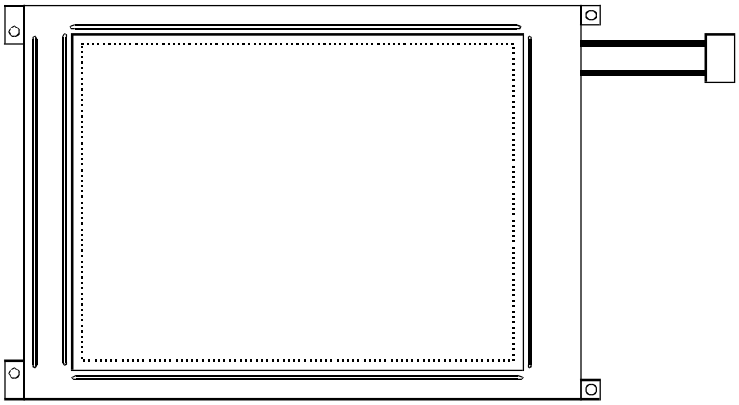
HANTRONIX

PRODUCT SPECIFICATION

HDM6448-1

640 x 480 GRAPHICS
LCD DISPLAY MODULE



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MECHANICAL DATA

(1) Product No.		HDM6448-1
(2) Module Size		260.0 (W)mm x 174.0 (H)mm x MAX8.0 (D)mm
(3) Dot Size		0.27 (W)mm x 0.27 (H)mm
(4) Dot Pitch		0.30 (W)mm x 0.30 (H)mm
(5) Number of Dots		640 (W) x 480 (H)Dots
(7) Duty		1/240
(8) LCD Display Mode	STN:	☐ Bule Mode
	FSTN:	☐ Black and White(Normally White/Positive Image)
		☐ Black and White(Normally Black/Negative Image)
	Rear Polarizer:	☐ Reflective ☐ Transflective ☐ Transmissive
		☐ Transflective (High Transmissive)
(9) Viewing Direction		☐ 6 O'clock ☐ 12 O'clock ☐____O'clock
(10) Backlight		☐ CCFL
(11) Weight		W/O B/L: about 348 g CCFL B/L: about 353.5 g

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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	
Input Voltage	VDD-VEE	0	27	V	
Static Electricity	-	-	-	-	Note 1

Note 1 LCM should be grounded during handling LCM.

(2) ENVIRONMENTAL ABSOLUTE MAXIMUM RATINGS

ITEM	NORMAL TEMP.			
	OPERATING		STORAGE	
	MIN.	MAX.	MIN.	MAX.
Ambient Temperature	0	50	-25	60
Humidity (Without Condensation)	Note 2,4		Note 3,4	
Vibration(Note ※)	-		49m/s² (5G)	

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 -25°C will be < 48 hrs, at 60°C will be < 120 hrs

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

Note※

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

ELECTRICAL CHARACTERISTICS

ITEM	SYMBOL	CONDITION		MIN.	TYP.	MAX.	UNIT
Power Supply for Logic	VDD-VSS	-		2.7	3.0	3.3	V
				4.75	5.0	5.25	
Input Voltage	VIL	L level		0	-	0.2VDD	V
	VIH	H level		0.8VDD	-	VDD	V
LCM Recommand LCD Module Driving Voltage	VDD-VEE	VDD=5V Duty=1/240 Bias=1/13	0°C	23.4	23.8	24.2	V
			25°C	22.2	22.6	23.0	
			50°C	20.9	21.3	21.7	
Power Supply Current for LCM	IDD	VDD=5.0V VDD-VEE=22.6V FLM=70Hz		-	30	-	mA
	IEE			-	20	-	
Power Supply Current for CCFL B.L.	ICCFL	450 Vrms 30KHz		-	5	-	mA

OPTICAL CHARACTERISTICS

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.
R	J	–	–	–	5.5	–	–	–	50	–	30
S	J	–	–	–	5.0	–	–	–	45	–	28
T	E	–	–	–	3.5	–	–	–	45	–	26
	G	–	6.5	–	8.0	–	4.5	–	40	–	55
NOTE		NOTE6						NOTE5			

