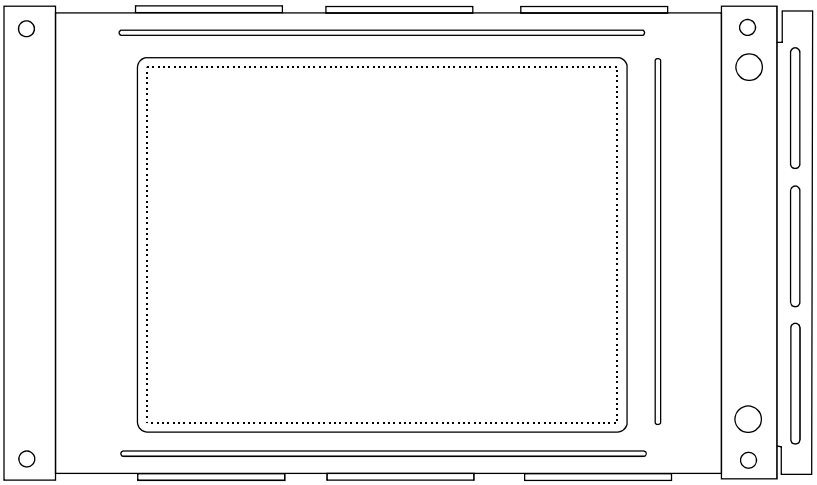
HANTRONIX

PRODUCT SPECIFICATION

HDM3224N-1

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



HANTRONIX, INC. 10080 BUBB RD. CUPERTINO, CA 95014	**Q.A.:** JK	**REV.:** 1.1	HDM3224N-1	SHEET 1 OF 18 **DATE:** 4/1/03

1. MECHANICAL DATA

(1) Product No.		**HDM3224N-1**
(2) Module Size		167.1 (W)mm x 109.0 (H)mm x 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:	Blue Mode
	Rear Polarizer:	Transmission
(8) Viewing Direction		6 O'clock
(9) Controller		SED1335(With 32KB SRAM)
(10) DC/DC Converter		Include
(11) Backlight		CCFT
(12) 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.

3. ELECTRICAL CHARACTERISTICS

3-1. ELECTRICAL CHARACTERISTICS

(VDD = 4.5V±5%)

ITEM	SYMBOL	CONDITION		MIN.	TYP.	MAX.	UNIT
Power Supply for Logic	VDD-GND	-		4.23	4.5	4.73	V
Input Voltage	VIH	H level		0.7VDD	-	VDD	V
	VIL	L level		0	-	0.3VDD	V
Recommended LC Driving Voltage	VDD-VO	Duty=1/240 Bias=1/13	-20°C	25.3	25.6	25.9	V
			0°C	23.7	24.0	24.3	
			25°C	22.8	23.1	23.4	
			50°C	21.4	21.7	22.0	
			70°C	20.4	20.7	21.0	
Power Supply Current	IDD	OSCILLATOR=10MHz FLM = 99.27 Hz VDD=4.5 V VDD-VO=23.1 V PATTERN : CHECKER		-	77	116	mA
Surface Luminance	L	(Dots All On)		-	155.2	-	cd/m²
		(Dots All Off)		-	31.3	-	

3-2.ELECTRICAL CHARACTERISTICS OF BACKLIGHT

Used CCFL Rating

Temp.=25°C

ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT	REMARK
Lamp voltage	V_L	–	260	–	Vrms	–
Lamp current	I_L	4	5	6	mArms	–
Lamp power consumption	P_L	–	1.3	–	W	(*1)
Starting voltage	Vs	–	–	420	Vrms	–
Lamp frequency	F_L	–	35	–	KHz	–
Lamp life time	L_L	–	20000	–	hrs	IL = 5 mArms (*2)

(*1) Power consumption excluded inverter loss .

