

液晶之友 电话: 020-33819057

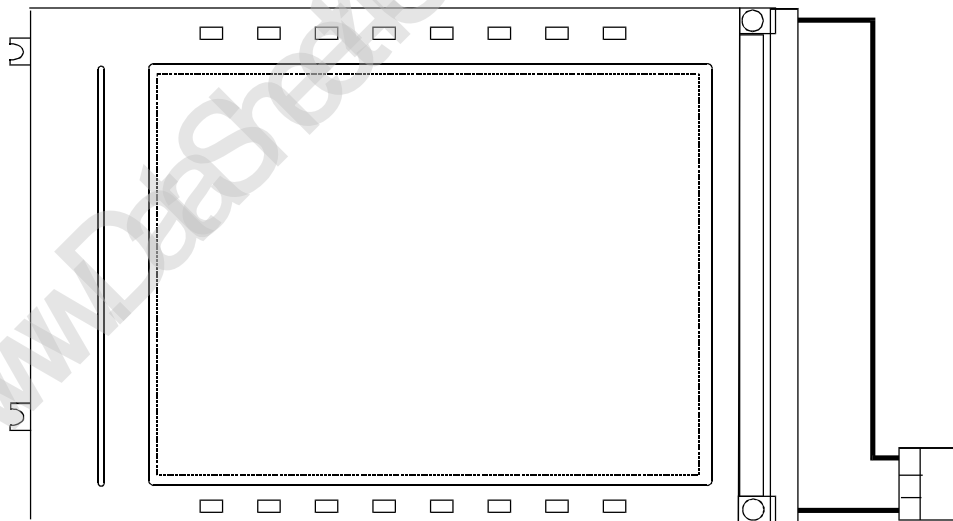
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HANTRONIX

PRODUCT SPECIFICATION

HDM6448SC

640x480 COLOR GRAPHICS
LCD DISPLAY MODULE



HANTRONIX, INC.
10080 BUBB RD.
CUPERTINO, CA 95014

Q.A.:

JB

REV.:

1.0

HDM6448SC

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DATE:

9/24/98

MECHANICAL DATA

(1) Product No.	7.4 INCH COLOR
(2) Module Size	205.5 MAX(W)mm x 141.0 (H)mm x MAX 7.0 (D)mm
(3) Dot Size	0.053 (W)mm x 0.21 (H)mm
(4) Dot Pitch	0.078 (W)mm x 0.235 (H)mm
(5) Number of Dots	640 (W)xRGB x 480 (H)DOTS
(6) Duty	1/240
(7) LCD	F--STN/Black and White(Normal Black/Negative Image) /Color Transmissive Type
(8) Viewing Direction	6 O'clock
(9) Backlight	CCFL
(10) Controller	Excluded
(11) DC/DC Converter	Excluded
(12) Weight	310 g(approx.)
(13) Recommended CCFT Inverter	TAD250 (TDK)

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ABSOLUTE MAXIMUM RATINGS

(1) ELECTRICAL ABSOLUTE RATINGS

VSS=0V

ITEM	SYMBOL	MIN	MAX	UNIT	COMMENT
Power Supply for Logic	VDD-VSS	-0.3	6.5	V	
Power Supply for LCD Drive	VEE-VSS	0	42.0	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	NORMAL TEMP.			
	OPERATING		STORAGE	
	MIN.	MAX.	MIN.	MAX.
Ambient Temperature	0	50	-20	70
Humidity (Without Condensation)	Note 1,3		Note 2,3	
Vibration	Note 4			

Note 1 $T_a \leq 50^\circ\text{C}$: 85%RH max

$T_a > 50^\circ\text{C}$: Absolute humidity must be lower
than the humidity of 85%RH at 50°C

Note 2 T_a at -20°C will be < 48 hrs, at 70°C will be < 120 hrs

Note 3 Background color changes slightly depending on ambient temperature.
This phenomenon is reversible.

