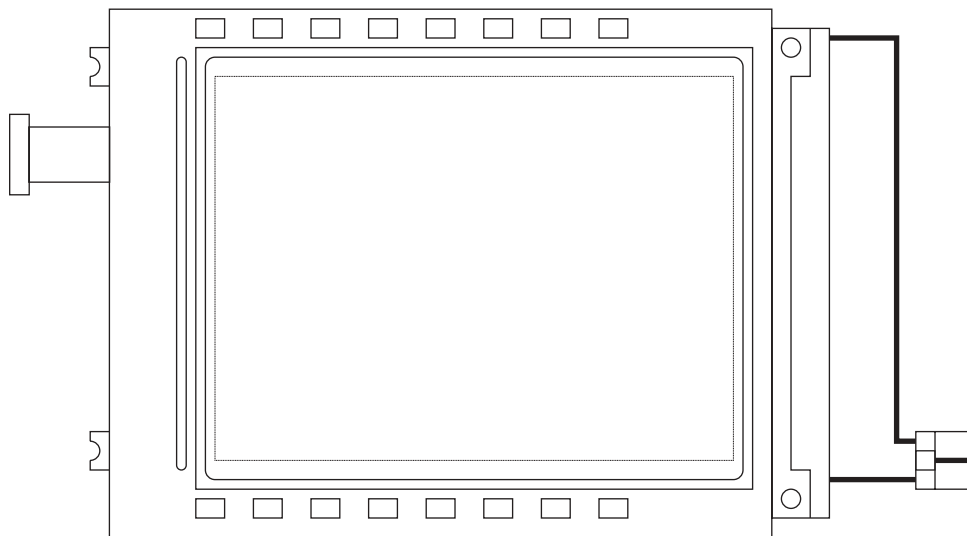




PRODUCT SPECIFICATION

HDM6448-S

640 x 480 7.4" GRAPHICS
LCD DISPLAY MODULE



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1. MECHANICAL DATA

(1) Product No.	HDM6448-S
(2) Module Size	205.5 (W)mm x 141.0 (H)mm x 7.0 MAX (D)mm
(3) Dot Size	0.21 (W)mm x 0.21 (H)mm
(4) Dot Pitch	0.23 (W)mm x 0.23 (H)mm
(5) Number of Dots	640 (W) x 480 (H)Dots
(7) Duty	1/240
(8) LCD Display Mode	FSTN: Black and White(Normally Black/Negative Image) Rear Polarizer: Transmissive
(9) Viewing Direction	6 O'clock
(10) Backlight	CCFL
(11) Controller	Excluded
(12) DC/DC Converter	Excluded
(13) Weight	310 g(approx.)
(14) Used Driver IC (Voltage for LC drive)	Positive Voltage

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

(2) ENVIRONMENTAL ABSOLUTE MAXIMUM RATINGS

ITEM	OPERATING		STORAGE	
	MIN.	MAX.	MIN.	MAX.
Ambient Temperature	0	50	-20	70
Humidity (Without Condensation)	Note 2,4		Note 3,4	
Vibration(Note 5)	-		49m/s ² (5G)	

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 < 48 hrs, at 70°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

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3. ELECTRICAL CHARACTERISTICS

3-1. ELECTRICAL CHARACTERISTICS OF LCD

ITEM		SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	
Power Supply for Logic		VDD-VSS	-	3.0	3.3	3.6	V	
				4.75	5.0	5.25		
Input Voltage		VIL	L level	VSS	0.2VDD	-	V	
		VIH	H level	0.8VDD	VDD	-	V	
LCM Recommend LCD Module Driving Voltage		VEE-VSS	VDD=5.0V Bias=1/13	0°C	23.0	23.4	23.8	V
				25°C	21.3	22.7	23.1	
				50°C	20.5	20.9	21.3	
Power Supply Current for LCM		IDD	VDD=5.0V VEE-VSS=22.7V FLM=70Hz PATTERN : ■ □ ■ □ □ ■ □ ■	-	2.0	4.0	mA	
		IEE		-	6.8	13.0		
LCM	Surface Luminance	Ls	Vin=10.4V IL=5mA ◎CXA-L10L (TDK)	PATTERN: (Dots All On) ■ ■ ■ ■ ■ ■ ■ ■	-	85.5	-	cd/m ²
				PATTERN: (Dots All Off) □ □ □ □ □ □ □ □	-	13.3	-	
LCM	Surface Uniformity	U	Vin=10.4V IL=5mA ◎CXA-L10L (TDK)	PATTERN: (Dots All On) ■ ■ ■ ■ ■ ■ ■ ■	80	85	-	%