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

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.
N	S	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 :

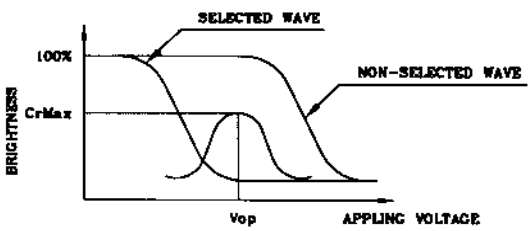
N : TRANSMISSION
S : BLUE

AT $\phi=0°$ $\theta=0°$

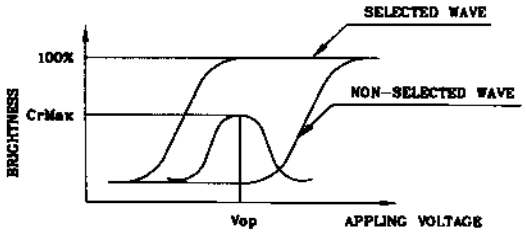
ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Response Time (rise)	Tr	-20℃	3200	4000	6000	ms	NOTE 2
		0℃	240	300	450		
		25℃	100	120	180		
		50℃	65	80	120		
		70℃	45	60	90		
Response Time (fall)	Tf	-20℃	1600	2000	3000	ms	NOTE 2
		0℃	350	450	670		
		25℃	110	140	210		
		50℃	45	60	90		
		70℃	40	50	75		

(FIG 1)

Definition of Operation Voltage(Vop)



(positive type)



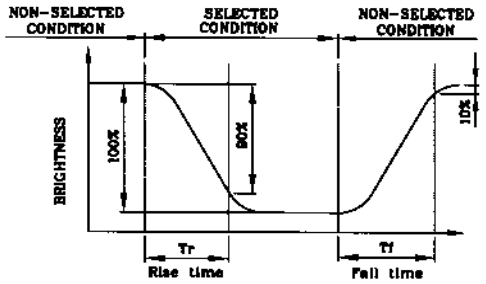
(negative type)

*Conditions

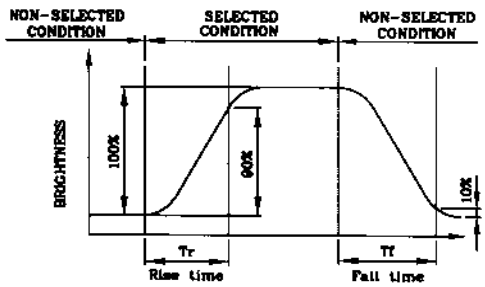
Viewing Angle : 0
Frame Frequency : 70Hz
Appling Waveform : I/N duty 1/a bias

(FIG 2)

Definition of Response Time(Tr,Tf)



(positive type)



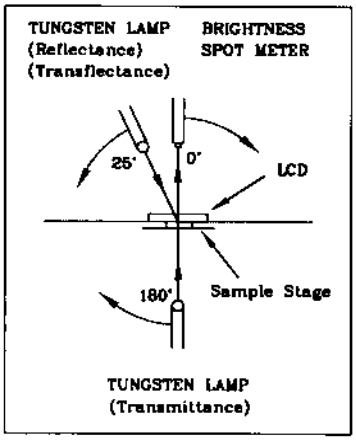
(negative type)

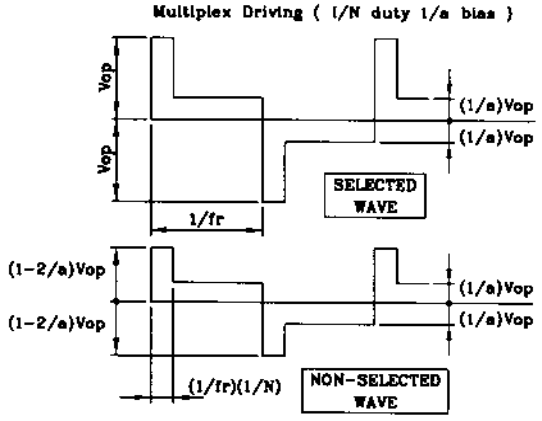
*Conditions

Operating Voltage : Vop
Viewing Angle (ϕ,θ) : (0,0)
Frame Frequency : 70Hz
Appling Waveform : I/N duty 1/a bias

(FIG 3)

Description of Measuring Equipment and Driving Waveforms





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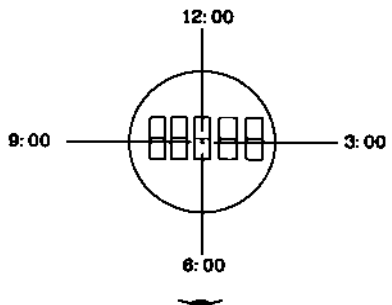
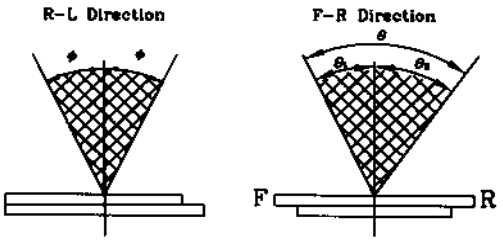
(FIG 4)