Note 4

Frequency	5 Hz~13.95 Hz	13.95 Hz~33 Hz	33 Hz~51 Hz	51 Hz~500 Hz
Vibration Level	-	2X9.8 m/s ²	-	5x9.8 m/s ²
Vibration Width	0.2 inch	-	0.036 inch	-
Vibration Direction	X/Y/Z			
Vibration Time	20 min- 1cycle X 3 directions			

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ELECTRICAL CHARACTERISTICS

3.1 ELECTRICAL CHARACTERISTICS OF LCM

ITEM	SYMBOL	CONDITION		MIN.	TYP.	MAX.	UNIT
Logic Circuit Power Supply	VDD-VSS	T _a = 25°C		4.5	5.0	5.5	V
Input Voltage	V _{IH}	H level		0.8VDD	-	VDD	V
	V _{IL}	L level		0	-	0.2VDD	V
Recommended LCD Driving Voltage (Normal Temp. LCM)	VEE-VSS	Duty=1/240 Bios=1/13 VDD=5.0V	0°C	-	24.1	24.2	V
			25°C	23.3	23.5	23.6	
			50°C	22.6	22.8	23.0	
Supply Current for Logic	I _{DD}	VDD-VSS = 5.0V VEE-VSS = 23.5V T _a = 25°C		-	18.8	28.5	mA
Supply Current for LCD	I _{EE}			-	8.0	12.5	mA

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ELECTRICAL CHARACTERISTICS OF BACKLIGHT

Used lamp : Rating

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	REMARK
Lamp Voltage	V _L	-	535		V _{rms}	-
Lamp current	I _L	4	5	6	mArms	(*1)
Lamp power consumption	P _L	-	2.7	-	W	(*2)
Lamp frequency	F _L	-	35	-	kHz	
Starting voltage	V _s	-	-	600	V _{rms}	T _a = 25°C
Color Degree	X	0.27	0.29	0.31	-	
	Y	0.27	0.29	0.31		
Brightness	B	22000	-	-	cd/m ²	
Lamp life time	L _L	10000	-	-	hrs	

(*1) It is recommended that I_L be not more than 5.0 mArms so that heat radiation of CCFT backlight may least affect the display quality .

(*2) Power consumption excluded inverter loss .

LCM : Rating

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	REMARK
Surface Luminance	L	-	76	-	cd/m ²	
Luminance Uniformity	Lu	-	85	-	%	White

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INVERTER : TDK TAD250

3.3.1 GENERAL SPECIFICATIONS

3.3.1.1 OPERATION TEMPERATURE : 0°C~50°C

3.3.1.2 STORAGE TEMPERATURE : -20°C~80°C

3.3.1.3 DIMENSION : 95.0(L)mm x 19.5(W)mm x MAX 8.8(H)mm

3.3.2 INPUT CHARACTERISTICS

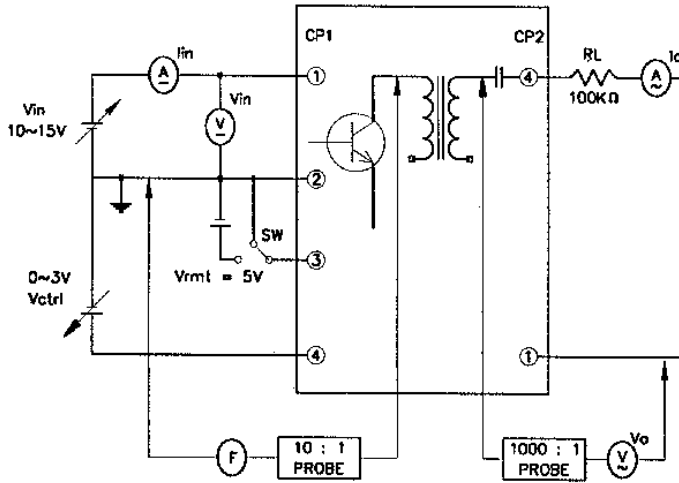
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	REMARKS
Input Voltage	V _{in}	10	12	15	V	
Input Current	I _{in}	-	450	550	mA	RL = 100KΩ, V _{in} = 12V
Input Power	P _{in}	-	5.4	6.6	W	RL = 100KΩ, V _{in} = 12V
Standby Standby Input Current	I _{in} Standby	-	0.1	1.0	μA	OFF state
Control Terminal Input Voltage	V _{mt}	3.5	5	10	V	ON state
		-0.5	0	0.4	V	OFF state
Control Terminal Input Current	I _{mt}	-	0.5	1.0	mA	V _{mt} = 5V
		-	-	-0.3	μA	V _{mt} = 0V