3-2.ELECTRICAL CHARACTERISTICS OF BACKLIGHT

Used lamp : Rating

Ta=25°C

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	REMARK
Open Voltage	V _{OPEN}	600	-	-	Vrms	-
Lamp Voltage	V _L	-	350	-	Vrms	-
Lamp current	I _L	4	5	6	mArms	(*1)
Lamp power consumption	P _L	-	1.75	-	W	(*2)
Lamp frequency	F _L	-	35	-	KHz	-
Lamp life time	L _L	-	20000	-	hrs	(*3)

(*1) It is recommended that I_L be not more than 6 mArms so that heat radiation of CCFT backlight may least affect the display quality .

(*2) Power consumption excluded inverter loss .

(*3) The life is defined by the time when the brightness gets down to 50% of the initial brightness.

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4.OPTICAL CHARACTERISTICS

AT Vop

ITEM		Cr(Contrast Ratio)		θ (Viewing Angle)		ϕ (Viewing Angle)	
		25 τ		25 τ		25 τ	
		MIN.	TYP.	MIN.	TYP.	MIN.	TYP.
T	G	-	8.0	-	80	-	± 50
NOTE		NOTE 6		NOTE 5			

NOTE :

T: TRANSMISSIVE

G: NORMALLY BLACK, 6 O'clock

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

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

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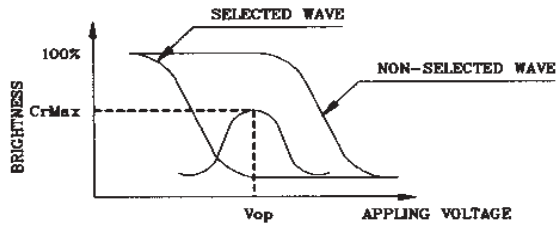
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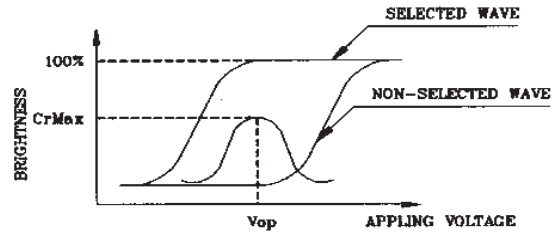
DATE: 10/17/02

(NOTE 1)

Definition of Operation Voltage(Vop)



(positive type)



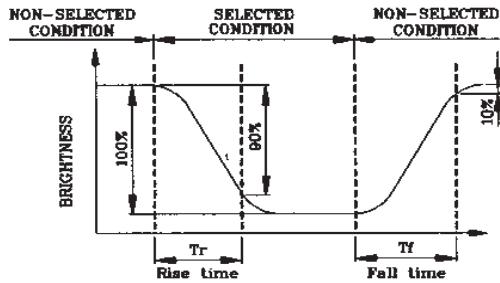
(negative type)

*Conditions

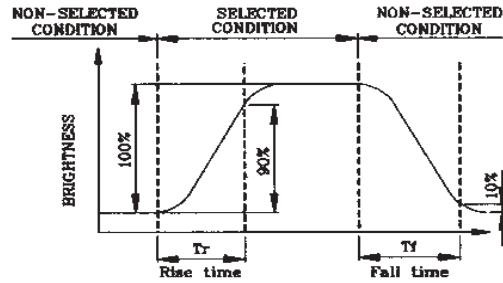
Viewing Angle : 0
 Frame Frequency : 70Hz
 Applying Waveform : 1/N duty 1/a bias

(NOTE 2)

Definition of Response Time(Tr,Tf)



(positive type)