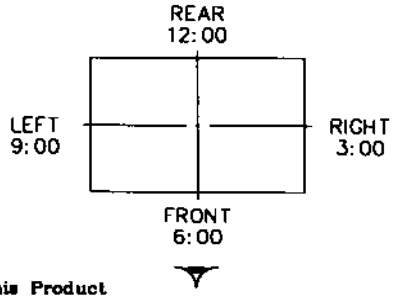
Definition of Viewing Direction



(FIG 5)

Definition of Viewing Angle





*For This Product

The Viewing Direction is 6 O'clock

So $\theta_1 > \theta_2$

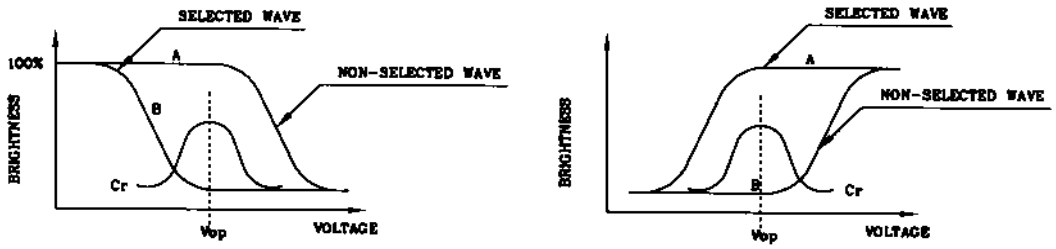
$\theta = \theta_1 + \theta_2$

*Conditions

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

(FIG 6)

Definition of Contrast Ratio (Cr)



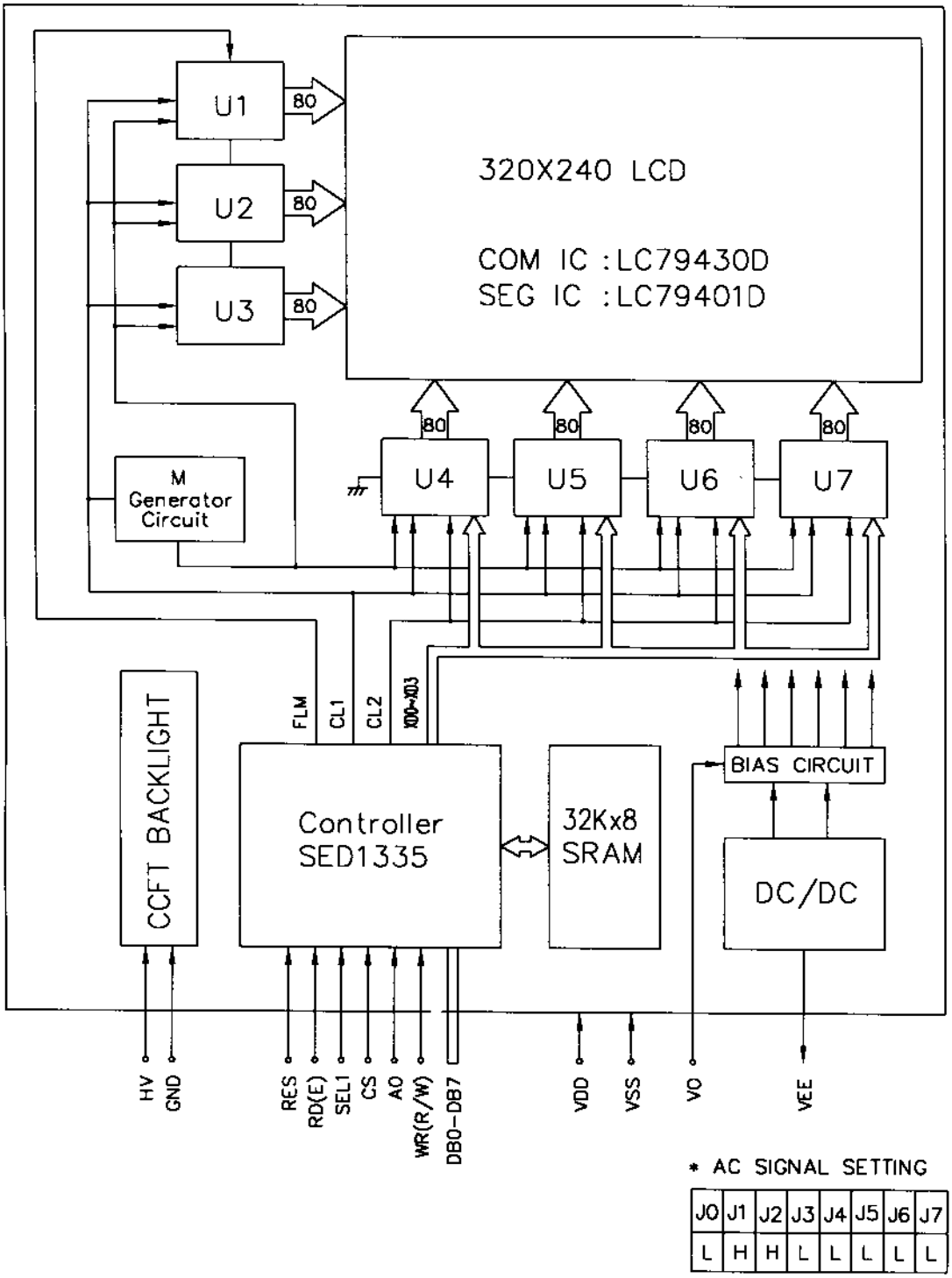
(positive type) (negative type)

