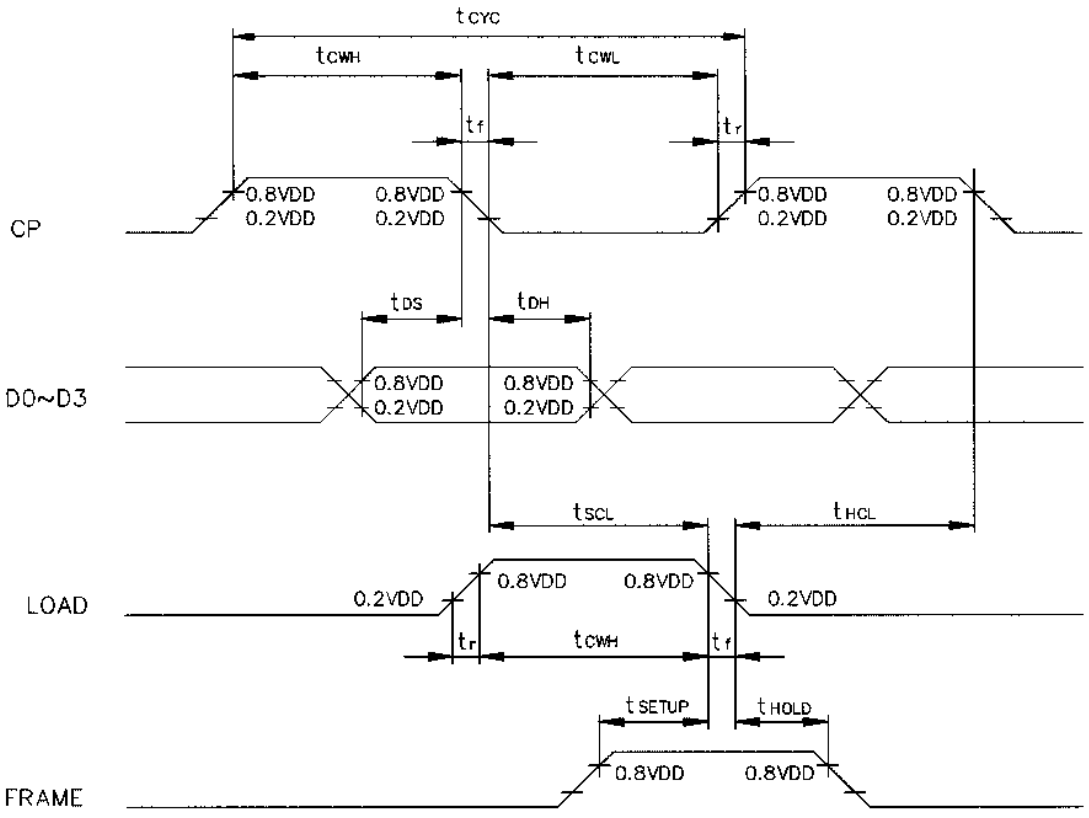
8.1TIMING CHARACTERISTICS

ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT
CLOCK CYCLE TIME	t_{CYC}	125	–	–	ns
CLOCK HIGH LEVEL WIDTH	t_{CWH}	45	–	–	ns
CLOCK LOW LEVEL WIDTH	t_{CWL}	45	–	–	ns
CLOCK RISE TIME	t_r	–	–	30	ns
CLOCK FALL TIME	t_f	–	–	30	ns
DATA SETUP TIME	t_{DS}	30	–	–	ns
DATA HOLD TIME	t_{DH}	30	–	–	ns
CLOCK SETUP TIME	t_{SCL}	80	–	–	ns
CLOCK HOLD TIME	t_{HCL}	80	–	–	ns
FRAME SETUP TIME	t_{SETUP}	30	–	–	ns
FRAME HOLD TIME	t_{HOLD}	30	–	–	ns