NOTE :

R: REFLECTIVE
S: TRANSFLECTIVE(Normal)
T: TRANSMISSIVE

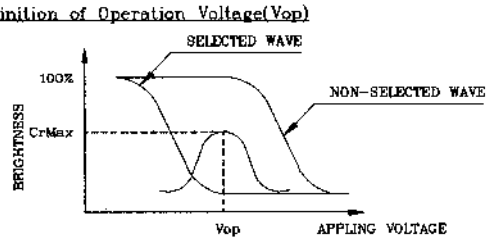
E: BLUE
G: NORMALLY BLACK
J: NORMALLY WHITE

AT ϕ=0° θ=0°

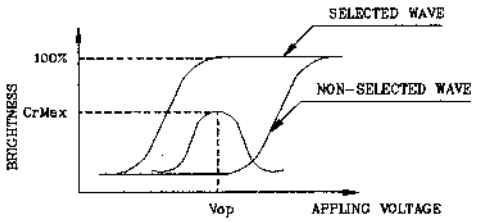
ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Response Time (rise)	Tr	0℃	–	340	680	ms	NOTE 2
		25℃	–	120	240		
		50℃	–	90	180		
Response Time (fall)	Tr	0℃	–	370	710	ms	NOTE 2
		25℃	–	170	290		
		50℃	–	80	170		

(NOTE 1)

Definition of Operation Voltage(Vop)



(positive type)



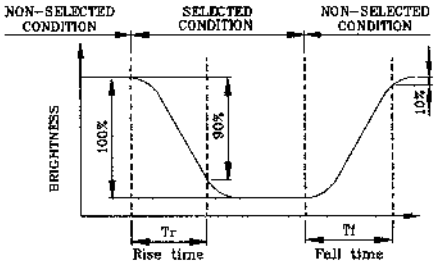
(negative type)

*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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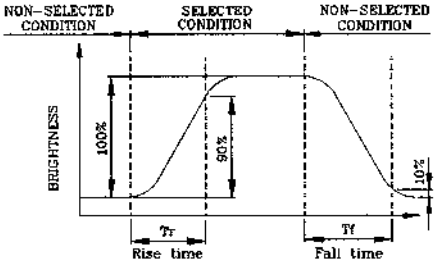


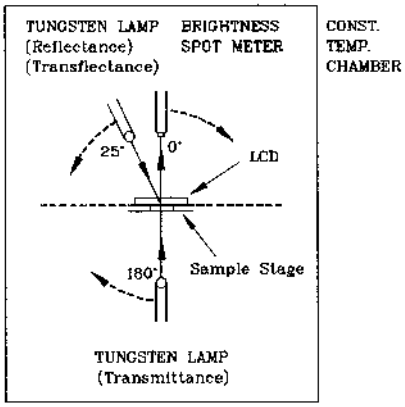
(negative type)

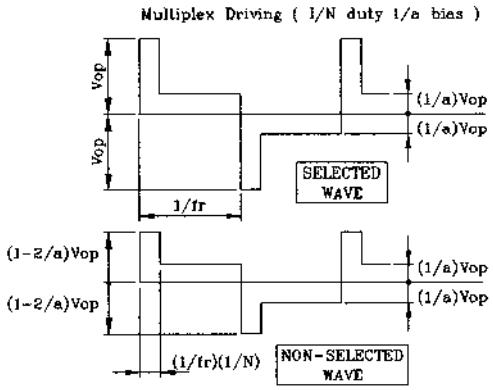
*Conditions

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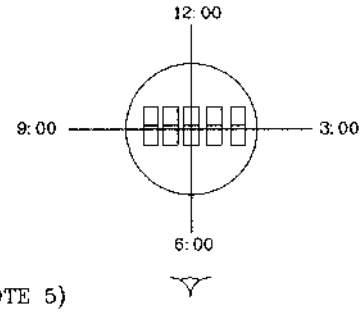
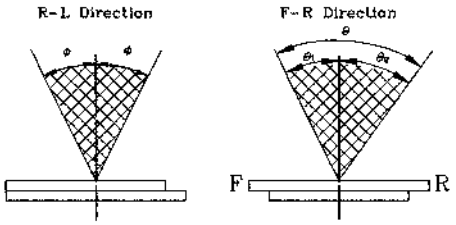
(NOTE 4)