Contrast Ratio : Cr=A/B

*Conditions

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

5. BLOCK DIAGRAM



* AC SIGNAL SETTING

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

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6. INTERNAL PIN CONNECTION

CN1: Pitch 1.0 mm

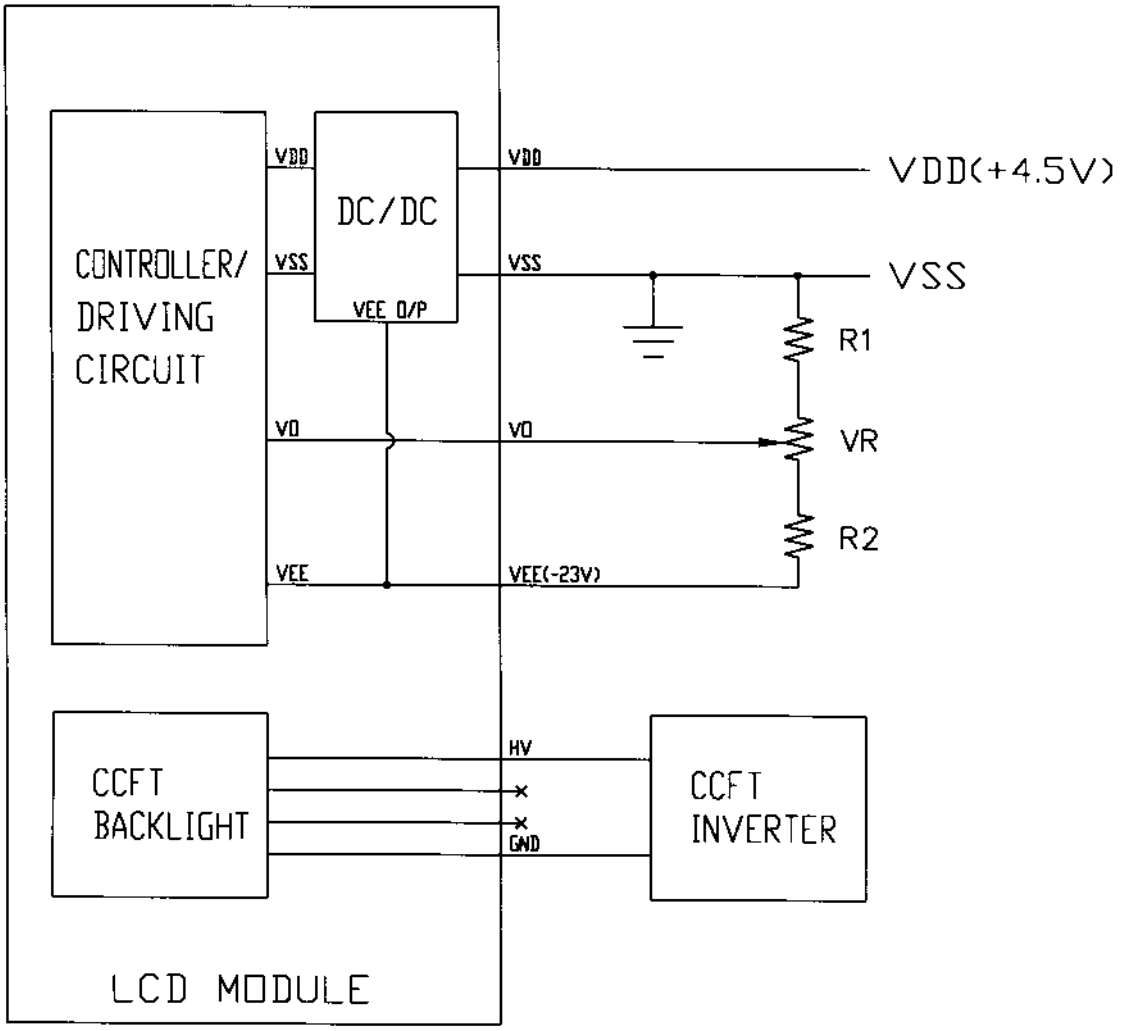
Pin No.	Symbol	Function
1	VSS	Ground
2	VDD	Power supply for Logic
3	V0	Negative voltage power supply (Tuned from VDD–VEE)
4	A0	Data type select
5	WR (R/W)	8080 Family : Write signal 6800 Family : R/W signal
6	RD(E)	8080 Family : Read signal 6800 Family : Enable clock
7 S 14	DB0 S DB7	3–State I/O data 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 S 22	N.C.	No connection