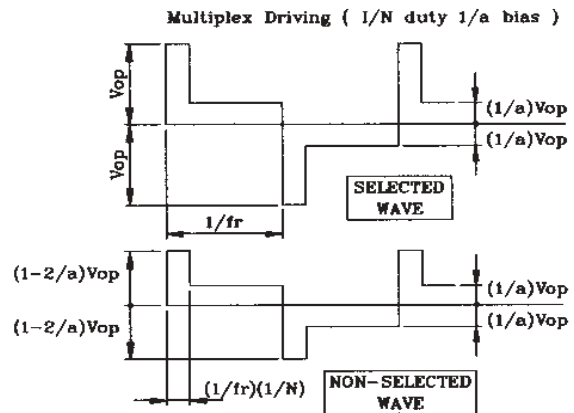
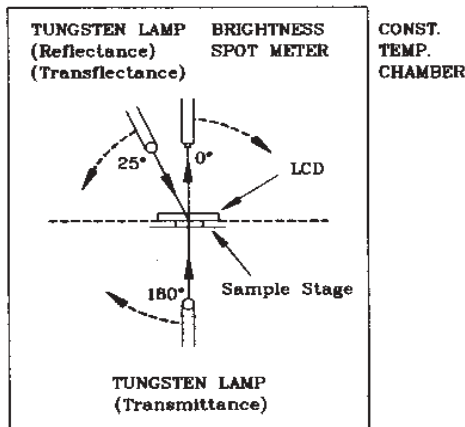
(negative type)

*Conditions

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

(NOTE 3)

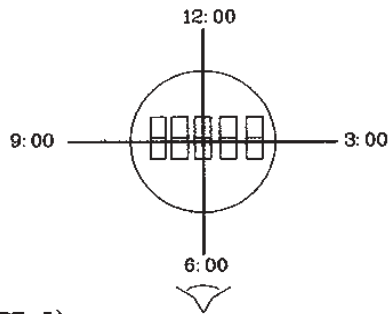
Description of Measuring Equipment and Driving Waveforms



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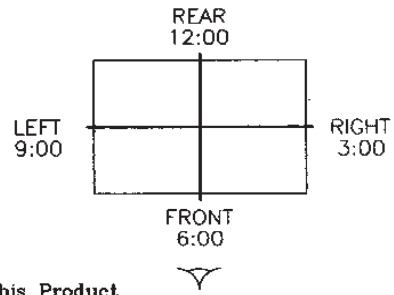
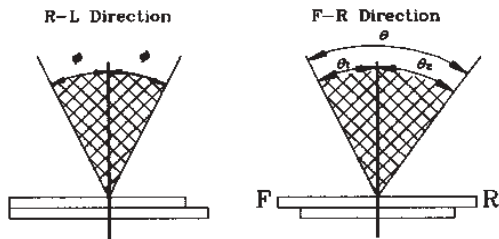
(NOTE 4)

Definition of Viewing Direction



(NOTE 5)

Definition of Viewing Angle



*For This Product
The Viewing Direction Is 6 O'clock
So $\theta_1 > \theta_2$

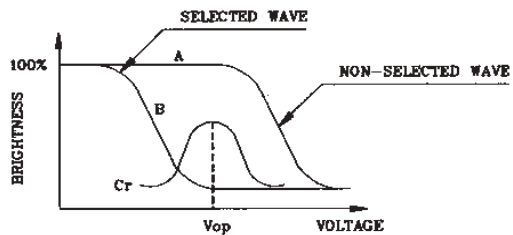
$$\theta = \theta_1 + \theta_2$$

*Conditions

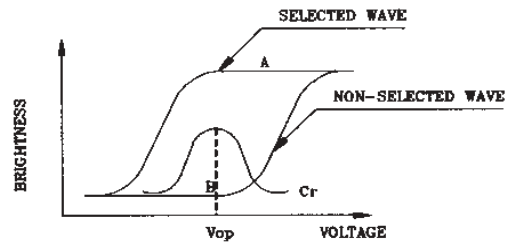
Operating Voltage : V_{op}
Frame Frequency : 70Hz
Applying Waveform : 1/N duty 1/a bias
Contrast Ratio : larger than 2

