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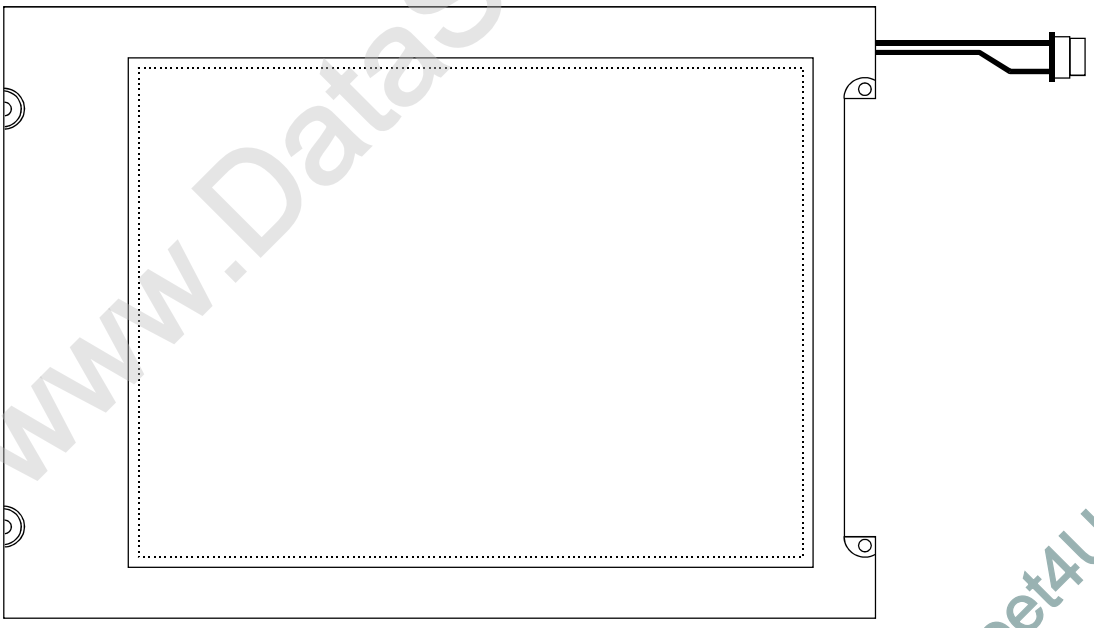
HANTRONIX

PRODUCT SPECIFICATION

HDM6448-A

640x480 10.4” Mono GRAPHICS
LCD DISPLAY MODULE



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HANTRONIX, INC. 10080 BUBB RD. CUPERTINO, CA 95014	Q.A.: JK	REV.: 1.2	HDM6448-A	SHEET 1 OF 18 DATE: 8/27/02

1. MECHANICAL DATA

(1) Product No.		**HDM6448-A**
(2) Module Size		268.0 (W)mm x 190.0 (H)mm x MAX.7.0 (D)mm
(3) Dot Size		0.305 (W)mm x 0.305 (H)mm
(4) Dot Pitch		0.33 (W)mm x 0.33 (H)mm
(5) Number of Dots		640 (W) x 480 (H)Dots
(6) Duty		1/240
(7) LCD Display Mode	FSTN:	☐ Black and White(Normally black/Negative Image)
		☐ Black and White(Normally white /Positive Image)
	Rear Polarizer:	☐ Transmision
		☐ Transflective(Medium Transparency)
		☐ Transflective(Normal)
(8) Viewing Direction		☐ 6 o'clock
		☐ 12 o'clock
(9) Backlight		CCFL
(10) Controller		Excluded
(11) DC/DC Converter		Excluded
(12) Weight		426.5(approx.)

2. ABSOLUTE MAXIMUM RATINGS

(1) ELECTRICAL ABSOLUTE RATINGS

VSS=0 V Standard

ITEM	SYMBOL	MIN	MAX	UNIT	COMMENT
Power Supply for Logic	VDD−VSS	−0.3	6.5	V	
Power Supply for LCM	VEE−VSS	0	27	V	
Input Voltage	VI	−0.3	VDD+0.3	V	
Static Electricity	−	−	−	−	Note 1

(2) ENVIRONMENTAL ABSOLUTE MAXIMUM RATINGS

ITEM	NORMAL TEMP.				WIDE TEMP.			
	OPERATING		STORAGE		OPERATING		STORAGE	
	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.
Ambient Temperature	0	50	−20	70	−20	70	−30	80
Humidity (Without Condensation)	Note 2,4		Note 3,4		Note 4,5		Note 4,6	

Note 1 LCM should be grounded during handling LCM.

Note 2 Ta ≦ 50°C : 85%RH max

Ta > 50°C : Absolute humidity must be lower than the humidity of 85%RH at 50°C

Note 3 Ta at −20°C will be < 48hrs, at 70°C will be < 120hrs

Note 4 Background color will change slightly depending on ambient temperature.

