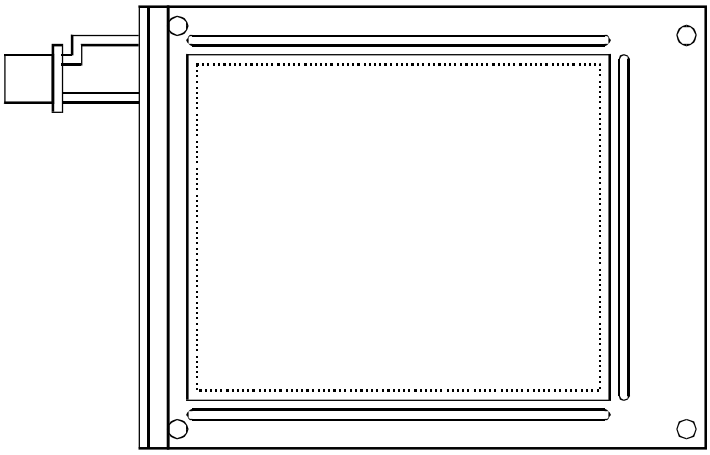
HANTRONIX

PRODUCT SPECIFICATION

HDM6448-6

640 x 480 GRAPHICS
LCD DISPLAY MODULE



HANTRONIX, INC. 10080 BUBB RD. CUPERTINO, CA 95014	**Q.A.:** JB	**REV.:** 1.0	HDM6448-6	SHEET 1 OF 15 **DATE:** 6/15/99

MECHANICAL DATA

(1) Product No.	
(2) Module Size	167.7 (W)mm x 122.8 (H)mm x 5.3 typ.(D)mm
(3) Lcd Viewing Area	125.6 (W)mm x 95.2 (H)mm
(4) Dot Size	0.17 (W)mm x 0.17 (H)mm
(5) Dot Pitch	0.19 (W)mm x 0.19 (H)mm
(6) Number of Dots	640 (W) x 480 (H)Dots
(8) Duty	1/240
(9) LCD Display Mode	FSTN: Black and White(Normally White/Positive Image)
	Rear Polarizer: Transflective(High Transparency)
(10) Viewing Direction	6 O'clock
(11) Backlight	CCFT
(12) Controller	Excluded
(13) DC/DC Converter	Excluded
(14) Weight	150 g(approx.)

ABSOLUTE MAXIMUM RATINGS

(1) ELECTRICAL ABSOLUTE RATINGS

VSS=0 V Standard

ITEM	SYMBOL	MIN	MAX	UNIT	COMMENT
Supply Voltage (Logic)	VDD−VSS	0	6.0	V	Ta = 25°C
Supply Voltage (LCD Drive)	VEE−VSS	0	30.0	V	Ta = 25°C
Input Voltage	VIN	0	VDD	V	Ta = 25°C
Static Electricity	−	−	−	−	Note 1

(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	
Vibration(Note 5)	−		49m/s² (5G)	

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 < 48 hrs, at 80°C will be < 120 hrs

Note 4 Background color will change slightly depending on ambient temperature. That phenomenon is reversible.

Note 5

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

ELECTRICAL CHARACTERISTICS

ITEM		SYMBOL	CONDITION		MIN.	TYP.	MAX.	UNIT
Power Supply for Logic		VDD−VSS	Ta = 25°C		3.0	3.3	5.5	V
Input Voltage		VIL	L level		0	−	0.2VDD	V
		VIH	H level		0.8VDD	−	VDD	V
Recommand LCD Module Driving Voltage		VEE−VSS	VDD=3.3V Bias=1/11.3	Ta=−20°C	21.9	22.3	22.7	V
				Ta=0°C	21.0	21.4	21.9	
				Ta=25°C	20.1	20.5	20.9	
				Ta=50°C	18.6	19.0	19.4	
				Ta=65°C	17.3	17.7	18.1	
Power Supply Current for LCM		IDD	VDD=3.3V VDD−VEE=20.5V FLM=70Hz Pattern : 		−	0.7	3.0	mA
		IEE			−	6.7	15.0	
CCFT	Open Voltage	VOPEN	Lamp Current = 5 mArms Frequency = 55 KHz		−	440	−	Vrms
	Lamp Voltage	VL			−	330	−	Vrms

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OPTICAL CHARACTERISTICS

AT Vop

ITEM / MODE		Cr(Contrast Ratio)						θ(Viewing Angle)		ϕ(Viewing Angle)	
		0°C		25°C		50°C		25°C		25°C	
		MIN.	TYP.	MIN.	TYP.	MIN.	TYP.	MIN.	TYP.	MIN.	TYP.
H	J	–	6.5	–	6.0	–	5.0	–	37	–	46
NOTE		NOTE 6						NOTE 5			

