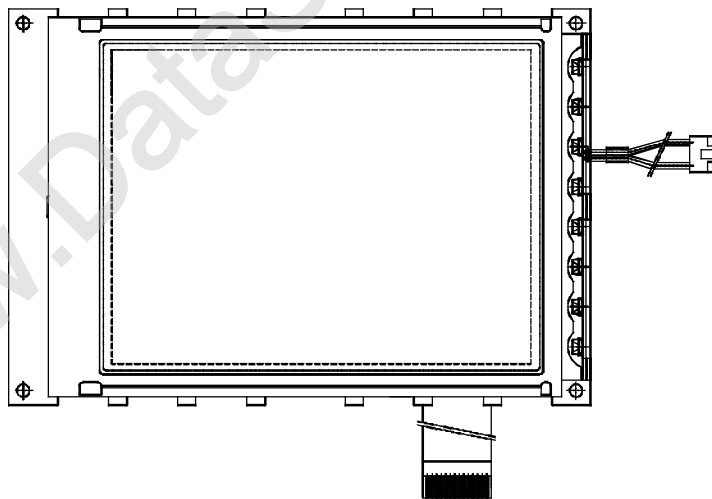


HANTRONIX

PRODUCT SPECIFICATION

HDM3224NL-1

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



HANTRONIX, INC. 10080 BUBB RD. CUPERTINO, CA 95014	Q.A.: JK	REV.: 1.0	HDM3224NL-1	SHEET 1 OF 18
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1.MECHANICAL DATA

(1) Product No.	HDM3224NL-1
(2) Module Size	160.0 (W)mm x 109.0 (H)mm x MAX.11.0 (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: Paper White(Positive Mode) Rear Polarizer: Transflective
(8) Viewing Direction	6 or 12 O'clock
(9) Backlight	LED B/L(White)
(10) Weight	199 g(Approx.)

2.ABSOLUTE MAXIMUM RATINGS

(1) ELECTRICAL ABSOLUTE RATINGS

VSS=0V

ITEM	SYMBOL	MIN	MAX	UNIT	COMMENT
Power Supply for Logic	VDD-VSS	-0.3	7.0	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	OPERATION		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

3-1. ELECTRICAL CHARACTERISTICS

(VDD = 5.0V±5%)

ITEM	SYMBOL	CONDITION		MIN.	TYP.	MAX.	UNIT
Power Supply for Logic	VDD-GND	—		4.75	5.0	5.25	V
Input Voltage	VIH	H level		0.7VDD	—	VDD	V
	VIL	L level		0	—	0.3VDD	V
Recommended LC Driving Voltage	VDD-V0	Duty=1/240	-20°C	25.2	25.5	25.8	V
			0°C	23.6	23.9	24.2	
			25°C	22.8	23.1	23.4	
			50°C	21.3	21.6	21.9	
			70°C	20.3	20.6	21.9	
Power Supply Current	IDD	OSCILLATOR=10MHz FLM = 99.27 Hz VDD= 5 V VDD-V0=23.1 V PATTERN :CHECKER □ ■ □ ■ □ ■ ■ □ ■ □ ■ □		—	77	116	mA
Surface Luminance	L	(Dots All On)		—	133	—	cd/m ²
		(Dots All Off)		—	23.1	—	

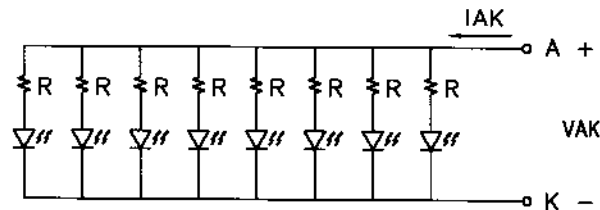
3-2.ELECTRICAL CHARACTERISTICS OF BACKLIGHT

Used LED Rating

Temp.=25°C

ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT	REMARK
Peak forward current	I_P	—	—	240	mA	—
Maximum reverse voltage	V_R	—	—	5	V	—
Applied forward current	I_{AK}	—	150	160	mA	at $V_{AK} = 5.0$ V
Applied forward voltage	V_{AK}	—	5.0	—	V	at $I_{AK} = 150$ mA
LED power consumption	P_F	—	0.75	—	W	—
LED life time	L_L	—	10000	—	hrs	at $V_{AK} = 150$ mA (*1)