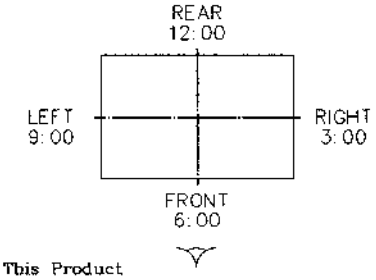
Definition of Viewing Direction



(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

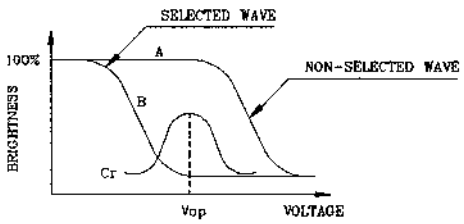
Frame Frequency : 70Hz

Appling Waveform : 1/N duty 1/a bias

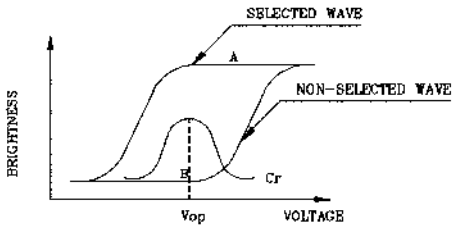
Contrast Ratio : larger than 2

(NOTE 6)

Definition of Contrast Ratio (Cr)



(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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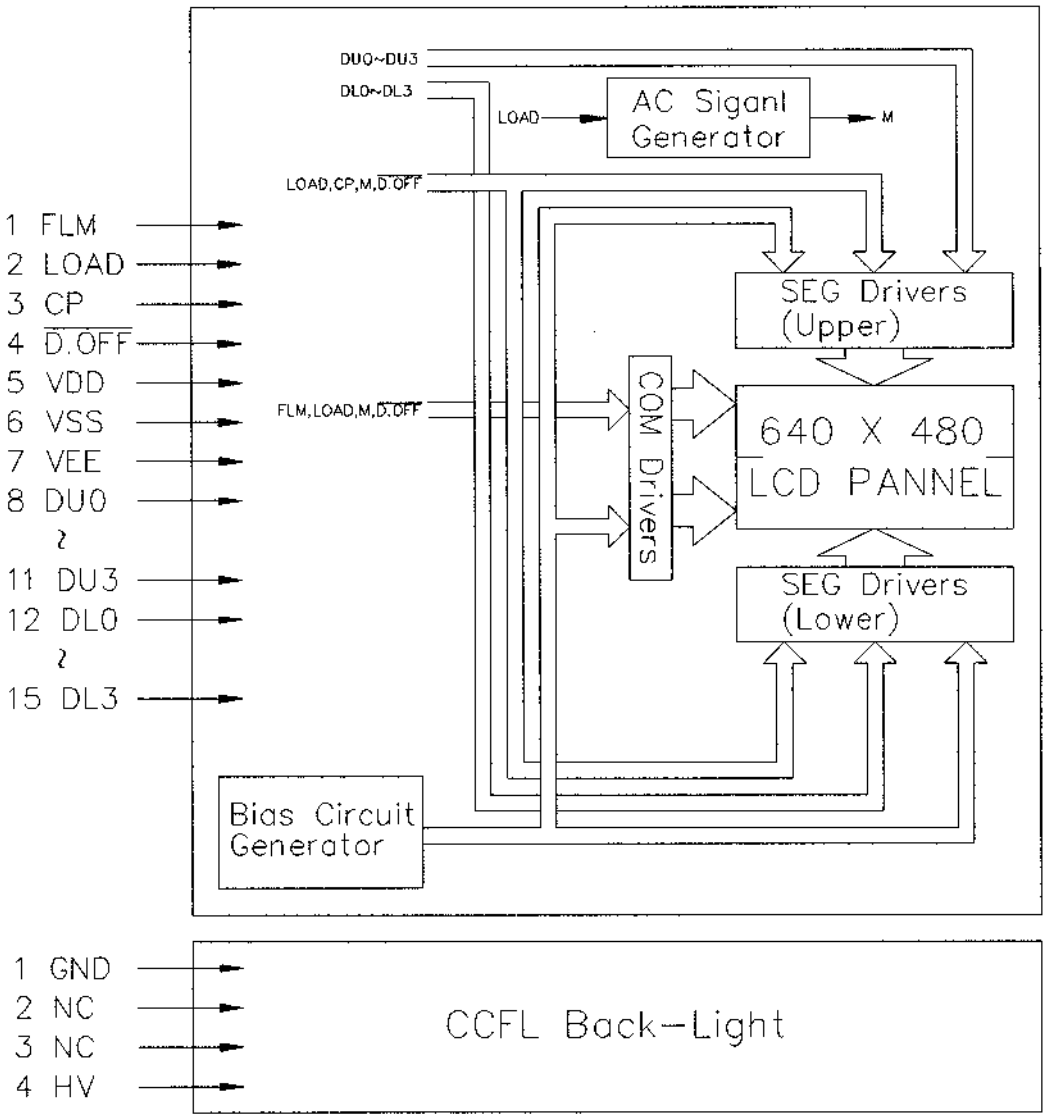
BLOCK DIAGRAM