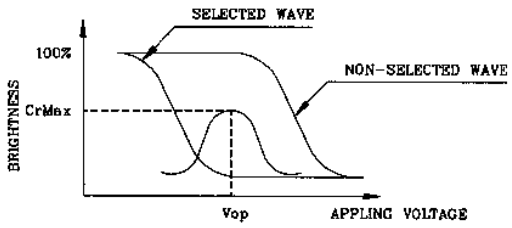
NOTE :
H : TRANSFLECTIVE(HIGH TRANSPARENCY)
J: NORMALLY WHITE

AT ϕ=0° θ=0°

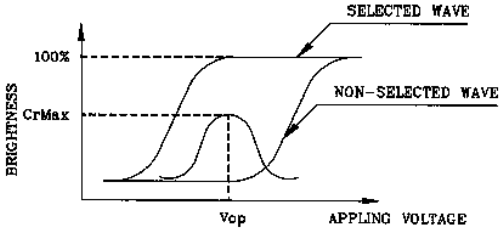
ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Response Time (rise)	Tr	-20℃	–	1700	2600	ms	Fig.2
		0℃	–	370	560		
		25℃	–	200	300		
		50℃	–	90	150		
		65℃	–	80	120		
Response Time (fall)	Tr	-20℃	–	900	1400	ms	Fig.2
		0℃	–	350	530		
		25℃	–	150	230		
		50℃	–	80	120		
		65℃	–	70	110		

(Fig.1)

Definition of Operation Voltage(Vop)



(positive type)



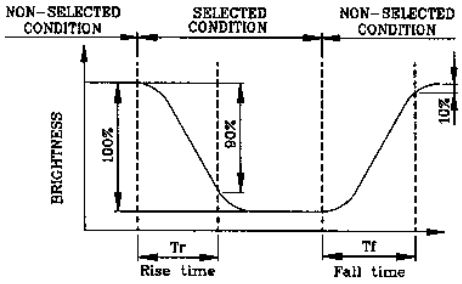
(negative type)

*Conditions

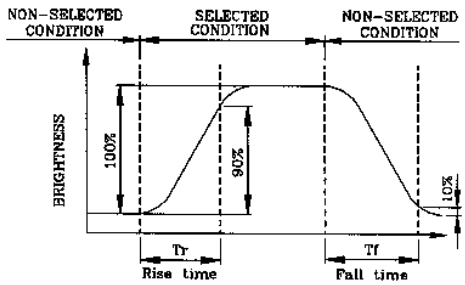
Viewing Angle : 0
Frame Frequency : 70Hz
Appling Waveform : I/N duty 1/a bias

(Fig.2)

Definition of Response Time(Tr,Tf)



(positive type)



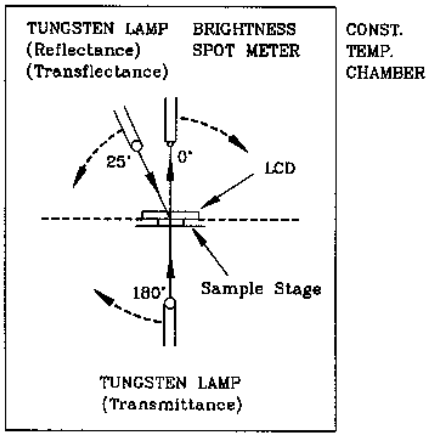
(negative type)

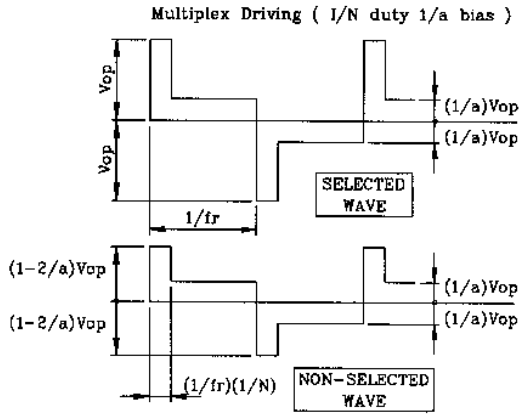
*Conditions

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

(Fig.3)

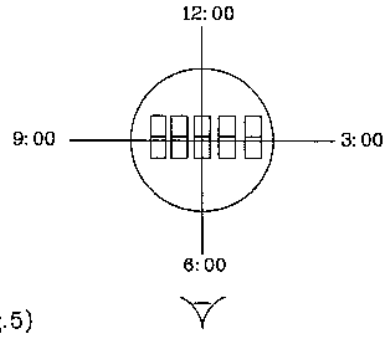
Description of Measuring Equipment and Driving Waveforms