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



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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.
H	T	(2.5)	(4.0)	(3.5)	(5.0)	(4.0)	(5.5)	(3.0)	(4.5)	(2.0)	(3.0)	-	(67)	-	(±32)
NOTE		NOTE 6										NOTE 5			

NOTE :

H : TRANSFLECTIVE
Y : PAPER WHITE

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

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Response Time (rise)	Tr	-20℃	3200	4000	6000	ms	NOTE 2
		0℃	240	300	450		
		25℃	100	120	180		
		50℃	65	80	120		
		70℃	45	60	90		
Response Time (fall)	Tf	-20℃	1600	2000	3000	ms	NOTE 2
		0℃	350	450	670		
		25℃	110	140	210		
		50℃	45	60	90		
		70℃	40	50	75		

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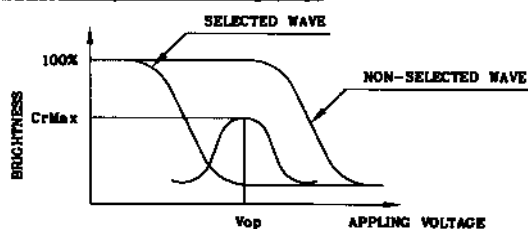
HDM3224NL-1

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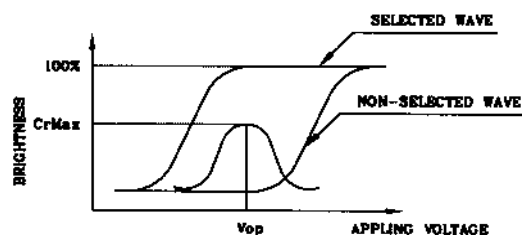
DATE:

6/19/03

(FIG 1)

Definition of Operation Voltage(Vop)

(positive type)



(negative type)

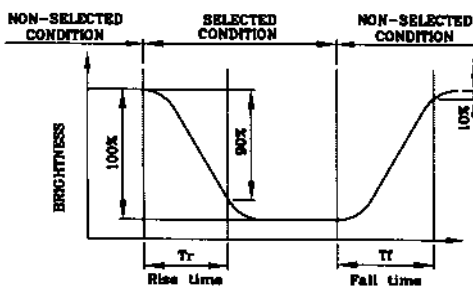
*Conditions

Viewing Angle : 0

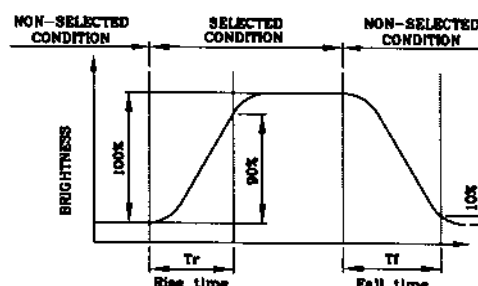
Frame Frequency : 70Hz

Applying Waveform : 1/N duty 1/a bias

(FIG 2)

Definition of Response Time(T_r, T_f)

(positive type)



(negative type)

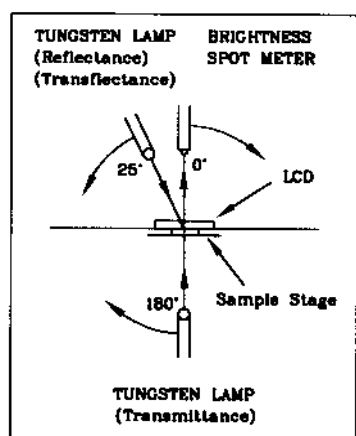
*Conditions

Operating Voltage : V_{op} Viewing Angle (θ, ϕ) : (0,0)

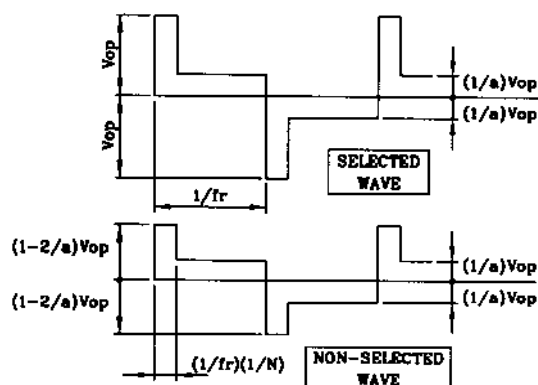
Frame Frequency : 70Hz

Applying Waveform : 1/N duty 1/a bias

(FIG 3)