* AC Signal Setting

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

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INTERNAL PIN CONNECTION

LCD

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

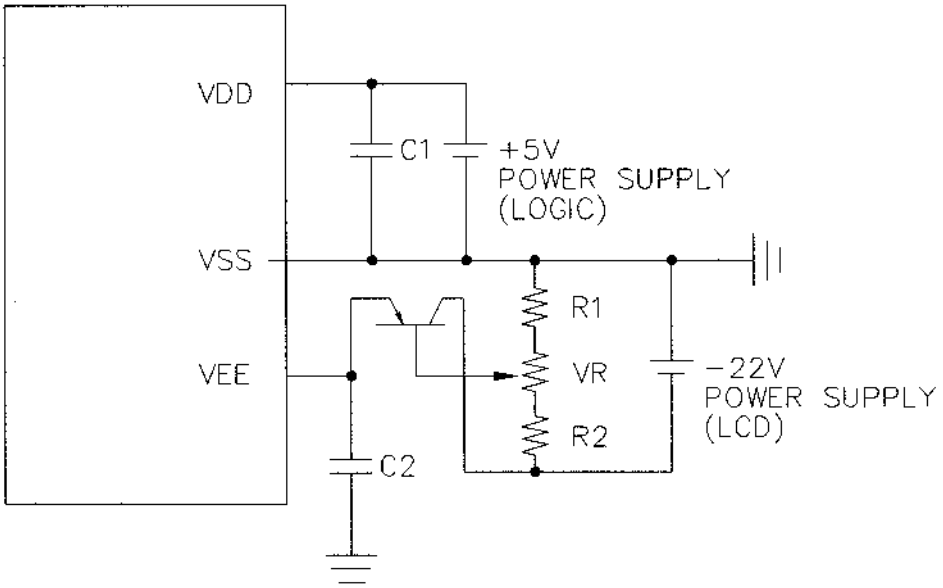
CCFT

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)
Mating connector : 51021-1500 (MOLEX)

CCFT
Used connector : M63M83-04 (MITSUMI)
Mating connector : M60-04-30-114P (MITSUMI)
M60-04-30-134P (MITSUMI)
M61M73-04 (MITSUMI)