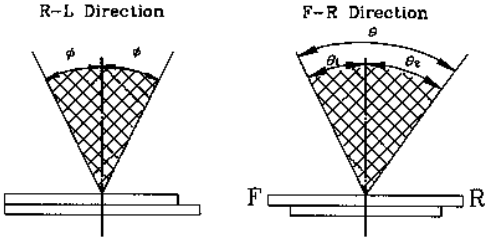


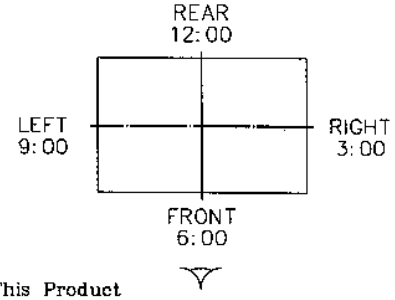
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(Fig. 4)
Definition of Viewing Direction



(Fig.5)
Definition of Viewing Angle



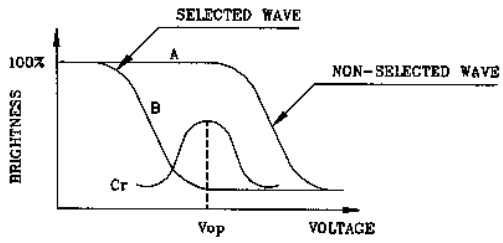


*For This Product
The Viewing Direction Is 6 O'clock
So $\theta 1 > \theta 2$

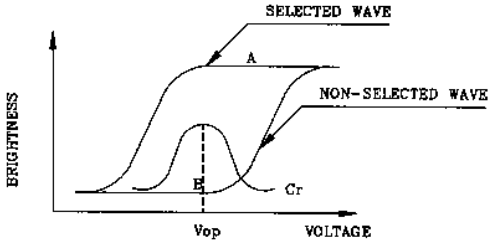
$\theta = \theta_1 + \theta_2$

*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)