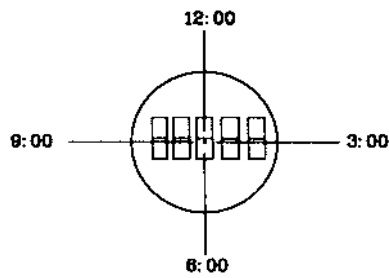
Description of Measuring Equipment and Driving WaveformsCONST.
TEMP.
CHAMBER

Multiplex Driving (1/N duty 1/a bias)



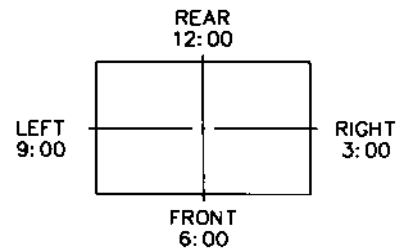
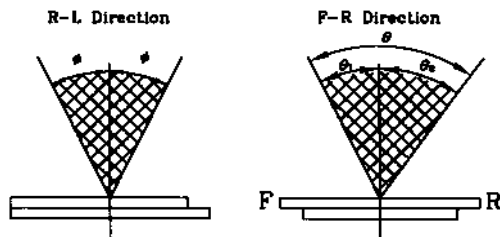
(FIG 4)

Definition of Viewing Direction



(FIG 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

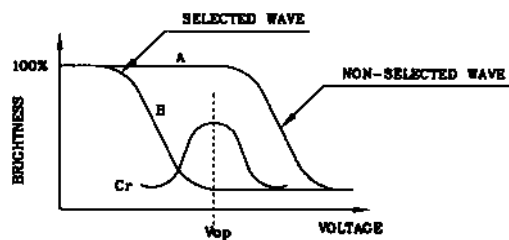
Frame Frequency : 70Hz

Applying Waveform : 1/N duty 1/a bias

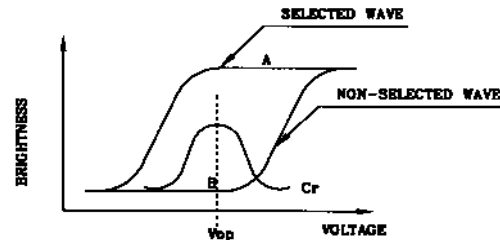
Contrast Ratio : larger than 2

(FIG 6)

Definition of Contrast Ratio (Cr)



(positive type)



(negative type)