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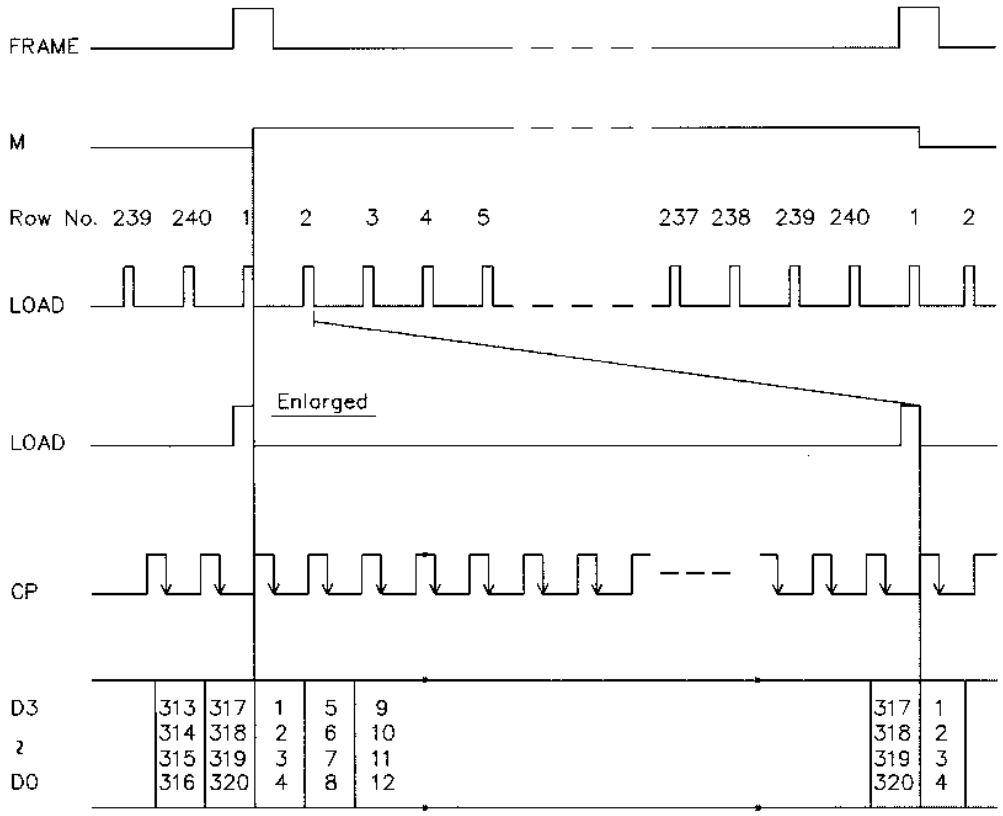
8.2TIMING CHART OF INPUT SIGNALS



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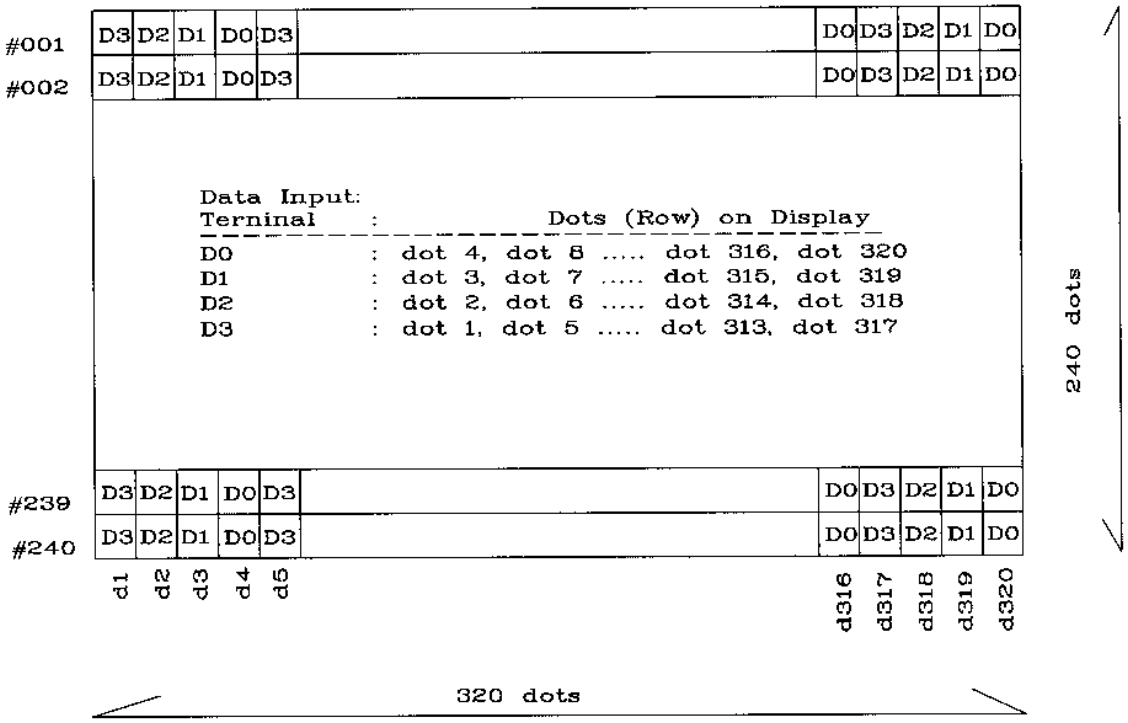
8.3DISPLAY PATTERN