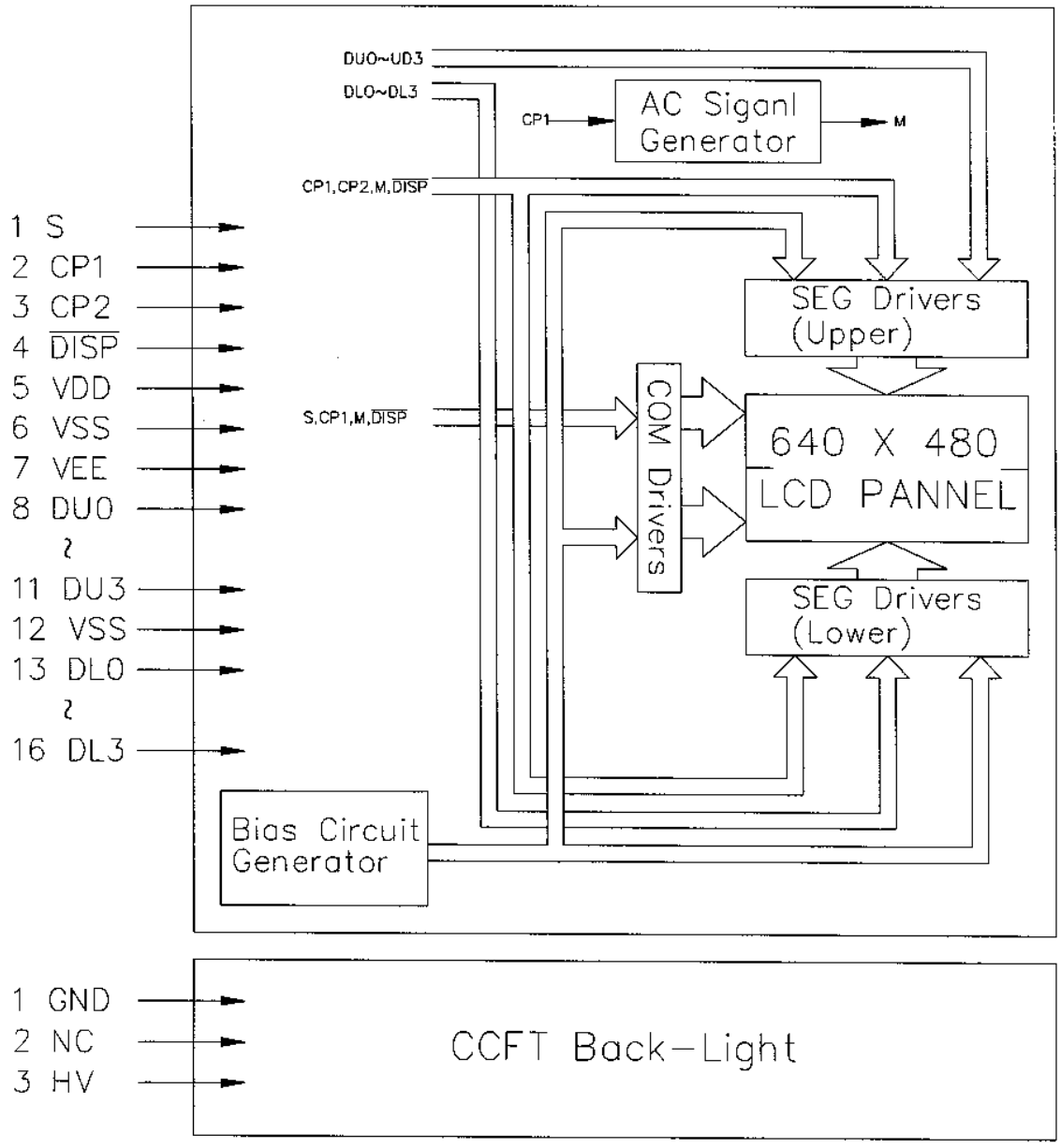


(negative type)

Contrast Ratio : Cr=A/B

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

BLOCK DIAGRAM



* AC Signal Setting

J1	J2	J3	J4	J5	J6	J7	J8
L	H	L	L	H	L	L	L

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INTERNAL PIN CONNECTION

LCD

Pin No.	Symbol	Level	Function
1	S	H/L	SCAN START-UP SIGNAL
2	CP1	H→L	INPUT DATA LATCH SIGNAL
3	CP2	H→L	DATA INPUT CLOCK SIGNAL
4	$\overline{DISP}$	H/L	DISPLAY OFF ("H"=ON,"L"=OFF)
5	VDD	–	POWER SUPPLY FOR LOGIC (+)
6	VSS	–	SIGNAL GROUND (GND)
7	VEE	–	POWER SUPPLY FOR LCD (+)
8	DU0	H/L	DISPLAY DATA (UPPER HALF)
9	DU1		
10	DU2		
11	DU3		
12	VSS	–	SIGNAL GROUND (GND)
13	DL0	H/L	DISPLAY DATA (LOWER HALF)
14	DL1		
15	DL2		
16	DL3		