Note 5 Ta ≦ 70°C : 75%RH max

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

Note 6 To at −30°C will be < 48hrs, at 80°C will be < 120hrs

Note✱

Frequency (HZ)	10~55~10/1 min
Vibration Width	1.5 m/m
Vibration Direction	X/Y/Z
Vibration Time	15 min/cycle X 3 directions

3. ELECTRICAL CHARACTERISTICS

3-1. ELECTRICAL CHARACTERISTICS OF LCM

ITEM		SYMBOL	CONDITION		MIN.	TYP.	MAX.	UNIT
Power Supply for Logic		VDD-VSS	-		4.5	5.0	5.5	V
Recommended LC Driving Voltage		VEE-VSS	Duty=1/240 Bias=1/13	0°C	24.7	25.0	25.3	V
				0°C	23.7	24.0	24.3	
				25°C	22.7	23.0	23.3	
				50°C	21.7	22.0	22.3	
				50°C	21.1	21.4	21.7	
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-VSS = (23.0V)		-	4.8	7.2	mA
		IEE	PATTERN : ■□■□■□ □■□■□■		-	10.1	15	mA
LCM	Surface Luminance	L (T434G)	ALL ON		-	260	-	cd/m²
			ALL OFF		-	13.4	-	
		L (S434J)	ALL ON		-	29.26	-	
			ALL OFF		-	90.24	-	
		L (P434K)	ALL ON		-	30.86	-	
			ALL OFF		-	94.87	-	

3-2. ELECTRICAL CHARACTERISTICS OF BACKLIGHT

Used CCFL Rating

Temp.=25°C

ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT	REMARK
Lamp voltage	V_L	–	461	–	Vrms	–
Lamp current	I_L	–	5.0	–	mArms	–
Lamp power consumption	P_L	–	2.31	–	W	(*1)
Starting voltage	V_S	–	–	860	Vrms	–
Lamp frequency	F_L	–	50	–	KHz	–
Lamp life time	L_L	20000	–	–	hrs	IL = 5.0Arms (*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°C		0°C		25°C		50°C		70°C		25°C		25°C	
		MIN.	TYP.	MIN.	TYP.	MIN.	TYP.	MIN.	TYP.	MIN.	TYP.	MIN.	TYP.	MIN.	TYP.
T	G	7.5	8.0	13	13.5	24	24.5	14	14.5	3.0	3.5	–	85	–	(L)60 (R) –
NOTE		NOTE 6										NOTE 5			

NOTE : T : Transmission
G : Norrmally Black 6 O'clock

AT $\phi=0°$ $\theta=0°$

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Response Time (rise)	Tr	−20°C	2800	3500	4200	ms	NOTE 2
		0°C	500	630	750		
		25°C	190	240	290		
		50°C	120	140	160		
		70°C	45	65	85		
Response Time (fall)	Tf	−20°C	1300	1800	2200	ms	NOTE 2
		0°C	380	470	550		
		25°C	90	120	150		
		50°C	40	60	80		
		70°C	30	50	70		

4-1 Optical Char. of Normal Temp. Mode

AT Vop

ITEM / MODE		Cr(Contrast Ratio)						θ(Viewing Angle)		φ(Viewing Angle)	
		0℃		25℃		50℃		25℃		25℃	
		MIN.	TYP.	MIN.	TYP.	MIN.	TYP.	MIN.	TYP.	MIN.	TYP.
S	J	4.5	5.5	5.0	6.0	4.0	5.0	–	59	–	(R)26 (L)29
P	K	4.5	5.0	5.5	6.5	4.0	4.5	–	55	–	±35
Note		NOTE 6						NOTE 5			

NOTE : S : Transflective (Normally) P : Transflective(medium transparency)
J : Normally White , 6 o'clock K : Norrmally White 12 O'clock

AT ø=0° θ=0°

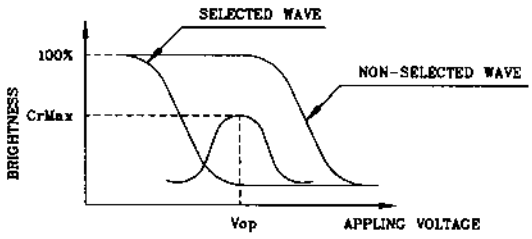
S-J mode ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Response Time (rise)	Tr	0°C	600	780	1100	ms	NOTE 2
		25°C	200	260	390		
		50°C	90	110	160		
Response Time (fall)	Tf	0°C	320	400	600	ms	NOTE 2
		25°C	100	130	200		
		50°C	50	60	90		

AT ø=0° θ=0°

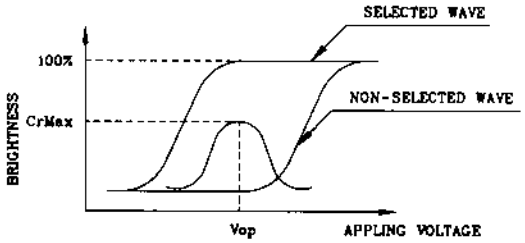
P-K mode ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Response Time (rise)	Tr	0°C	550	700	900	ms	NOTE 2
		25°C	200	260	340		
		50°C	110	130	170		
Response Time (fall)	Tf	0°C	350	450	580	ms	NOTE 2
		25°C	100	120	170		
		50°C	45	65	85		