3.3.3 OUTPUT CHARACTERISTICS

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	REMARKS
NO Load Output Voltage	V _s	1400	-	-	V _{rms}	
Tube Current	I _L	2.7	3	3.3	mArms	V _{ctrl} = 3V Min. Brightness
		5.4	6	6.6	mArms	V _{ctrl} = 0V Max. Brightness
Working Frequency	f	35	45	55	kHz	

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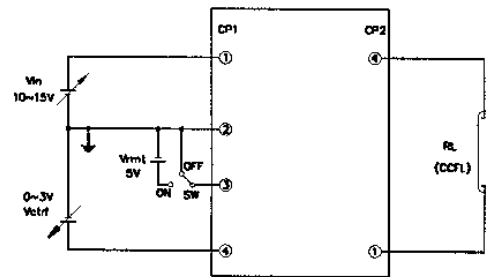
MEASUREMENT



MEASURE INSTRUMENTS

- (A) DIGITAL MULTIMETER
HP 3478A or equivalent
- (V) DIGITAL MULTIMETER
HP 3478A or equivalent
- (A) TRUE RMS MULTIMETER
FLUKE 8060A or equivalent
- (V) TRUE RMS VOLTMETER
HP 3400A or equivalent
- (F) TRUE RMS MULTIMETER
FLUKE 8060A or equivalent

APPLICATION EXAMPLES



PIN ASSIGNMENTS

INPUT (CP1) CONNECTOR :
MOLEX 53261-0590

NO.	SIGNAL
1	V _{in}
2	Gnd
3	V _{rms}
4	V _{ctrl}
5	NC

OUTPUT (CP2) CONNECTOR :
MITSUMI : M60-04-30-134P

NO.	SIGNAL
1	RTN
2	NC
3	NC
4	HV

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Color of CIE Coordinate

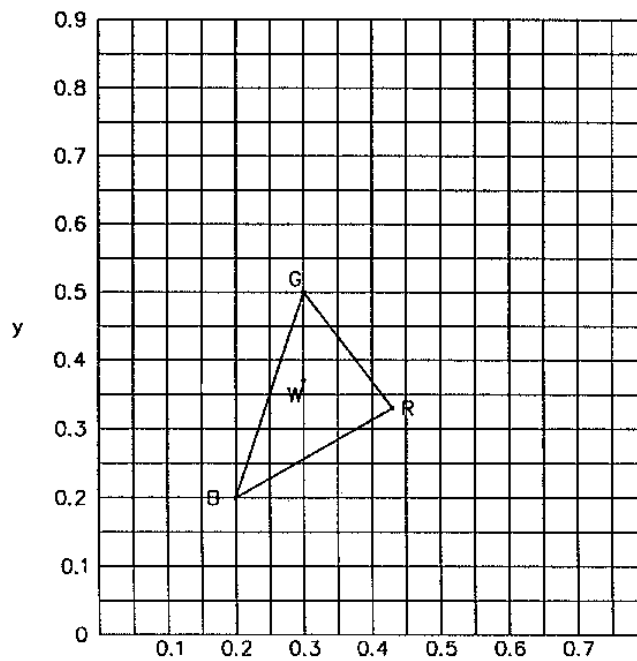
Ta = 25°C

ITEM		SYMBOL	CONDITION	VALUE	BRIGHTNESS (cd/m ²)	NOTE
Color of CIE Coordinate	Red	X	$\phi=0^\circ, \theta=0^\circ$ CCFL BACKLIGHT COLOR DEGREE X=0.3352 Y=0.3445 BRIGHTNESS =1350 cd/m ²	0.4249	21.1	Note*
		y		0.3254		
	Green	X		0.2918	43.6	
		y		0.4977		
	Blue	X		0.1944	13.2	
		y		0.2053		
	White	X		0.3096	59.5	
		y		0.3649		