POWER SUPPLY



1. R1 + VR + R2 = 10K ~ 20KΩ
2. C1, C2 : 10μF

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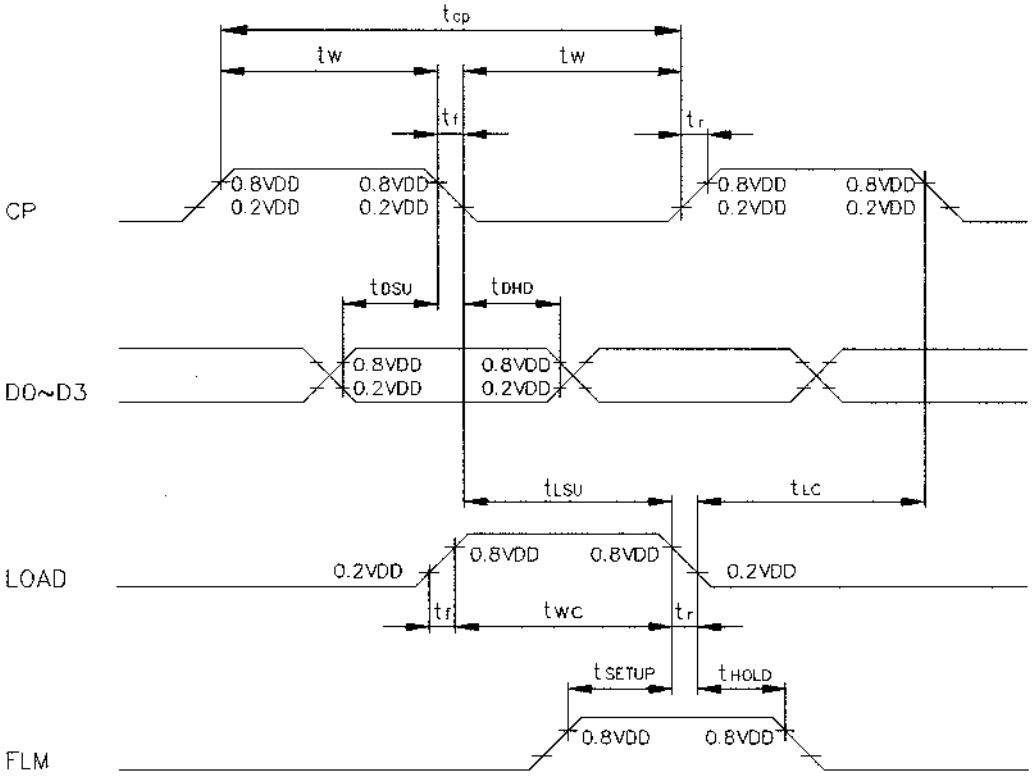
TIMING CHARACTERISTICS

@VDD=2.5~5.5V

ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT
Shift Clock Period	t_{cp}	152	–	–	ns
"CP" PULSE WIDTH	t_w	65	–	–	ns
CLOCK RISE, FALL TIME	t_r , t_f	–	–	50	ns
DATA SETUP TIME	t_{DSU}	50	–	–	ns
DATA HOLD TIME	t_{DHD}	40	–	–	ns
"CP"→"LOAD" FALL TIME	t_{LSU}	65	–	–	ns
"LOAD"→"CP" FALL TIME	t_{LC}	65	–	–	ns
"FLM" SETUP TIME	t_{SETUP}	100	–	–	ns
"FLM" HOLD TIME	t_{HOLD}	100	–	–	ns
"LOAD" PULSE WIDTH	t_{WC}	65	–	–	ns