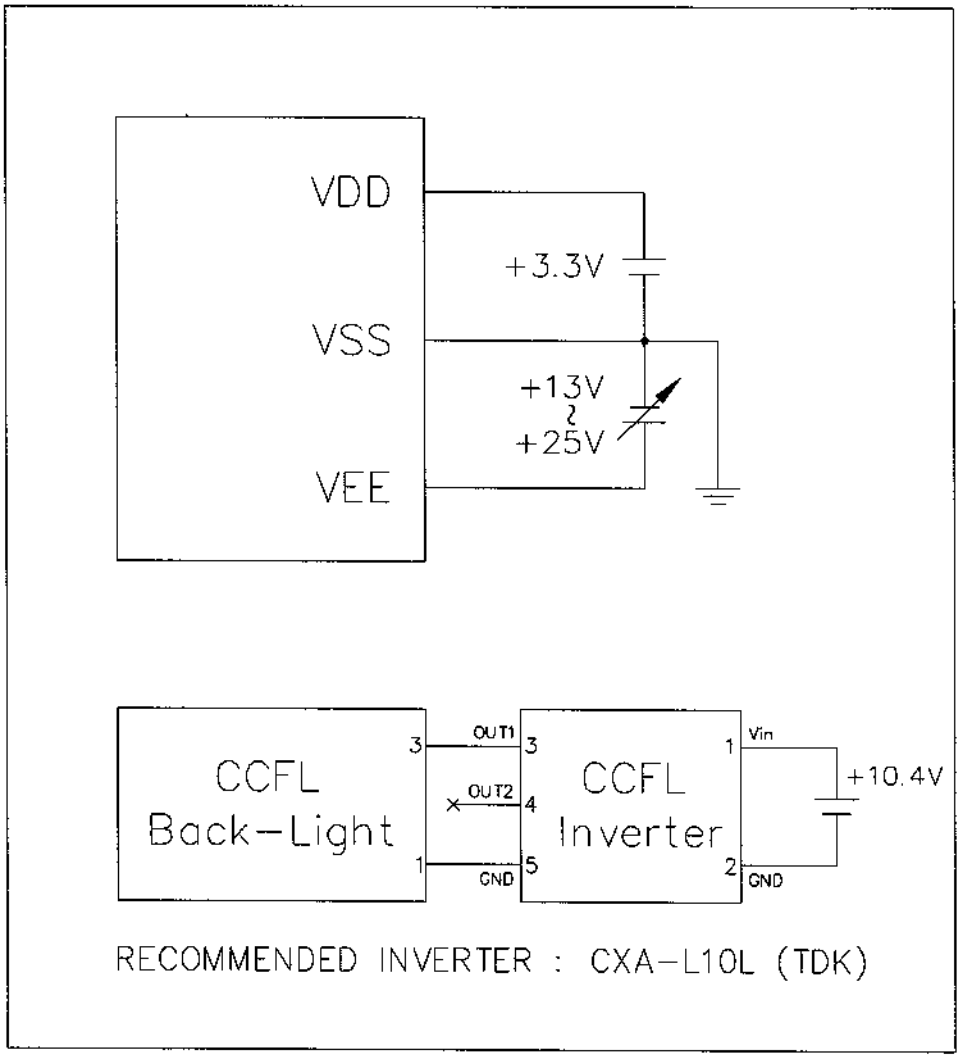
CCFT

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

LCD
Used connector : FH12A-16S-0.5SH (HIROSE)
Mating cable : FFC or FPC (Pitch 0.5mm,16 pins,Conact Partion Thickness 0.3mm)

CCFT
Used connector : BHR-03VS-1 (JST)
Mating connector : SM02(80)B-BHS-1

POWER SUPPLY



RECOMMENDED INVERTER : CXA-L10L (TDK)

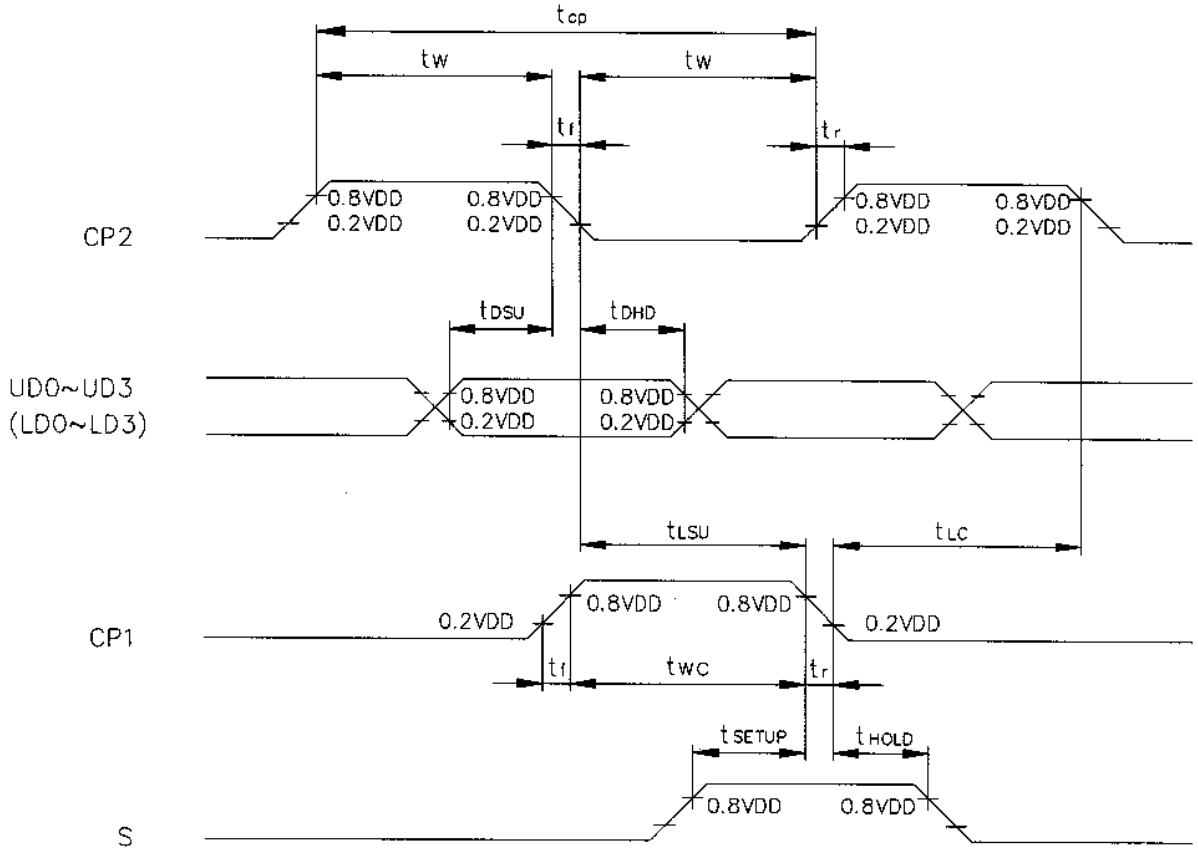
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TIMING CHARACTERISTICS