Note* Measuring at position 3 on Fig.1
CIE chromaticity diagram

Tolerance : ±0.05

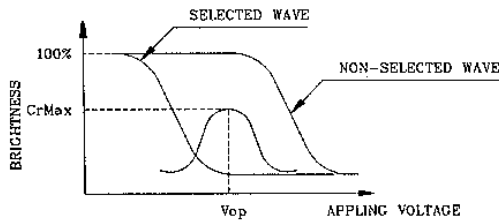
Fig.1



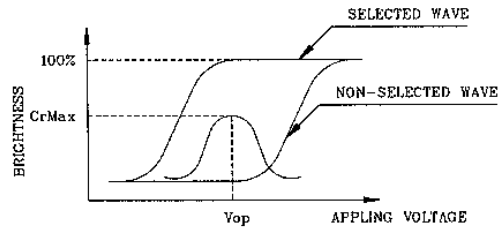
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(NOTE 1)

Definition of Operation Voltage(Vop)



(positive type)



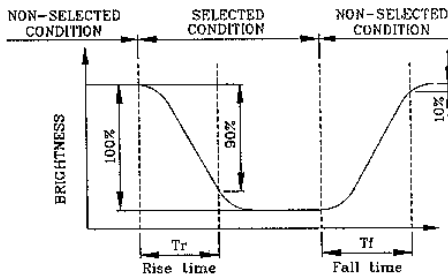
(negative type)

*Conditions

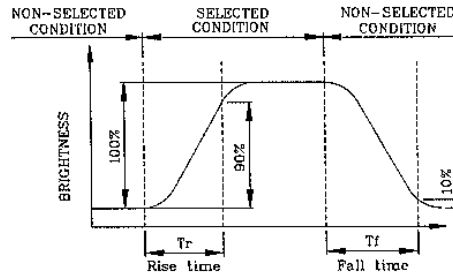
Viewing Angle : 0
 Frame Frequency : 70Hz
 Applying Waveform : 1/N duty 1/a bias

(NOTE 2)

Definition of Response Time(Tr,Tf)



(positive type)



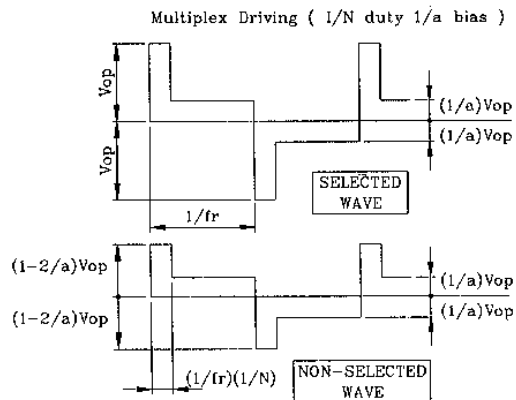
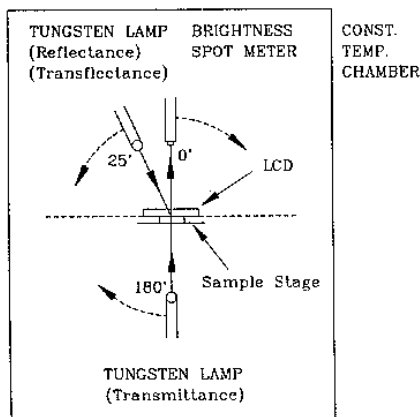
(negative type)

*Conditions

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

(NOTE 3)