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

7. POWER SUPPLY



1. R1+VR+R2=10KΩ~20KΩ
2. RECOMMENDED CCFT INVERTER: CXA-L10L(TDK)
   (OPERATING TEMP. -10℃~60℃)

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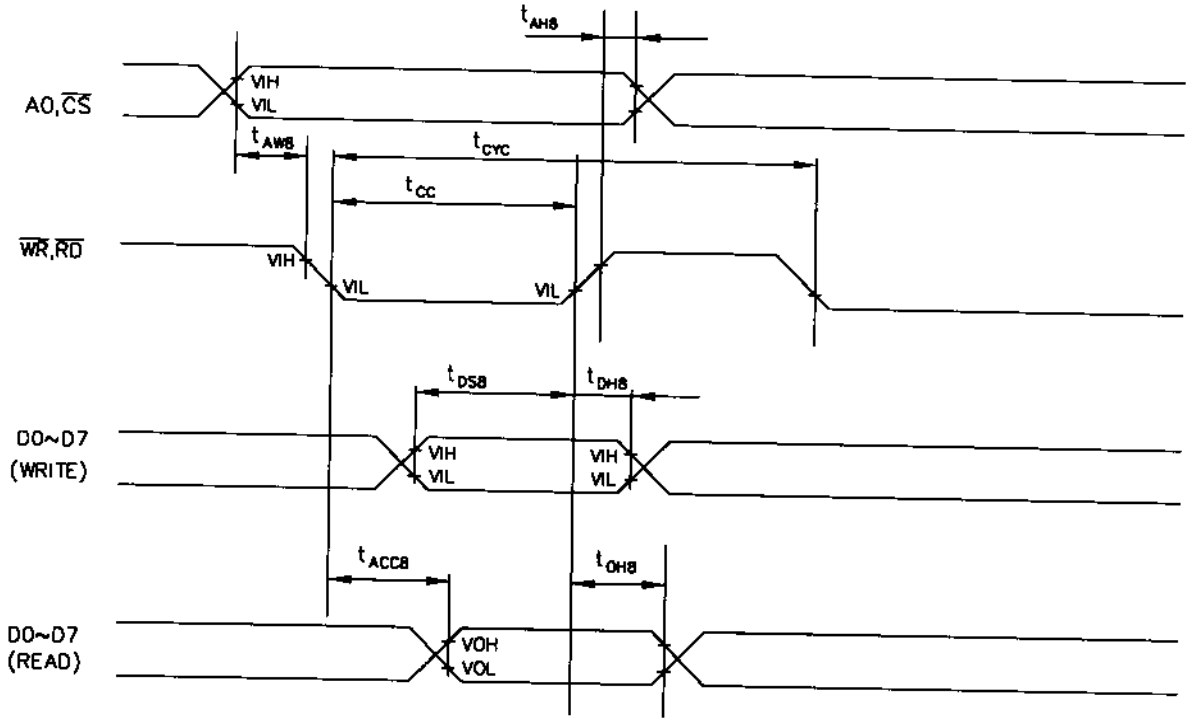
8. TIMING CHARACTERISTICS