8-1. INTERFACE TIMING

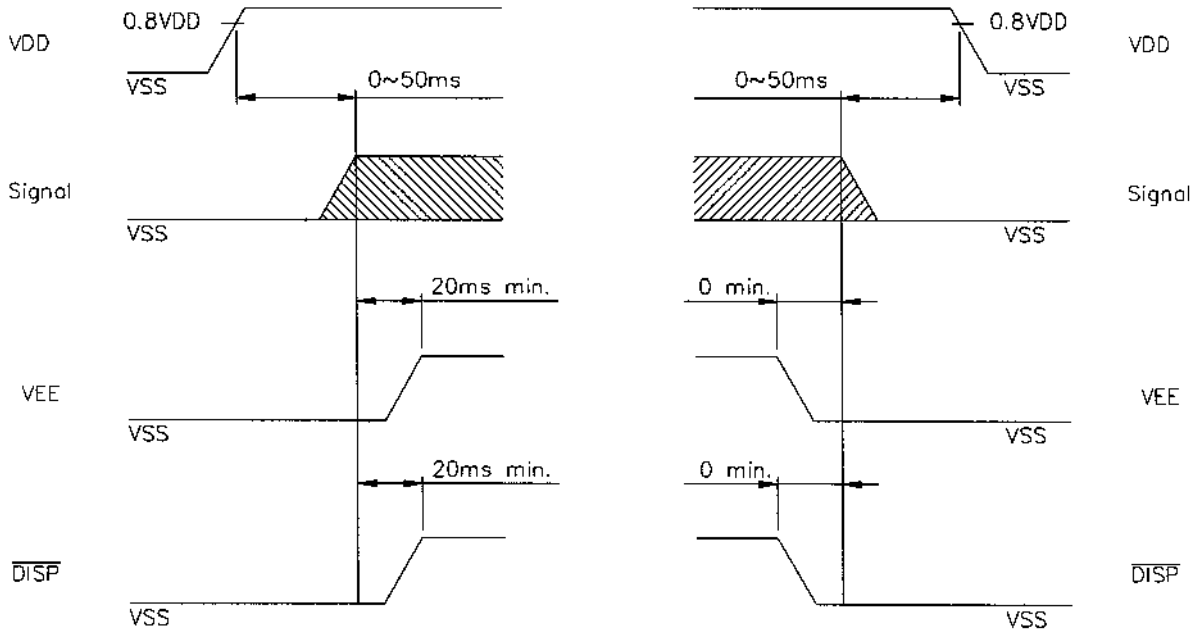
@VDD=2.5~5.5V

ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT
Shift Clock Period	t_{cp}	125	–	–	ns
"CP2" PULSE WIDTH	t_W	51	–	–	ns
CLOCK RISE, FALL TIME	t_r , t_f	–	–	50	ns
DATA SETUP TIME	t_{DSU}	30	–	–	ns
DATA HOLD TIME	t_{DHD}	50	–	–	ns
"CP2"→"CP1" FALL TIME	t_{LSU}	51	–	–	ns
"CP1"→"CP2" FALL TIME	t_{LC}	51	–	–	ns
"S" SETUP TIME	t_{SETUP}	100	–	–	ns
"S" HOLD TIME	t_{HOLD}	100	–	–	ns
"CP1" PULSE WIDTH	t_{WC}	65	–	–	ns