$$\text{Contrast Ratio : } Cr = A/B$$

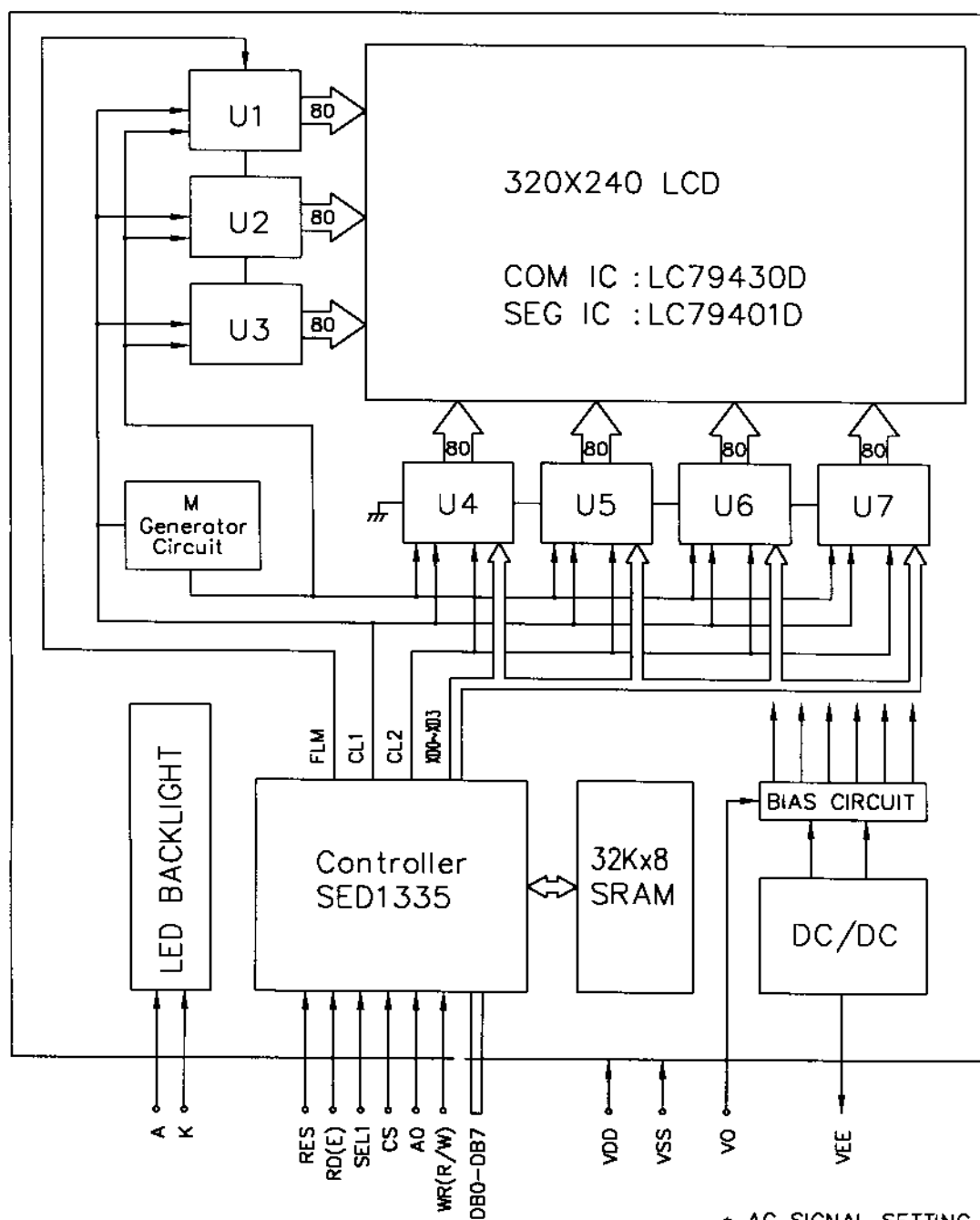
*Conditions

Viewing Angle : 0

Frame Frequency : 70Hz

Applying Waveform : 1/N duty 1/a bias

5. BLOCK DIAGRAM



* AC SIGNAL SETTING

J0	J1	J2	J3	J4	J5	J6	J7
L	H	H	L	L	L	L	L

6.INTERNAL PIN CONNECTION

CN1: Pitch 1.25mm

Pin No.	Symbol	Function
1	VSS	Ground
2	VDD	Power supply for Logic
3	V0	Negative voltage power supply (Tuned from VDD-VEE)
4	A0	Data type select
5	WR (R/W)	8080 Family : Write signal 6800 Family : R/W signal
6	RD(E)	8080 Family : Read signal 6800 Family : Enable clock
7 5 14	DB0 S DB7	3-State I/O data bus
15	CS	Chip select
16	RES	This active Low input performs hardware reset on the SED 1335F
17	VEE	Supply voltage for LCD panel (-23V) (Generated from internal DC/DC converter)
18	SEL1	'0' FOR 8080 Family MPU , '1' for 6080 family MPU
19 5 22	N.C.	No connection