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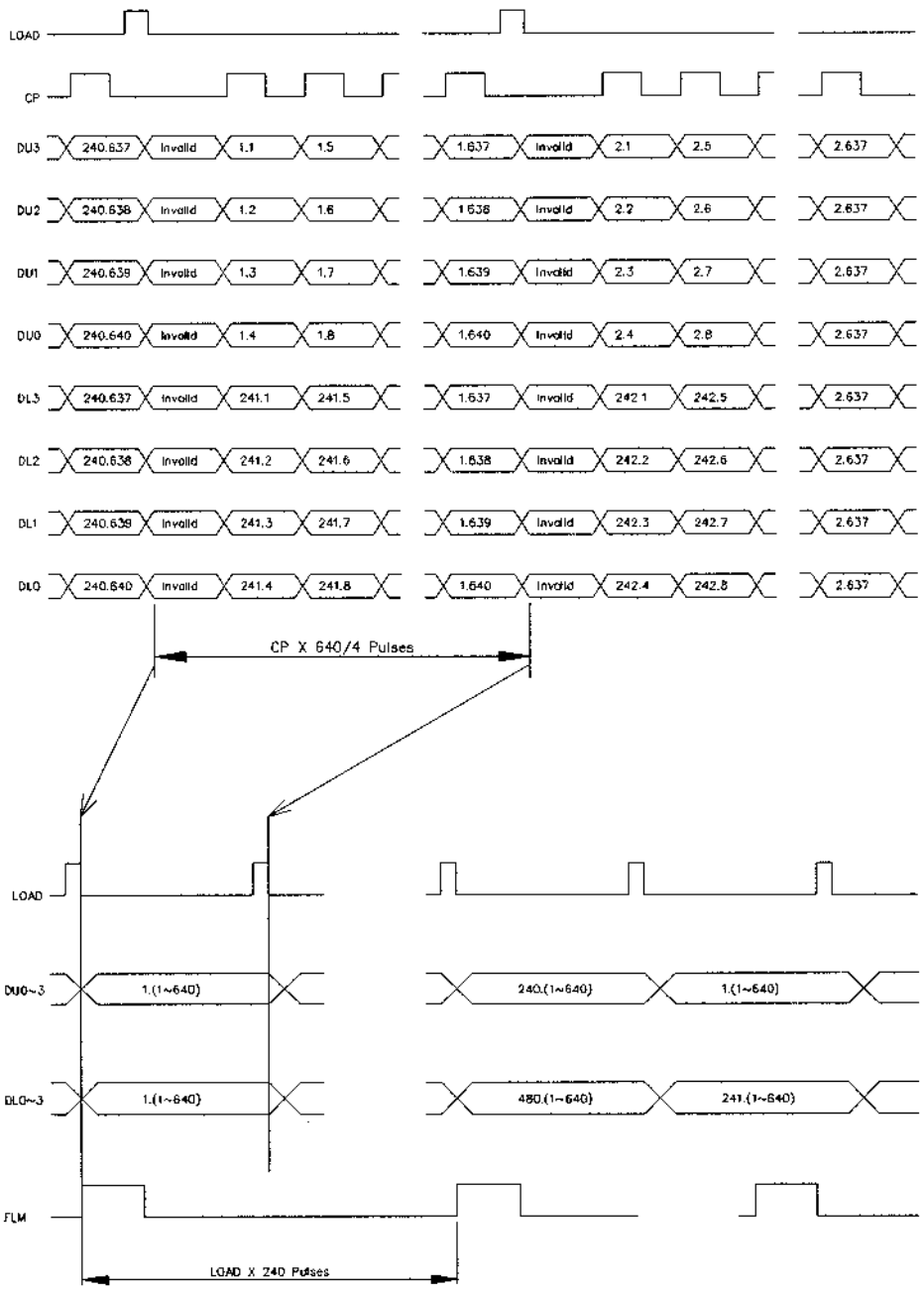
TIMING TIMING