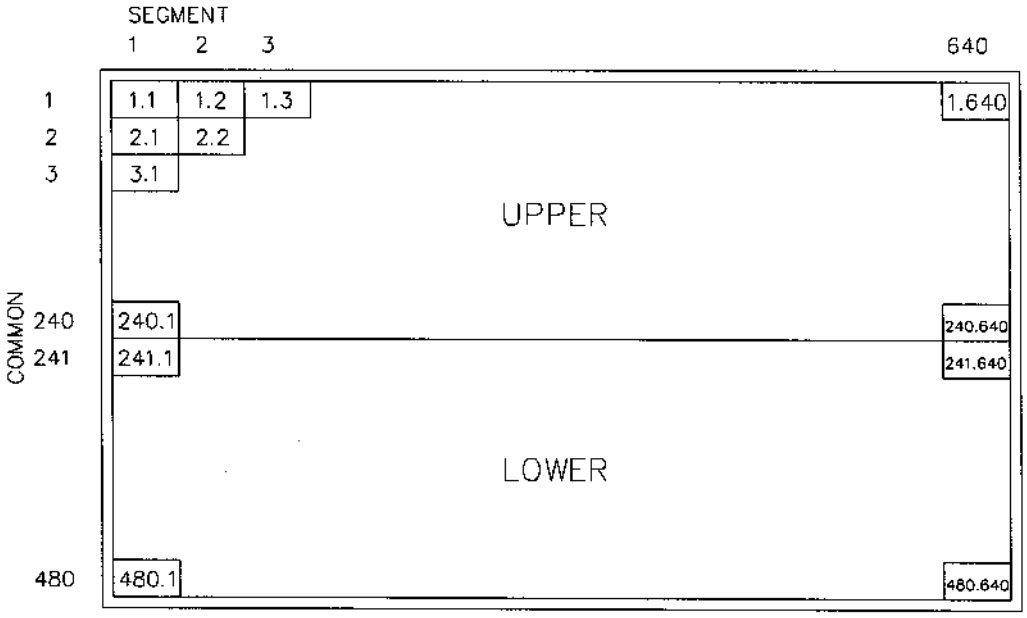
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POWER ON/OFF TIMING

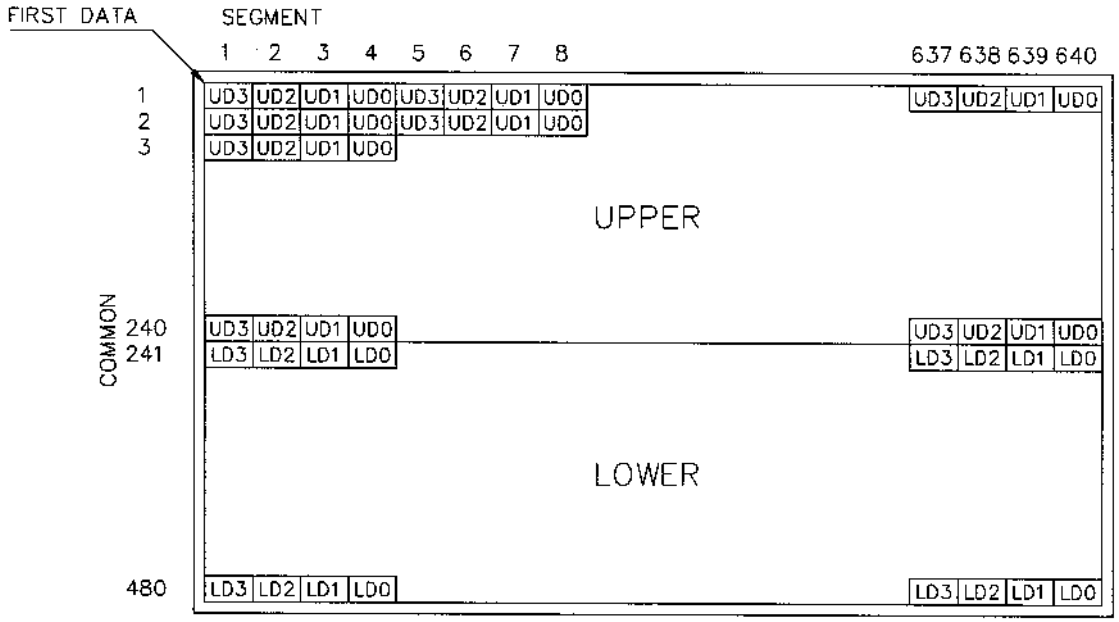


The missing pixels may occur when the LCM is driven beyond above power interface timing sequence.