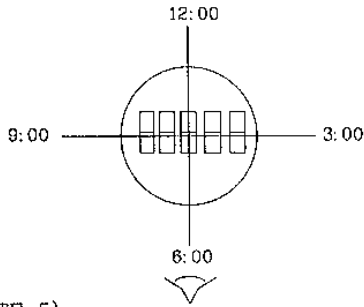
Description of Measuring Equipment and Driving Waveforms



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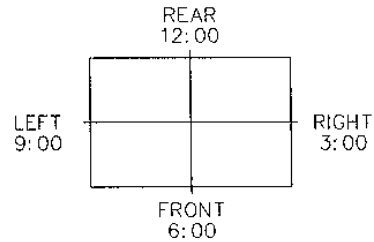
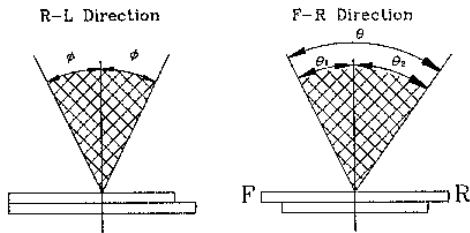
(NOTE 4)

Definition of Viewing Direction



(NOTE 5)

Definition of Viewing Angle



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

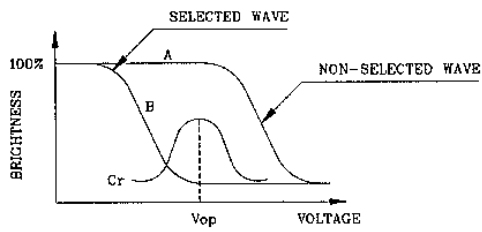
$$\theta = \theta_1 + \theta_2$$

*Conditions

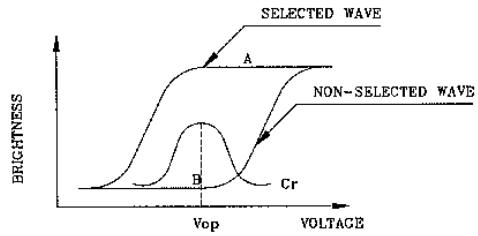
Operating Voltage : V_{op}
Frame Frequency : 70Hz
Applying Waveform : 1/N duty 1/a bias
Contrast Ratio : larger than 2