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_{AH8}	10	–	–	ns
	ADDRESS SETUP TIME	t_{AW8}	0	–	–	ns
$\overline{WR}$,$\overline{RD}$	SYSTEM CYCLE TIME	t_{CYC8}	1	–	–	ns
	STROBE PULSE WIDTH	t_{CC}	120	–	–	ns
D0 to D7	DATA HOLD TIME	t_{DH8}	5	–	–	ns
	DATA SETUP TIME	t_{DS8}	120	–	–	ns
	$\overline{RD}$ ACCESS TIME	t_{ACC8}	–	–	50	ns
	OUTPUT DISABLE TIME	t_{OH8}	10	–	50	ns



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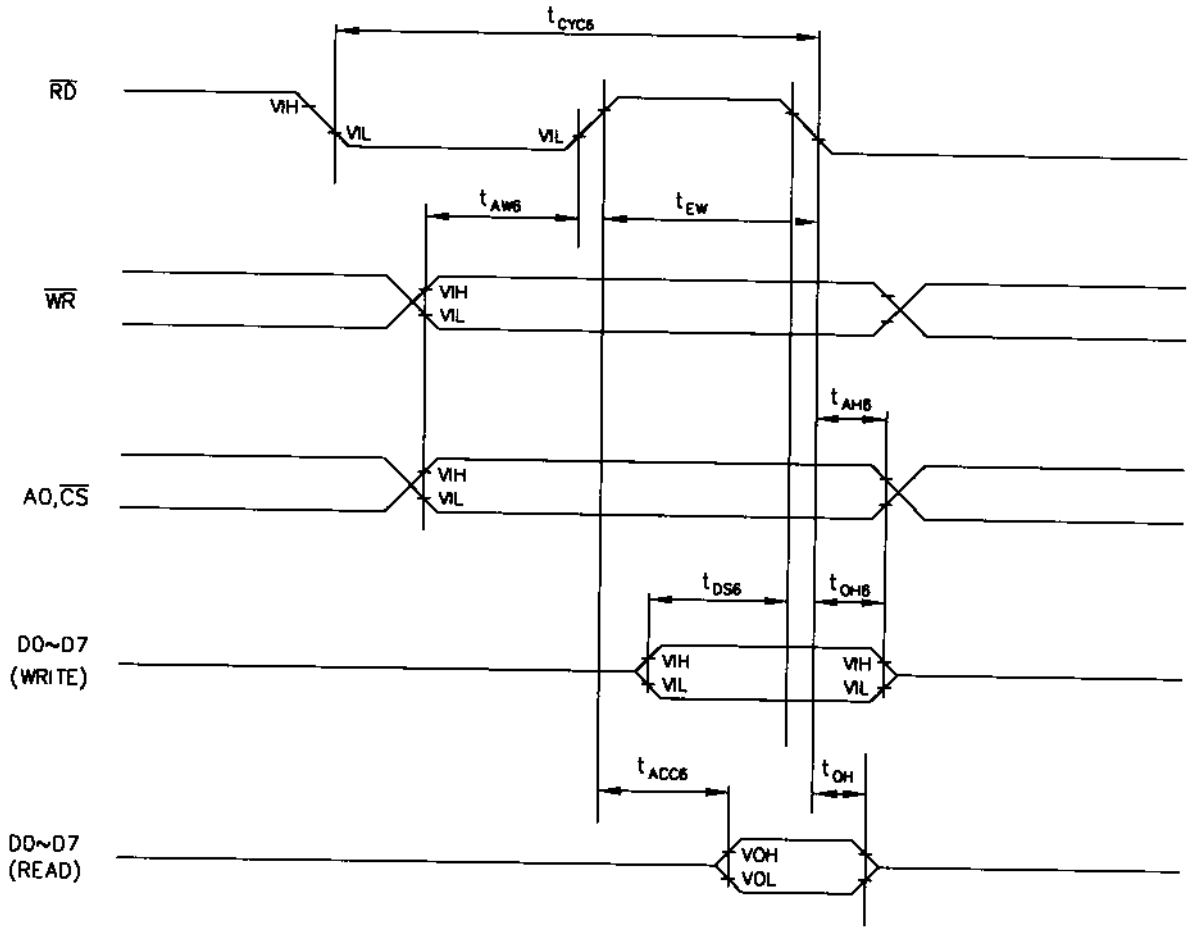
8-2.READ/WRITE CHARACTERISTICS(6800 FAMILY MPU)