(NOTE 1)

Definition of Operation Voltage(Vop)



(positive type)



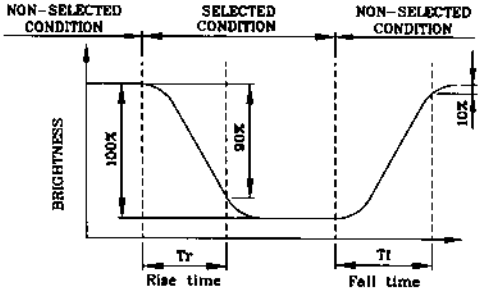
(negative type)

*Conditions

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

(NOTE 2)

Definition of Response Time(Tr,Tf)



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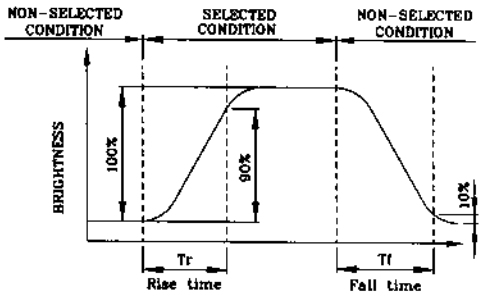


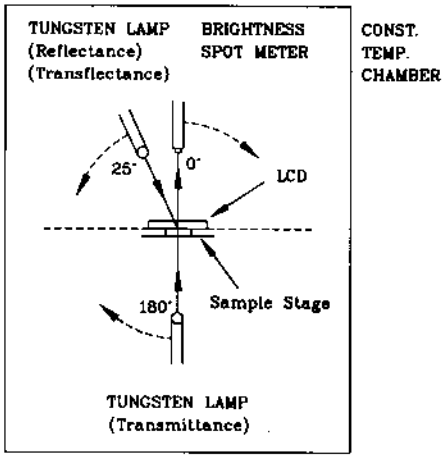
(negative type)

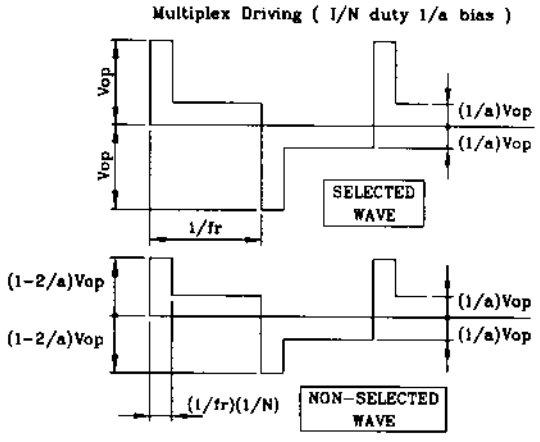
*Conditions

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

(NOTE 3)

Description of Measuring Equipment and Driving Waveforms





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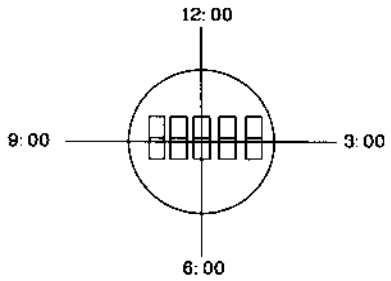
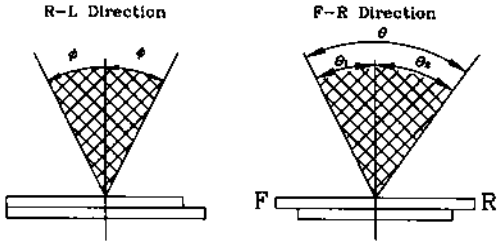
(NOTE 4)

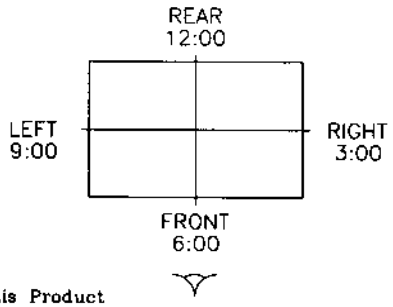
Definition of Viewing Direction



(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

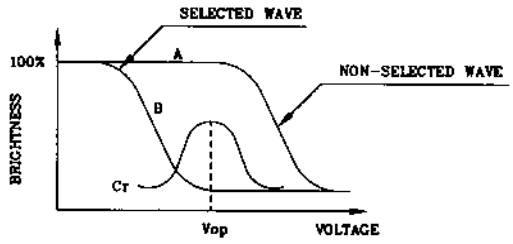
Frame Frequency : 70Hz

Appling Waveform : 1/N duty 1/a bias

Contrast Ratio : larger than 2

(NOTE 6)

Definition of Contrast Ratio (Cr)