(NOTE 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

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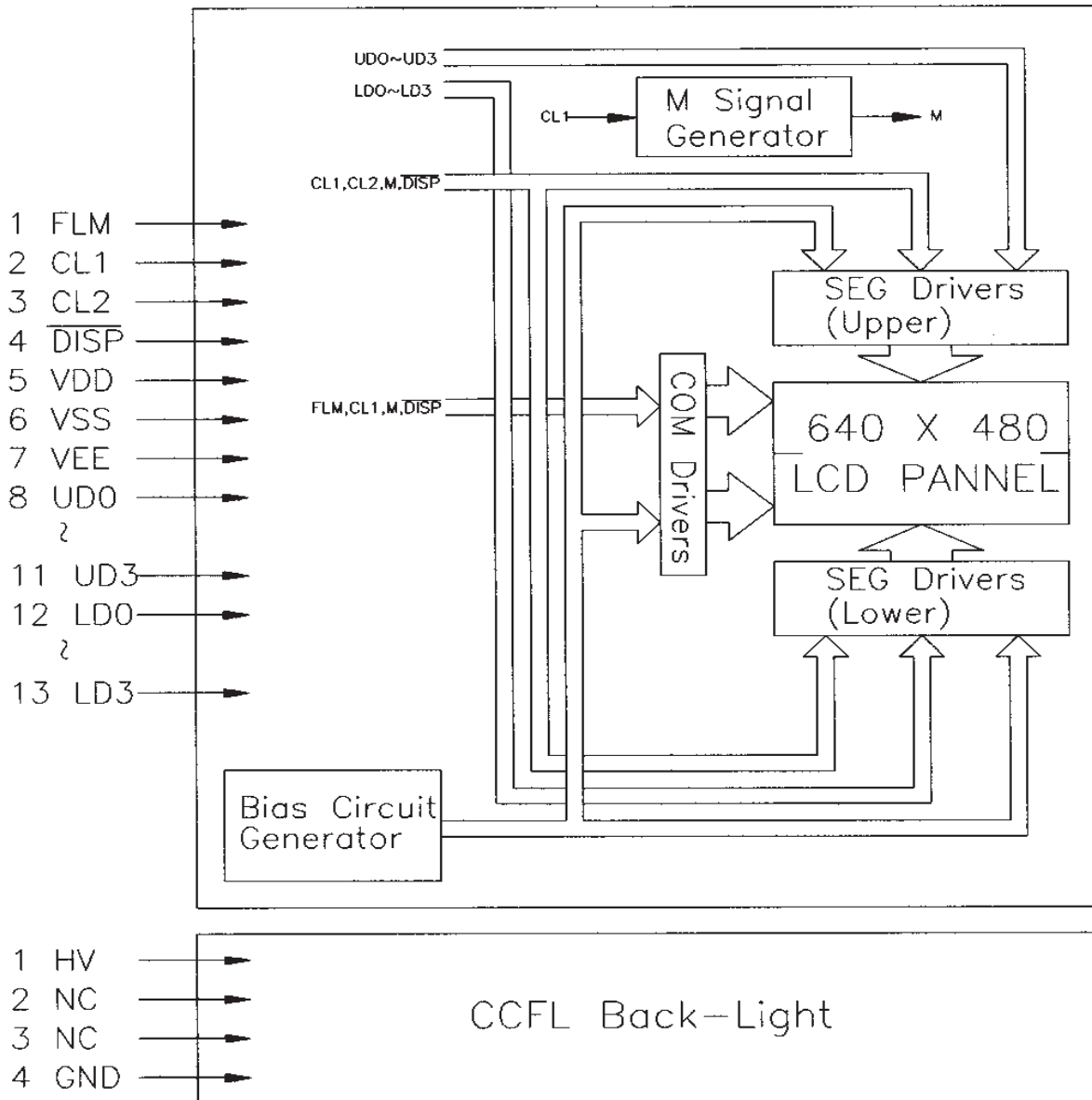
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5. BLOCK DIAGRAM



* M Signal Value Setting

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

6. INTERNAL PIN CONNECTION

LCD

Pin No.	Symbol	Level	Function
1	FLM	H/L	SCAN START-UP SIGNAL
2	CL1	H→L	DATA LATCH PULSE
3	CL2	H→L	DATA SHIFT PULSE
4	DISP	H/L	DISPLAY OFF ("H"=ON,"L"=OFF)
5	VDD	-	POWER SUPPLY FOR LOGIC (+3.3V/+5V)
6	VSS	-	SIGNAL GROUND (GND)
7	VEE	-	POWER SUPPLY FOR LCD (+V)
8	UD0	H/L	DISPLAY DATA (UPPER HALF)
9	UD1		
10	UD2		
11	UD3		
12	LD0	H/L	DISPLAY DATA (LOWER HALF)
13	LD1		
14	LD2		
15	LD3		