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_{AW6}	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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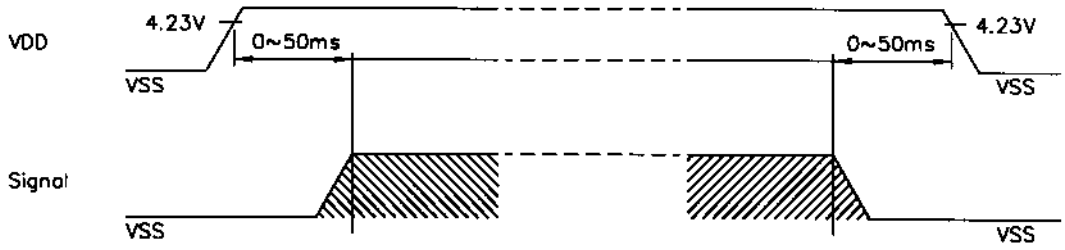
8-3.POWER ON/OFF TIMING

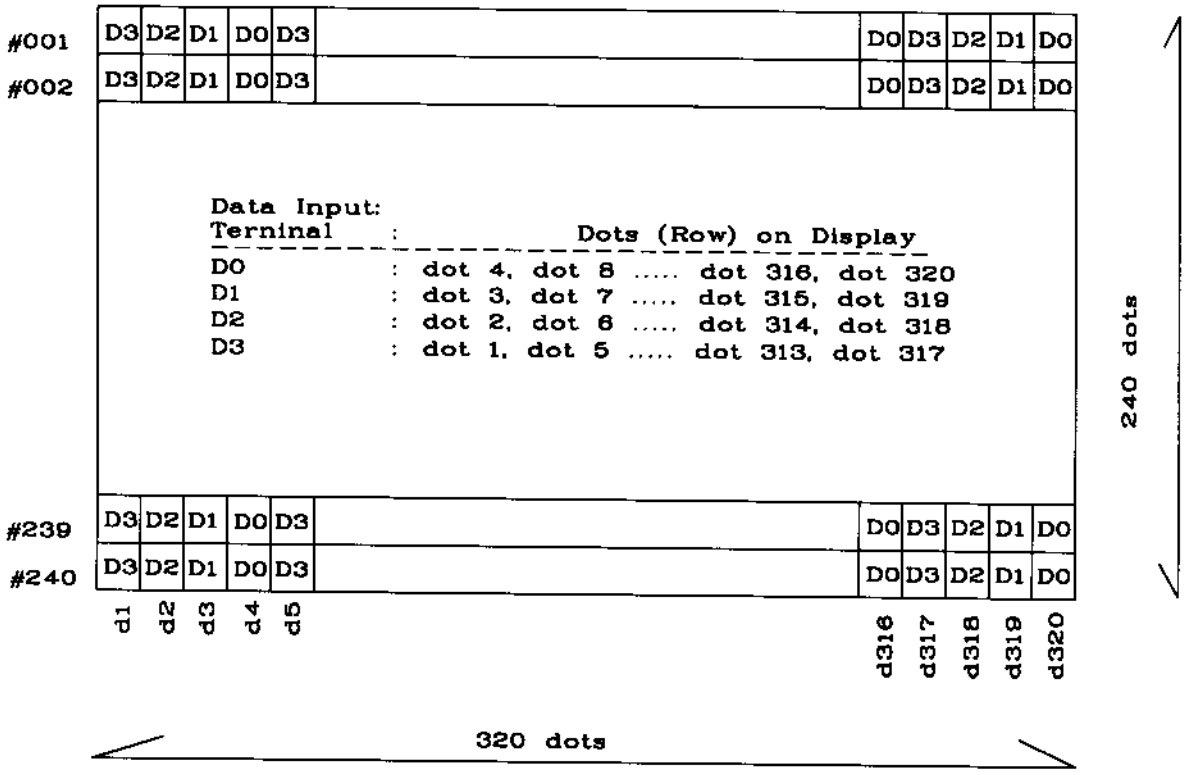


POWER ON

POWER OFF