MATING CONNECTOR: AVX/ELCO 00-6207-3419-22-000

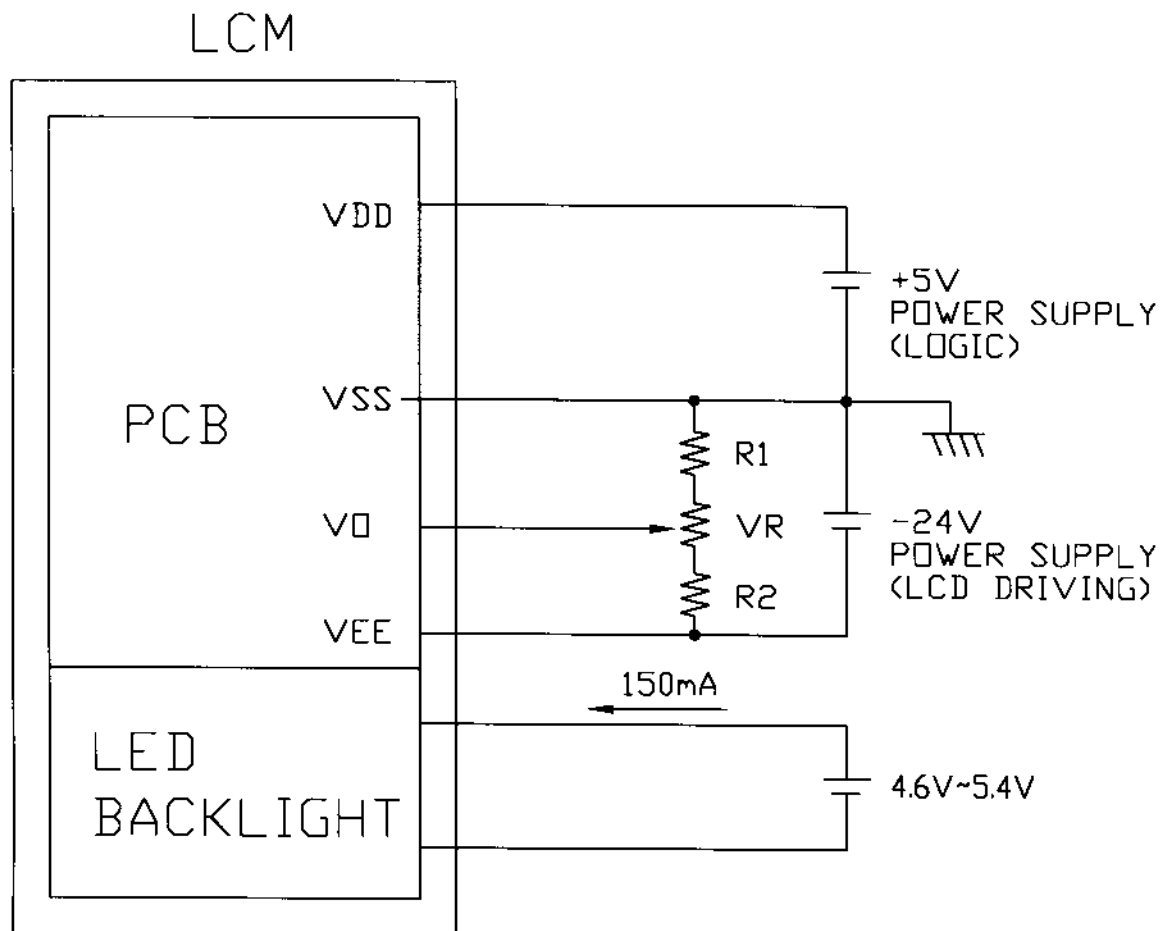
CN2 : J.A.E./IL-G-4S-S3C2

Pin No.	Symbol	Level	Function
1	HV	-	Power supply for CCFT
2	NC	-	-
3	NC	-	-
4	GND	-	Ground line (from inverter)