CCFL

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

LCD

Used connector : MOLEX 53261-1590

Mating connector : MOLEX 51021-1500(HOUSING) X 1 +
MOLEX 50058-8000(TERMINAL) X 15 or Compatible

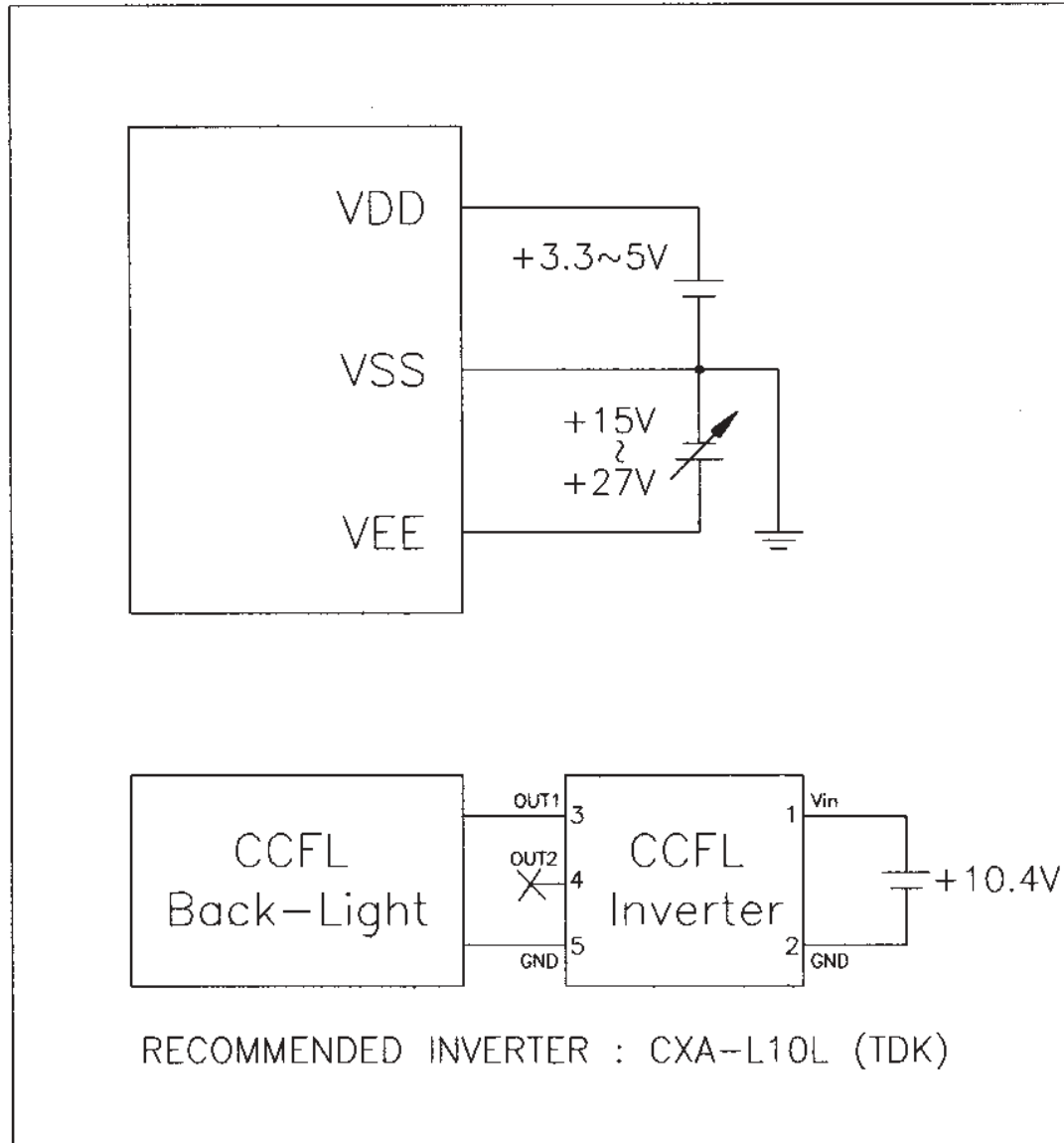
CCFL

Used connector : M63M83-04 (MITSUMI)