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

8-4.DISPLAY PATTERN



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

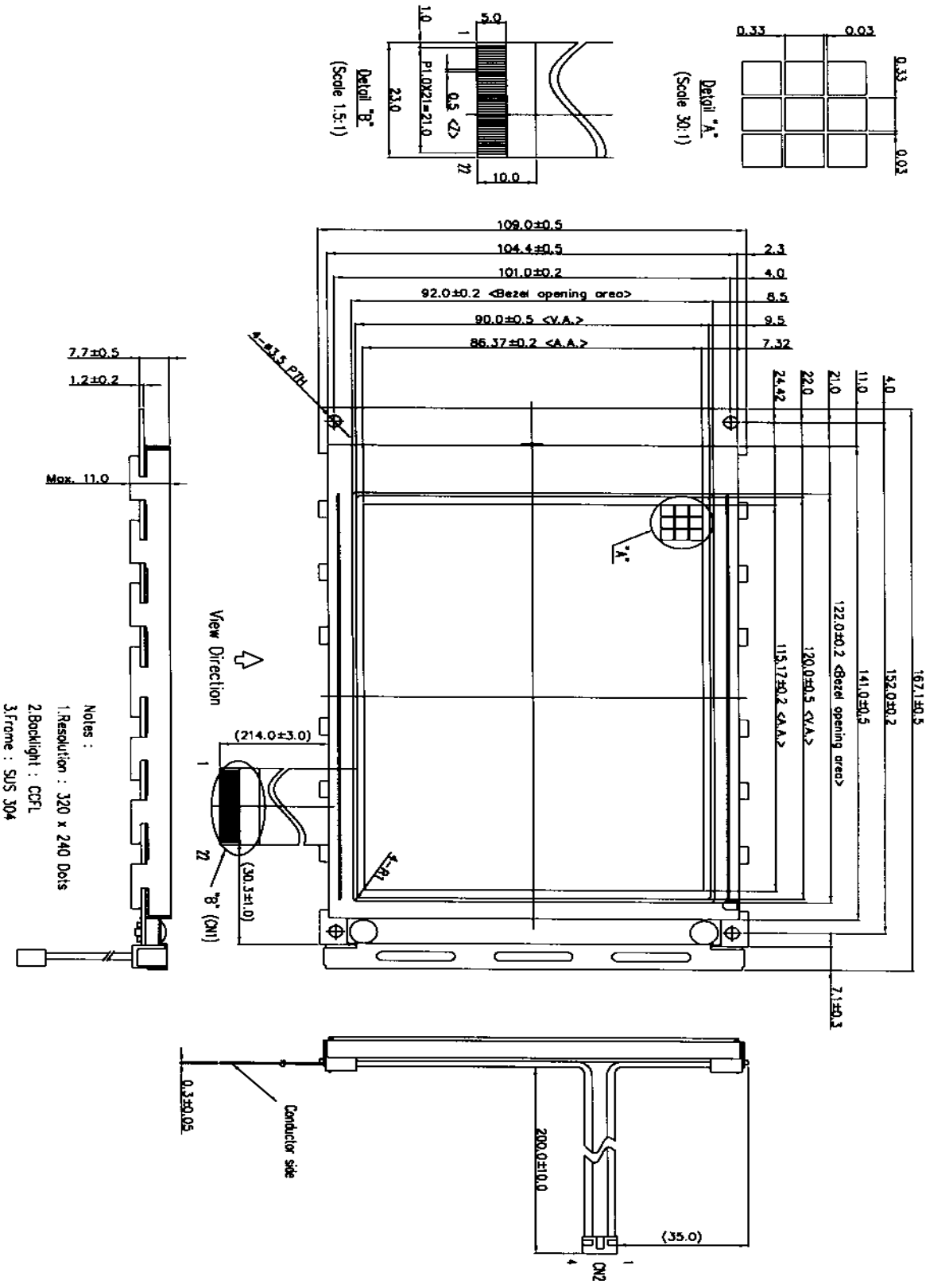
NOTE:

- 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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