MATING CONNECTOR: J.A.E./IL-G-4P-S3T2-E
or J.A.E./IL-G-4P-S3L2-E

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7. POWER SUPPLY



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

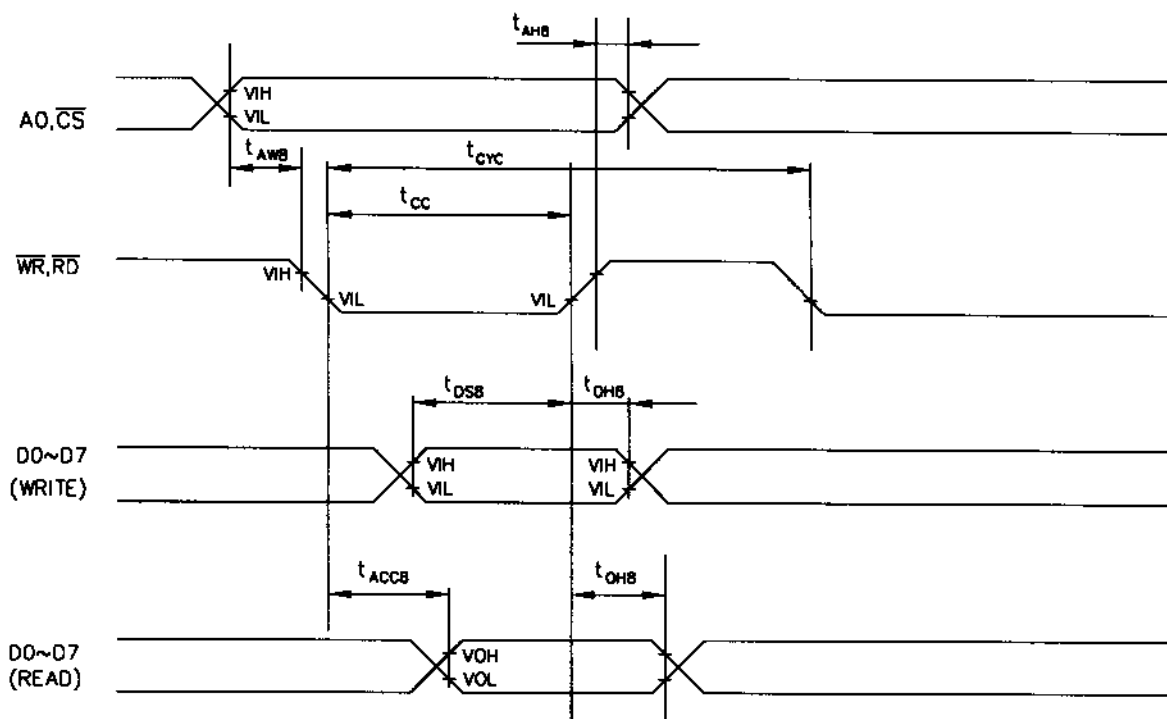
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8. TIMING CHARACTERISTICS

8-1. READ/WRITE CHARACTERISTICS(8080 FAMILY MPU)

VDD=5.0V±5%

ITEM	ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT
A0, $\overline{CS}$	ADDRESS HOLD TIME	t_{AHB}	10	—	—	ns
	ADDRESS SETUP TIME	t_{AWS}	0	—	—	ns
$\overline{WR}, \overline{RD}$	SYSTEM CYCLE TIME	t_{CYC}	1	—	—	ns
	STROBE PULSE WIDTH	t_{CC}	120	—	—	ns
D0 to D7	DATA HOLD TIME	t_{DHB}	5	—	—	ns
	DATA SETUP TIME	t_{DSB}	120	—	—	ns
	RD ACCESS TIME	t_{ACCB}	—	—	50	ns
	OUTPUT DISABLE TIME	t_{OHB}	10	—	50	ns