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

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7. POWER SUPPLY



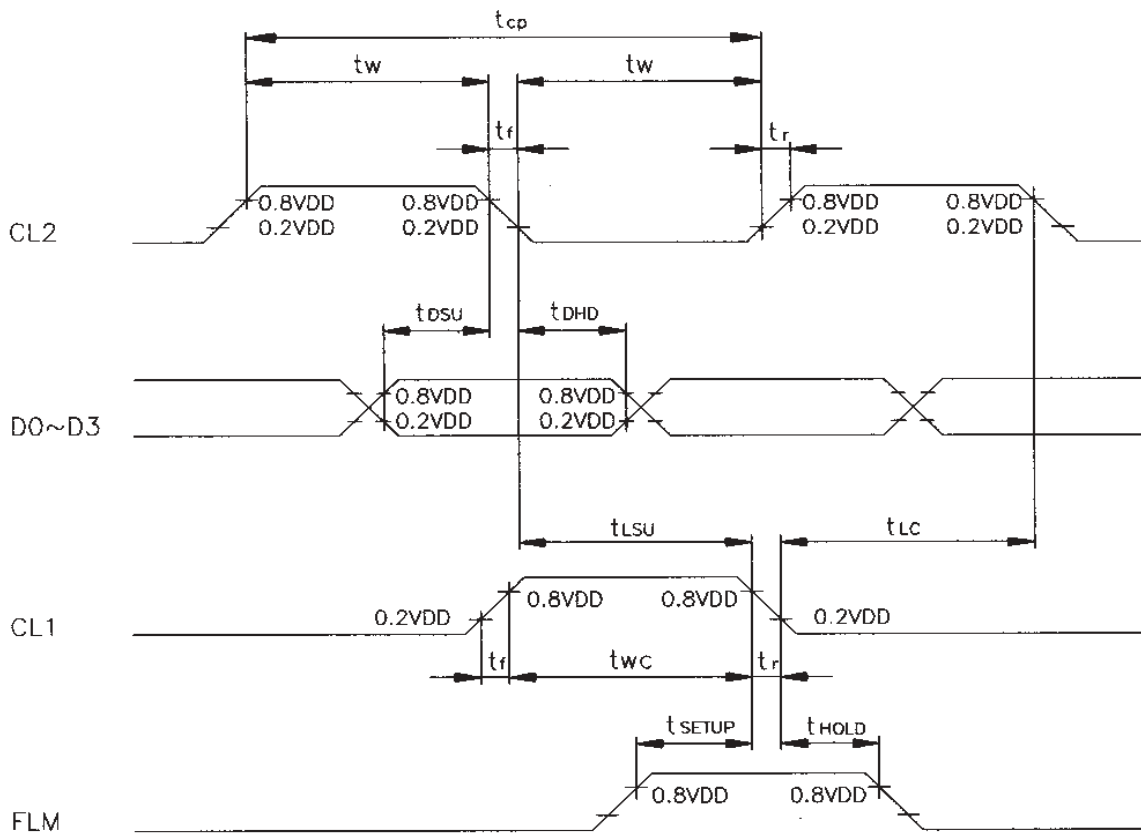
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8. TIMING CHARACTERISTICS

8-1. INTERFACE TIMING

@VDD=2.5~5.5V

ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT
Shift Clock Period	t_{cp}	152	-	-	ns
"CL2" 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
"CL2" → "CL1" FALL TIME	t_{lsu}	65	-	-	ns
"CL1" → "CL2" FALL TIME	t_{lc}	65	-	-	ns
"FLM" SETUP TIME	t_{setup}	100	-	-	ns
"FLM" HOLD TIME	t_{hold}	100	-	-	ns
"CL1" PULSE WIDTH	t_{wc}	65	-	-	ns