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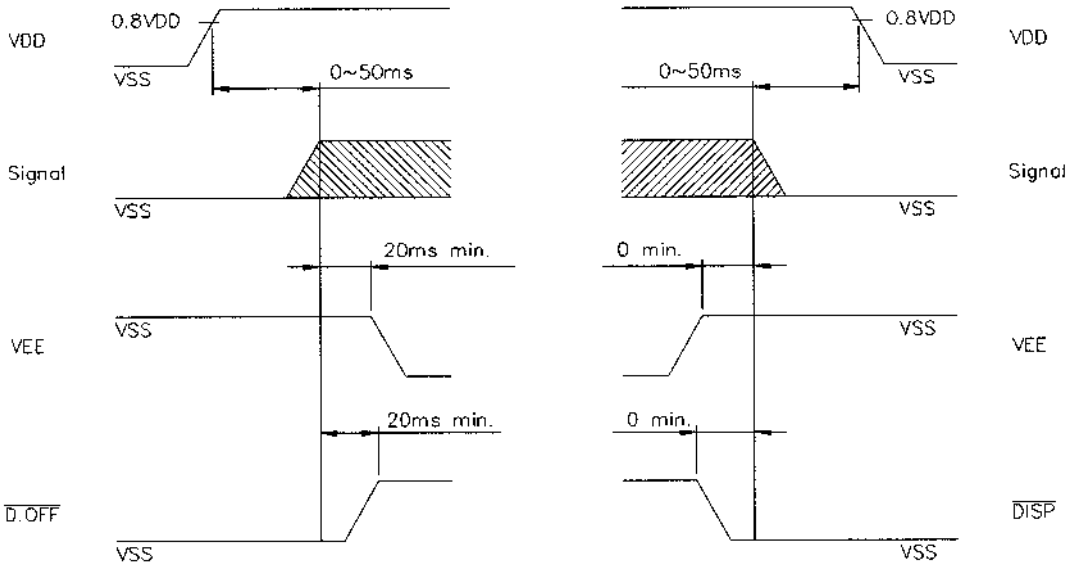
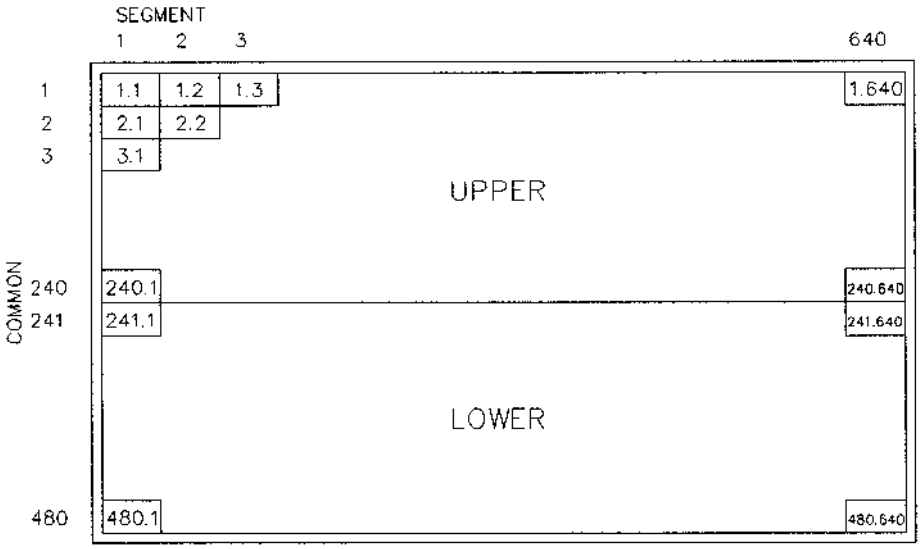
POWER ON/OFF TIMING

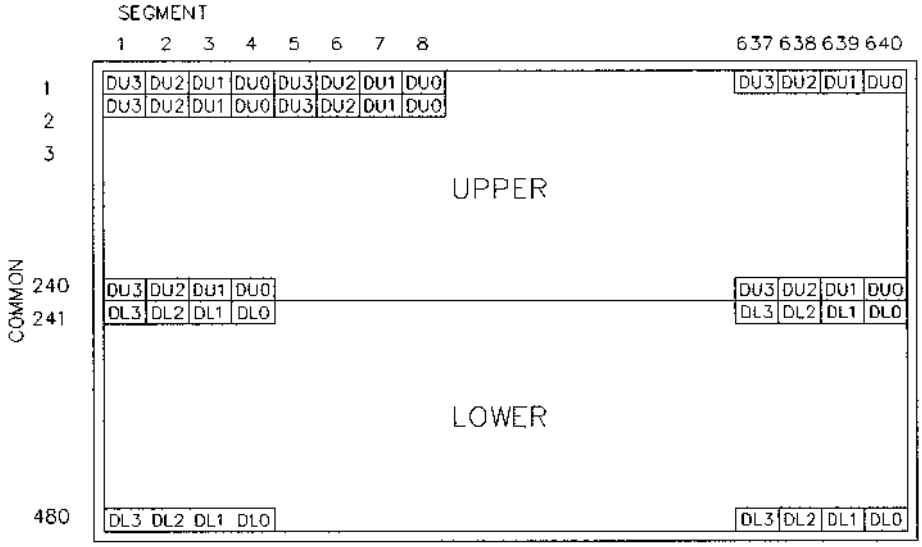


The missing pixels may occur when the LCM is driven beyond above power interface timing sequence.