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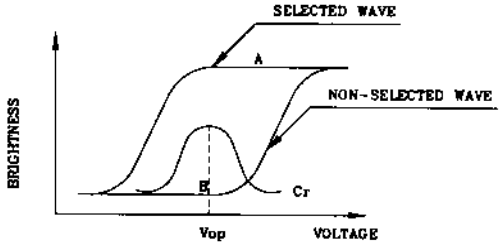

(negative type)

Contrast Ratio : Cr=A/B

*Conditions

Viewing Angle : 0

Frame Frequency : 70Hz

Appling Waveform : 1/N duty 1/a bias

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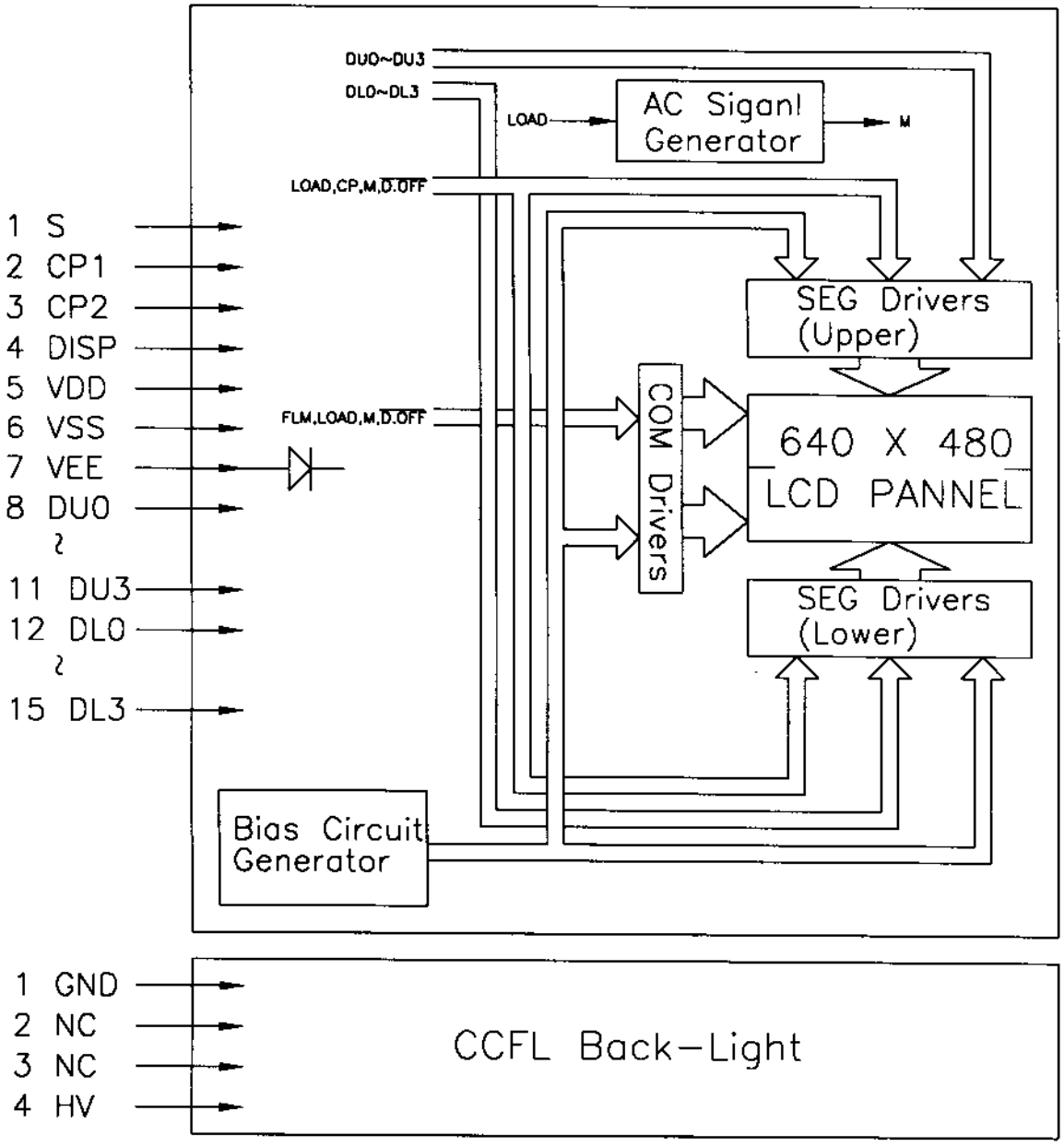
5. BLOCK DIAGRAM



* AC Signal Setting

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

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6. INTERNAL PIN CONNECTION

LCD

Pin No.	Symbol	Level	Function
1	S	H	Scan Start-Up Signal
2	CP1	H —— L	Input Data Latch Signal
3	CP2	H —— L	Data Input Clock Signal
4	DISP	On : H Off : L	Display Control Signal
5	VDD	-	Power Supply for Logic and LCD (+)
6	VSS	-	Ground Potential
7	VEE	-	Power Supply for LCD (+)
8	DU0	On : H Off : L	Display Data Signal (Upper Half)
9	DU1		
10	DU2		
11	DU3		
12	DL0	On : H Off : L	Display Data Signal (Lower Half)
13	DL1		
14	DL2		
15	DL3		