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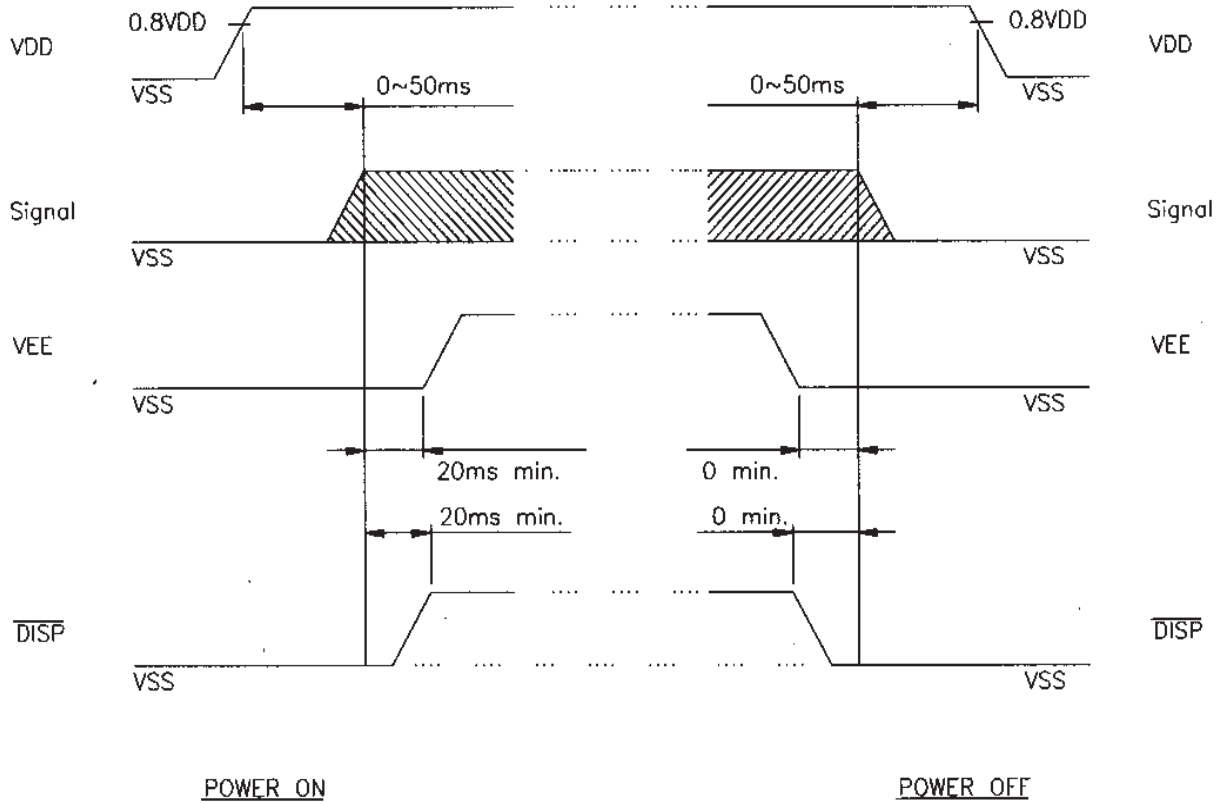
REV.:
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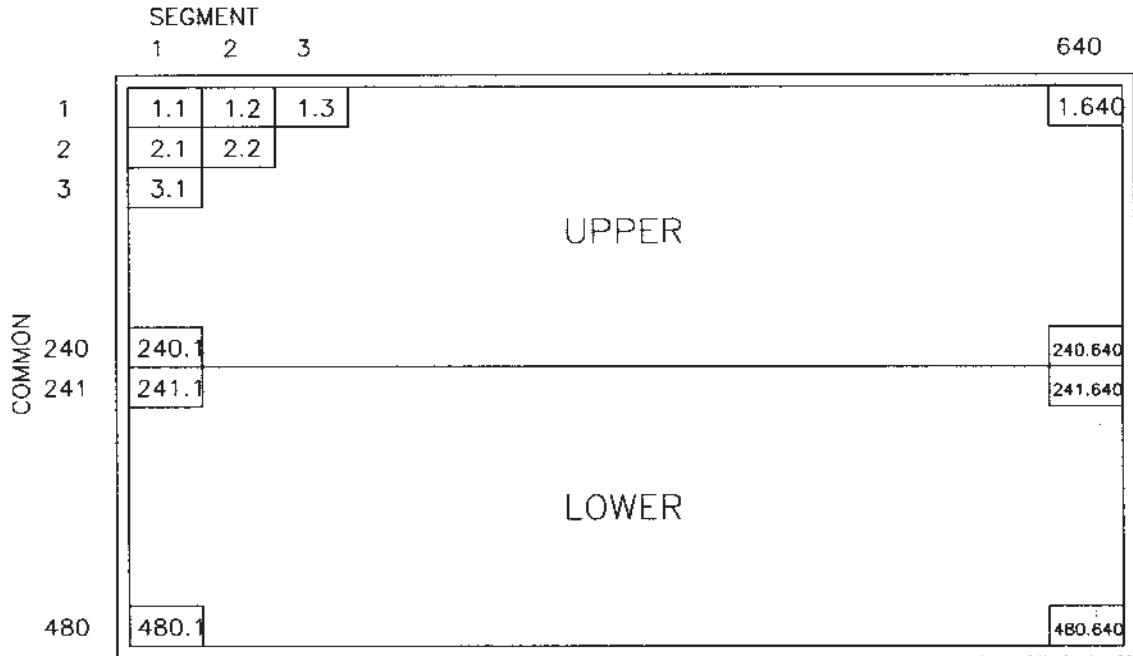
8-2. POWER ON/OFF TIMING