DISPLAY PATTERM



NOTE : 1.1 MEANS 1ST COMMON 1ST SEGMENT DOT



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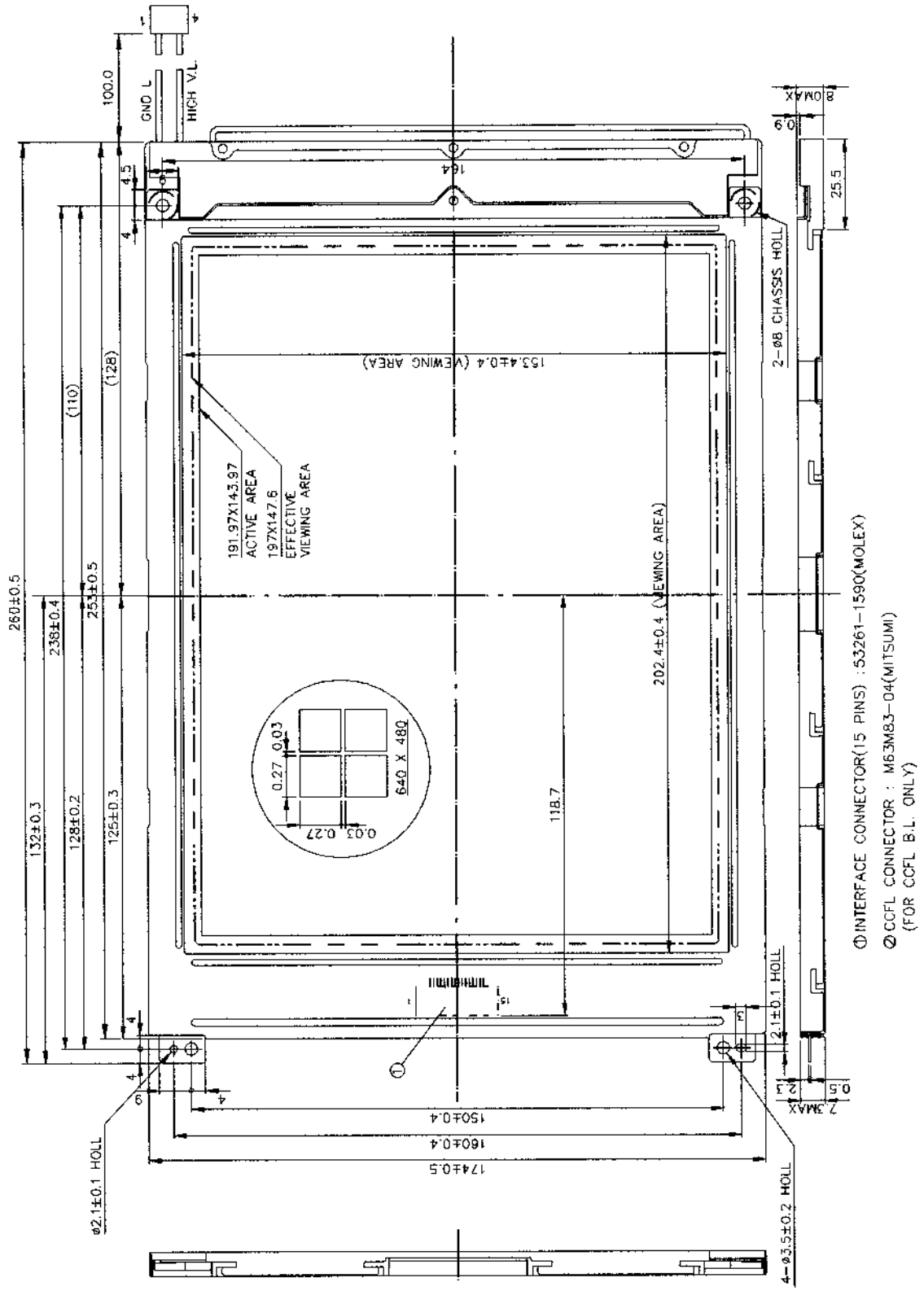

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