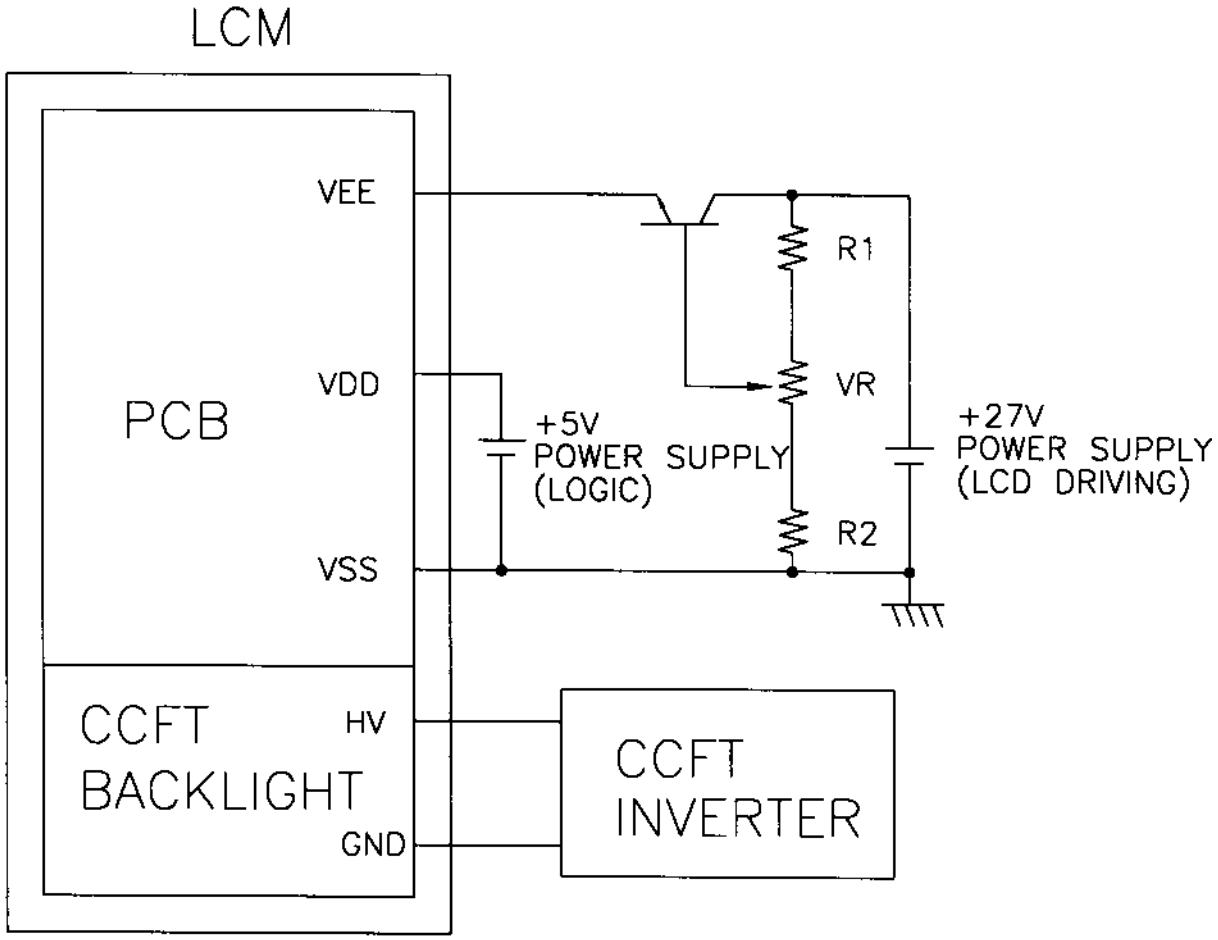
CCFT

Pin No.	Symbol	Level	Function
1	GND	-	GROUND LINE (INVERTER)
2	NC	-	NON CONNECTION
3	NC	-	NON CONNECTION
4	HV	-	HIGH VOLTAGE LINE (INVERTER)

LCD
Used connector : 53261-1590 (MOLEX)

CCFT
USE CONNECT : M63M83-04(MITSUMI)