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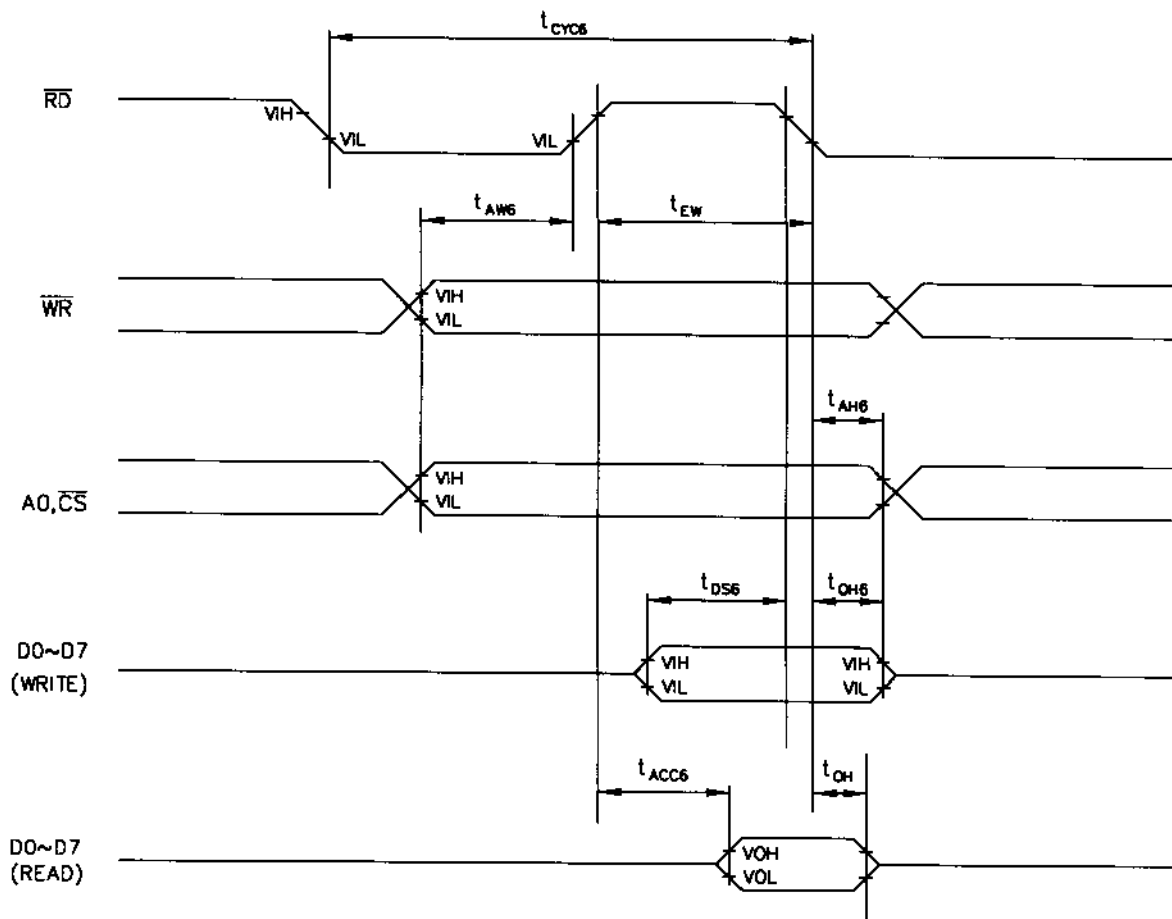
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8-2.READ/WRITE CHARACTERISTICS(6800 FAMILY MPU)

VDD=5.0V±5%

ITEM	ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT
A0, $\overline{CS}$, $\overline{WR}$	ADDRESS HOLD TIME	t_{AH6}	0	—	—	ns
	ADDRESS SETUP TIME	t_{AS6}	0	—	—	ns
	SYSTEM CYCLE TIME	t_{CYC6}	1	—	—	ns
D0 to D7	DATA HOLD TIME	t_{DH6}	0	—	—	ns
	DATA SETUP TIME	t_{DS6}	100	—	—	ns
	ACCESS TIME	t_{ACC6}	—	—	85	ns
	OUTPUT DISABLE TIME	t_{OH6}	10	—	50	ns
$\overline{RD}$	ENABLE PULSE WIDTH	t_{RDW}	120	—	50	ns



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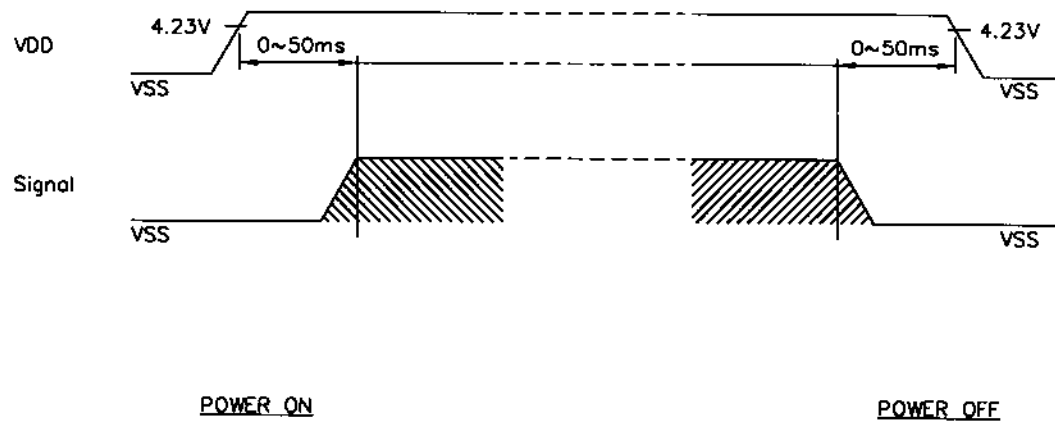
HDM3224NL-1

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DATE:

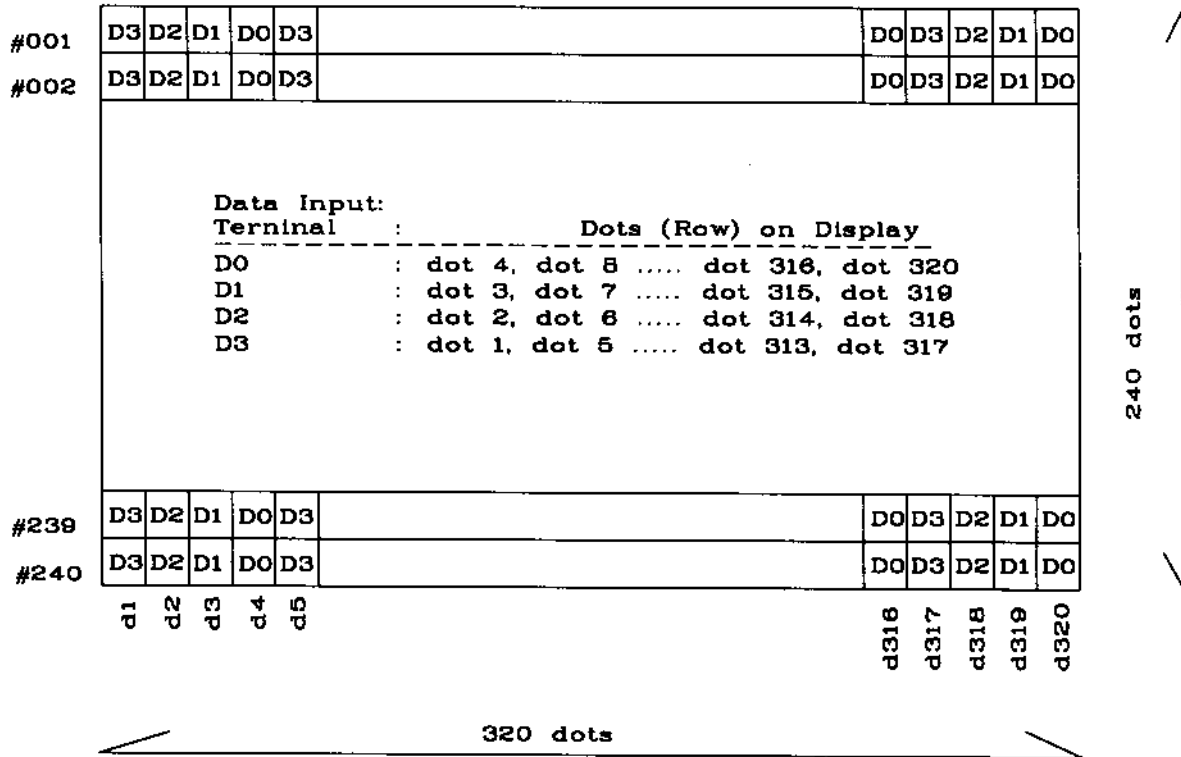
6/19/03

8-3. POWER ON/OFF TIMING



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

8-4.DISPLAY PATTERN



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 → 70°C, 30min → 25°C, 5min (1cycle)			Appearance without defect	5 cycles

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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 ketanics solvent & Aromatic solvent, use with a soft cloth soaked with a cleaning naphtha solvent.

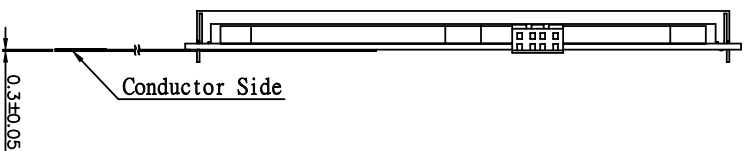
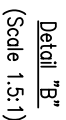
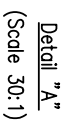
- STORAGE

- 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 WARRANTY

- 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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CHECK	Louis Lee	92.12.02			
DESIGN	C. B. LAN	92.12.01			
DRAWN	C. B. LAN	92.12.01			
	NAME	DATE	SCALE	UNIT	
			1/1	mm	

APPROVE	Tony Chou	92.12.02	THIRD ANGLE P
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Notes :

- 1.Resolution : 320 x 240 Dots
- 2.Backlight : LED (White)
- 3.Frame : 厶口厶 (0.5mm)

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