DISPLAY PATTERM



1.1 MEANS 1ST COMMON 1ST SEGMENT DOT



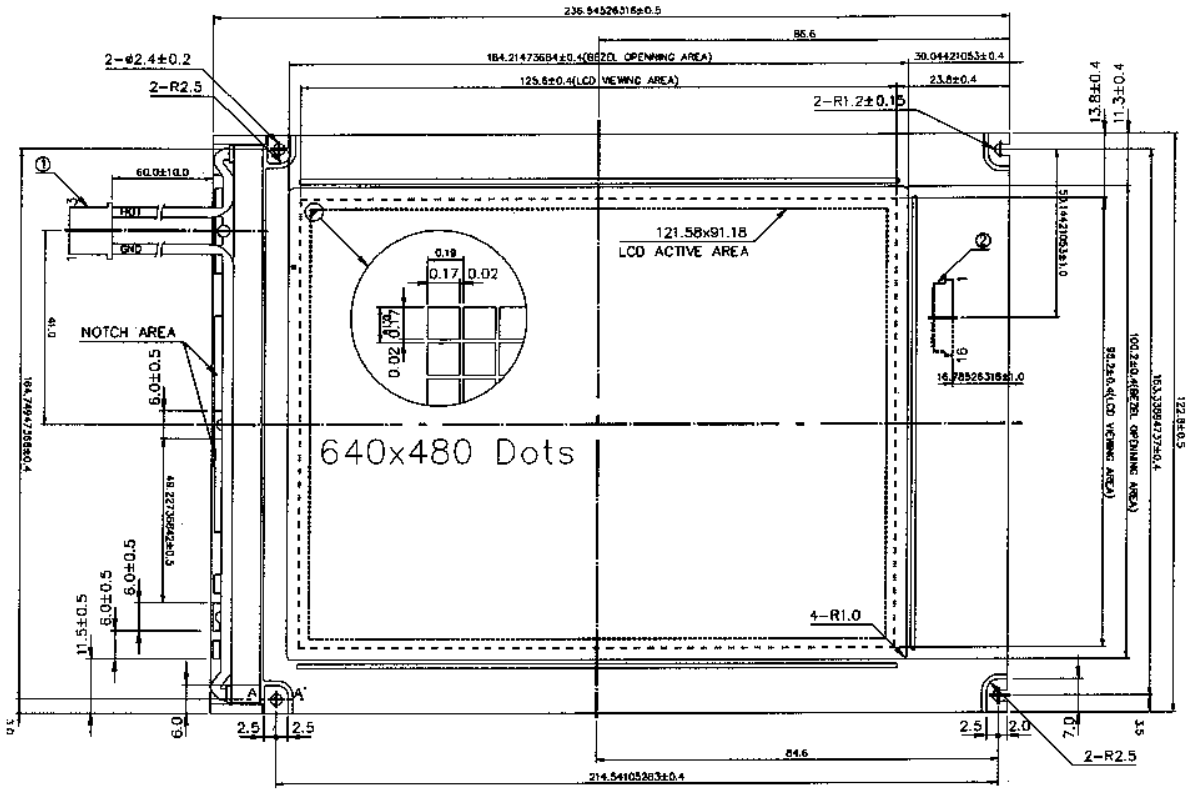
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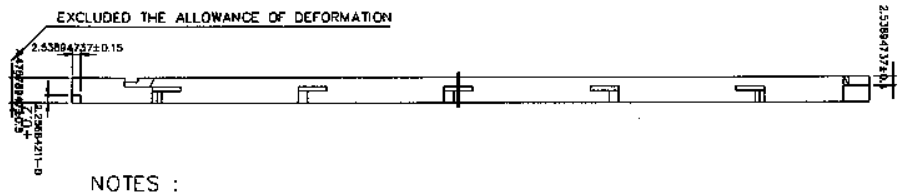
RELIABILITY TEST

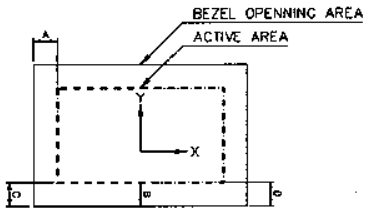
NO	ITEM	CONDITION			STANDARD	NOTE
1	High Temp. Storage	70°C	120HR		Appearance without defect	
2	Low Temp. Storage	−25°C	120HR		Appearance without defect	
3	High Temp. & High Humi. Storage	40°C 90%RH	120HR		Appearance without defect	
4	Thermal Shock	−20°C,30min→25°C.5min →60°C,30min→25°C.5min (1cycle)			Appearance without defect	5 cycles

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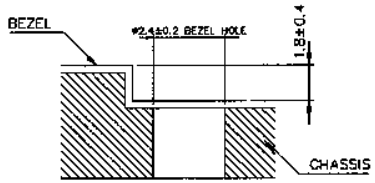






1)TOLERANCE X-direction A : 4.51±0.8
2)TOLERANCE Y-direction B : 4.51±0.8
3)OBLIQUITY of DISPLAY AREA (C-D)<0.8

BEZEL/DISPLAY POSITION



A-A' SECTION

NOTES :

1. RESOLUTION : 640 X 480 DOTS
2. TOLERANCE NO SPECIFIED: ±0.5mm
3. ① CCFT CONNECTOR : BHR-03VS-1 (JST) OR COMPATIABLE
   ② INTERFACE CONNECTOR : FH12A-16S-0.5SH (HIROSE) OR COMPATIABLE
4. 顯示保證區域為LCD VIEWING AREA (125.6x95.2) 內, LCD VIEWING AREA與 BEZEL OPENNING AREA 之間為框膠區域,當模組顯示時,LCD VIEWING AREA (125.6x95.2) 外之框膠區域露出被看到為可接受之顯示品質