7. POWER SUPPLY



1. R1+VR+R2=10K~20KΩ
2. RECOMMENDED CCFT INVERTER : TDK-M10L

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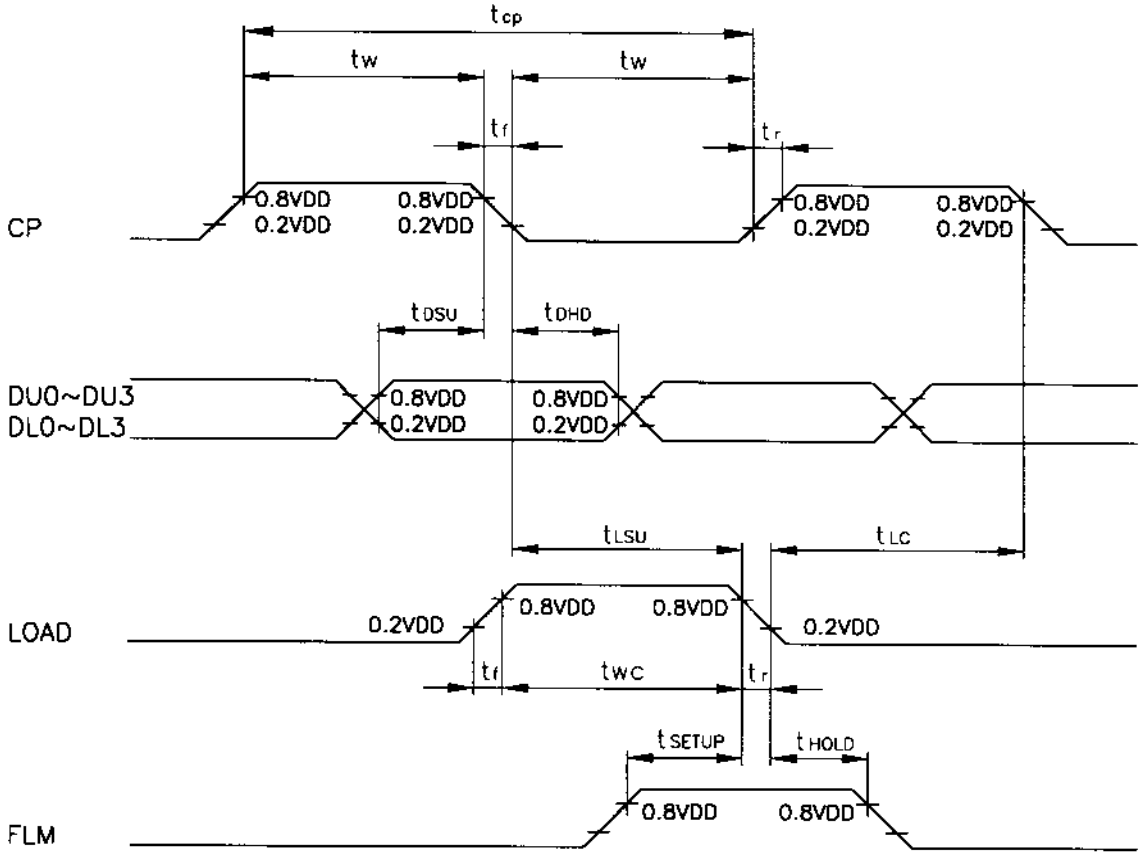
8. TIMING CHARACTERISTICS

8-1. INTERFACE TIMING

@VDD=2.5~5.5V

ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT
Shift Clock Period	t_{cp}	125	–	–	ns
"CP" PULSE WIDTH	t_w	51	–	–	ns
CLOCK RISE, FALL TIME	t_r , t_f	–	–	20	ns
DATA SETUP TIME	t_{DSU}	40	–	–	ns
DATA HOLD TIME	t_{DHD}	30	–	–	ns
"CP" → "LOAD" FALL TIME	t_{LSU}	51	–	–	ns
"LOAD" → "CP" FALL TIME	t_{LC}	51	–	–	ns
"FLM" SETUP TIME	t_{SETUP}	30	–	–	ns
"FLM" HOLD TIME	t_{HOLD}	50	–	–	ns
"LOAD" PULSE WIDTH	t_{WC}	51	–	–	ns