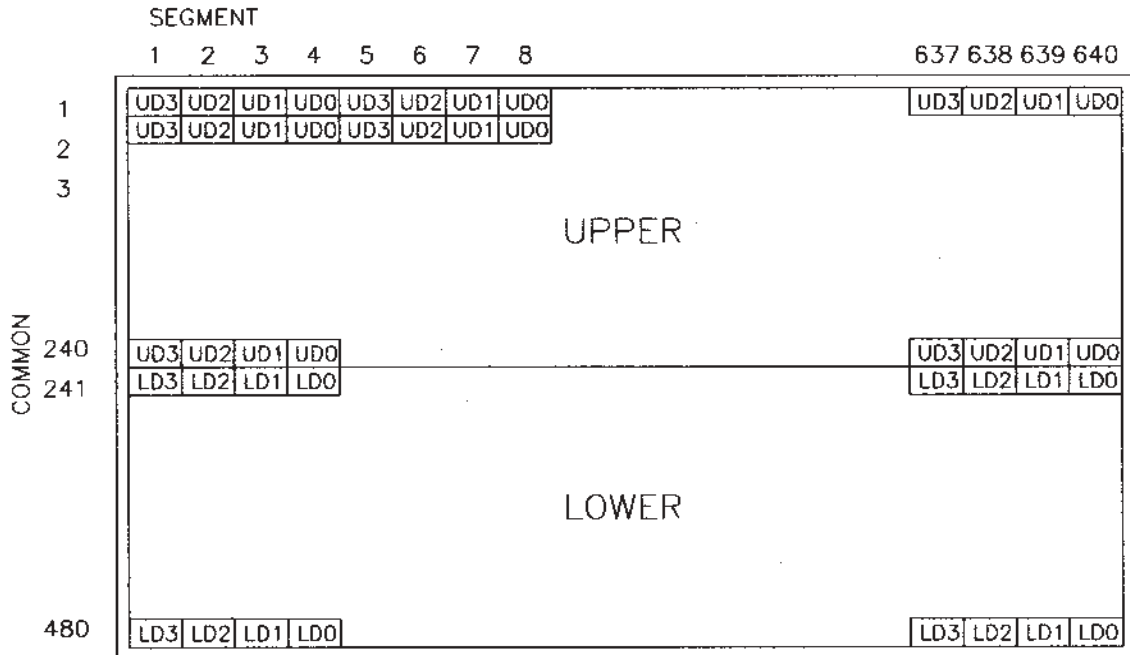
The missing pixels may occur when the LCM is driven beyond above power interface timing sequence.

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8-3.DISPLAY PATTERN



NOTE : 1.1 MEANS 1ST COMMON 1ST SEGMENT DOT



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

- 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 $25^{\circ}\text{C}\pm 5^{\circ}\text{C}$ 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 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.

- THE OPERATING LIFE TIME OF BACK LIGHT

CCFT : 20,000HR

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