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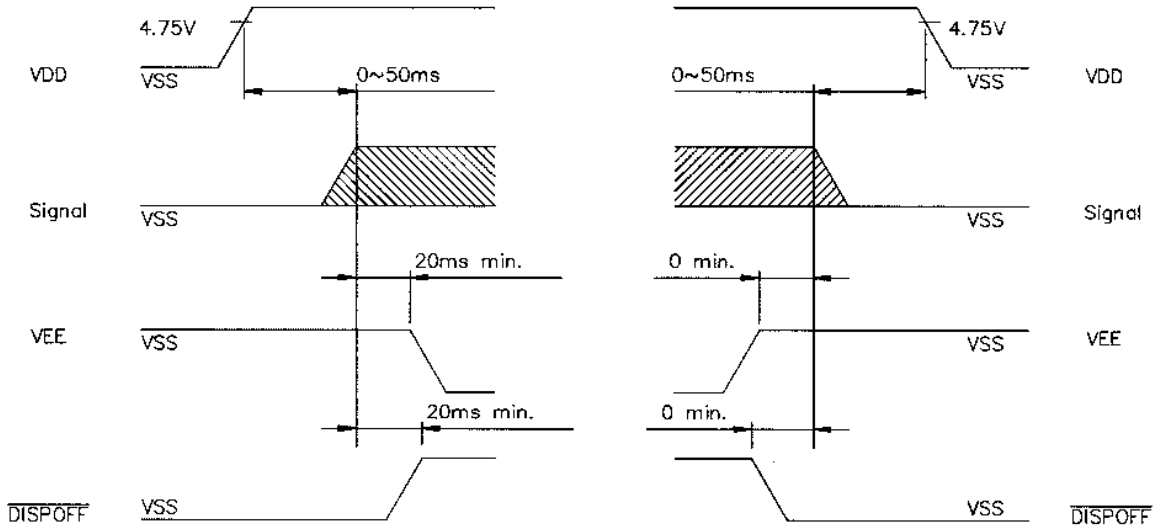
8.4POWER ON/OFF TIMING



POWER ON

POWER OFF

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

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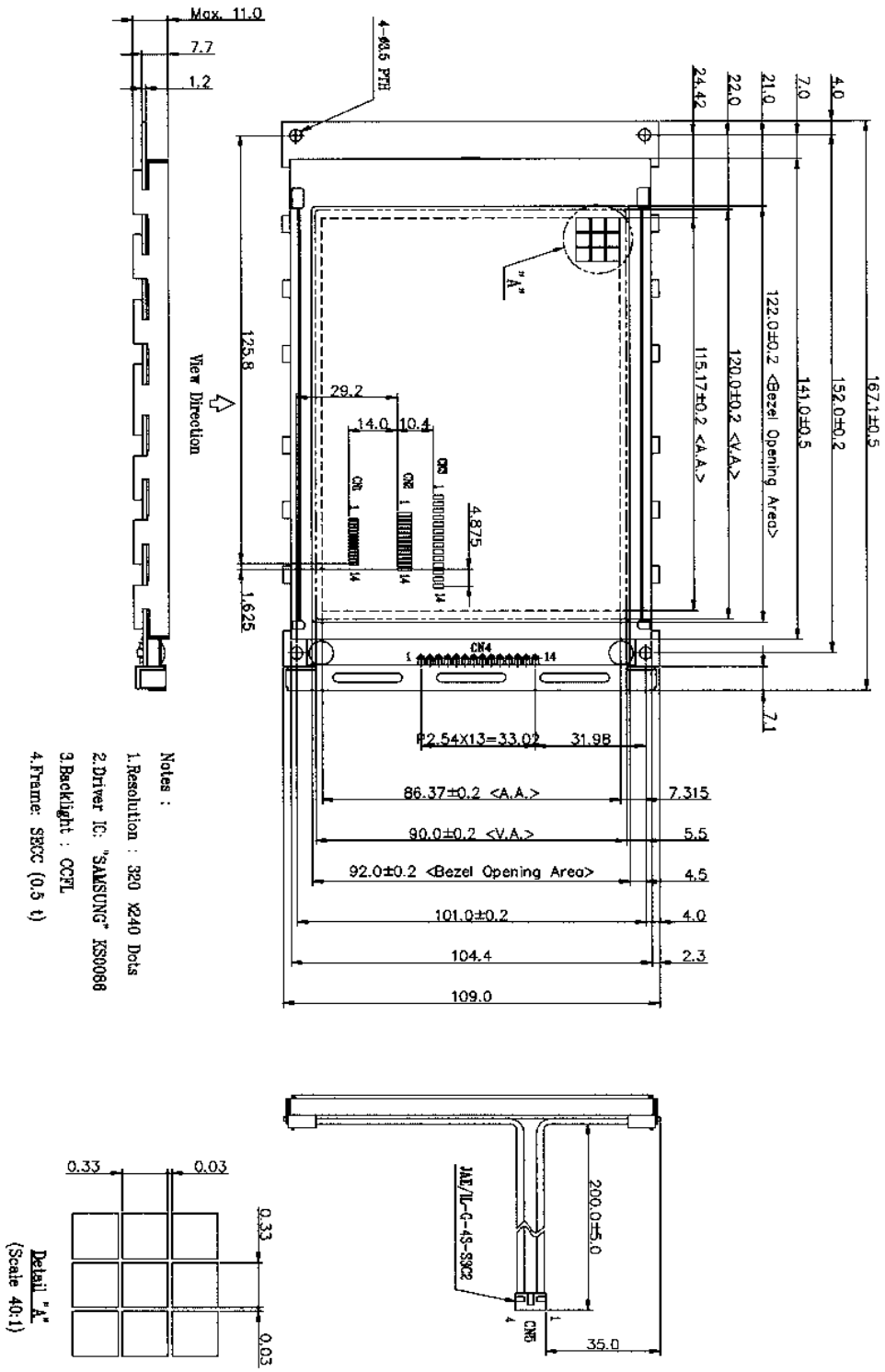
NOTE:

- 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°C±5°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.



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