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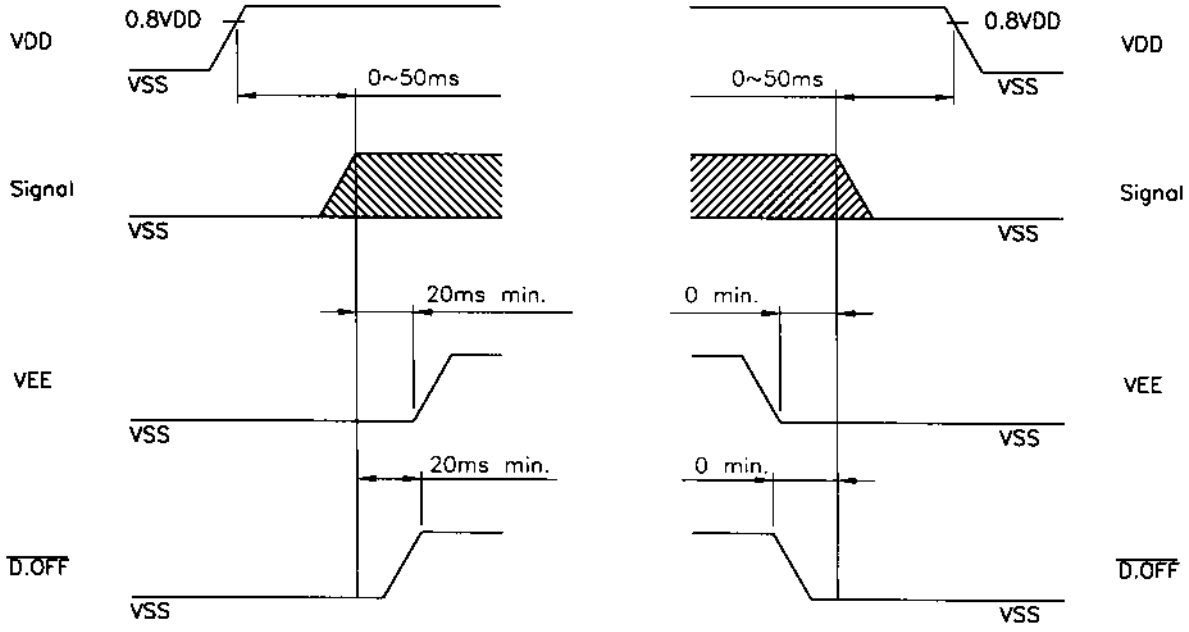
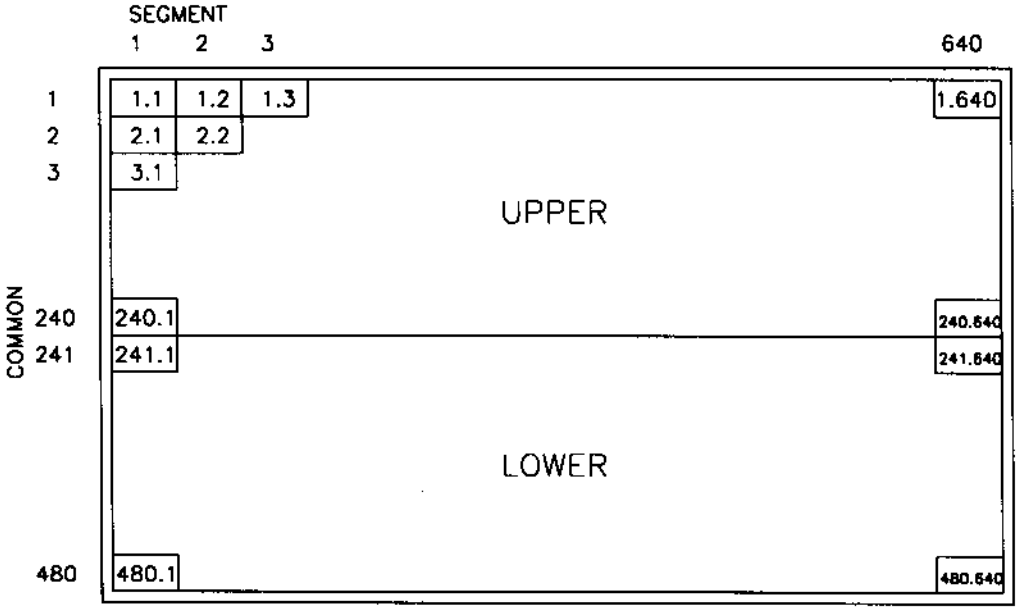
8-2. POWER ON/OFF TIMING

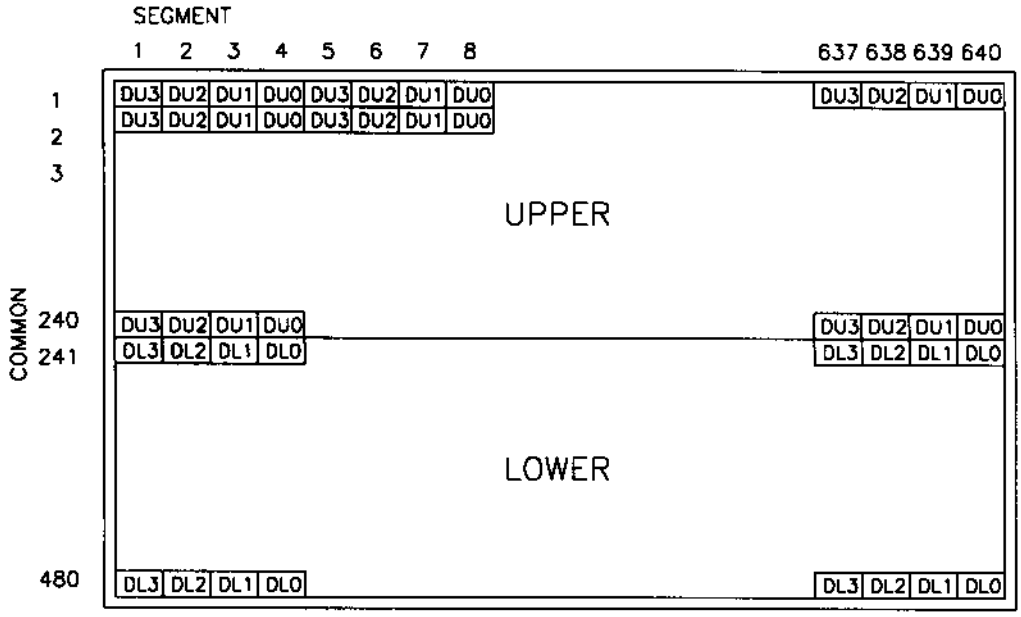


The missing pixels may occur when the LCM is driven beyond above power interface timing sequence.

9. DISPLAY PATTERM



NOTE : 1.1 MEANS 1ST COMMON 1ST SEGMENT DOT



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10. 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

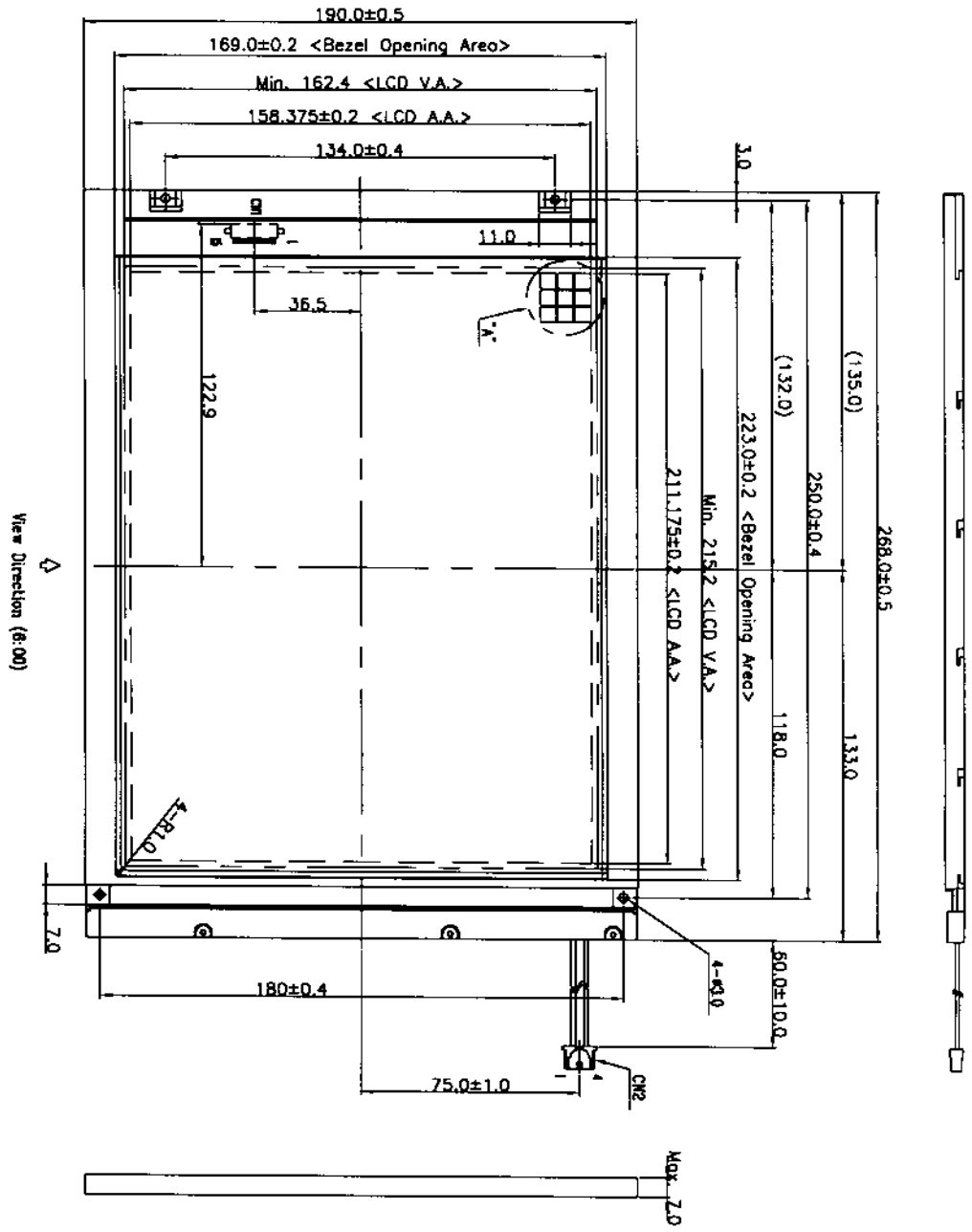
(2) NOTE:

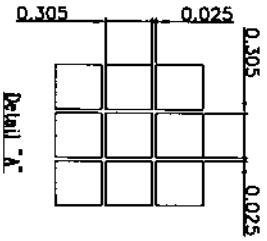
- SAFETY
  1. If the LCD panel breaks, be coreful not to get the liquid crystal to touch your skin.
  2. If the liquid crystal touches your skin or clothes, please wash it off immediately by using soap and water.

- 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 naphtho 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.





Notes :

1. Resolution : 640 x 480 Dots
2. Frame : SUS430*2B (t 0.3)
3. Backlight : CCFL

CN1 : 53261-1590 (Molex)
CN2 : MG30683-04 (MITSUMI)

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