(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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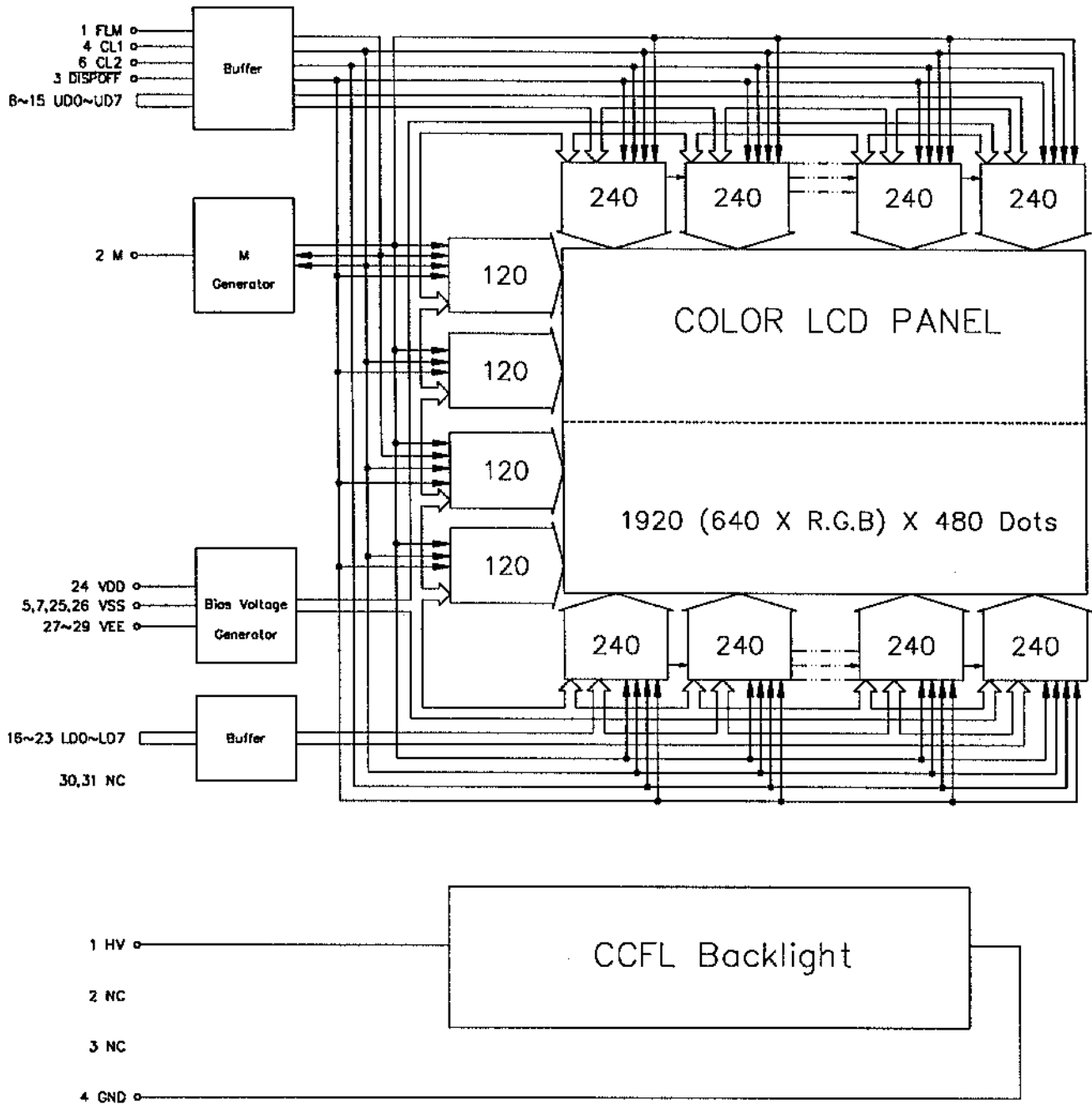
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BLOCK DIAGRAM



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INTERFACE PIN CONNECTION

USED LCD CONNECTOR :

CN1 : DF9-31P-1V (HIROSE)

CORRESPONDABLE LCD CONNECTOR : DF9-31S-1V (HIROSE)

INTERFACE	PIN NO.	SYMBOL	FUNCTION
LCM	CN1	1	FLM The FLM signal indicates the beging of each display cycle.
		2	M Alternate signal for LCD Drive
		3	DISPOFF H ---display ON, L ---display OFF
		4	CL1 The CL1 latches the serial data in the shift registers.
		5	VSS GND
		6	CL2 Clock signal for shifting the serial data.
		7	VSS GND
		8	UD0 Display data for upper column driver
		9	UD1 Display data for upper column driver
		10	UD2 Display data for upper column driver
		11	UD3 Display data for upper column driver
		12	UD4 Display data for upper column driver
		13	UD5 Display data for upper column driver
		14	UD6 Display data for upper column driver
		15	UD7 Display data for upper column driver
		16	LD0 Display data for lower column driver
		17	LD1 Display data for lower column driver
		18	LD2 Display data for lower column driver
		19	LD3 Display data for lower column driver
		20	LD4 Display data for lower column driver
		21	LD5 Display data for lower column driver
		22	LD6 Display data for lower column driver
		23	LD7 Display data for lower column driver
		24	VDD +5V
		25	VSS GND
		26	VSS GND
		27	VEE Power supply voltage for LCD (+)
		28	VEE Power supply voltage for LCD (+)
		29	VEE Power supply voltage for LCD (+)
		30	NC No Connection
		31	NC No Connection

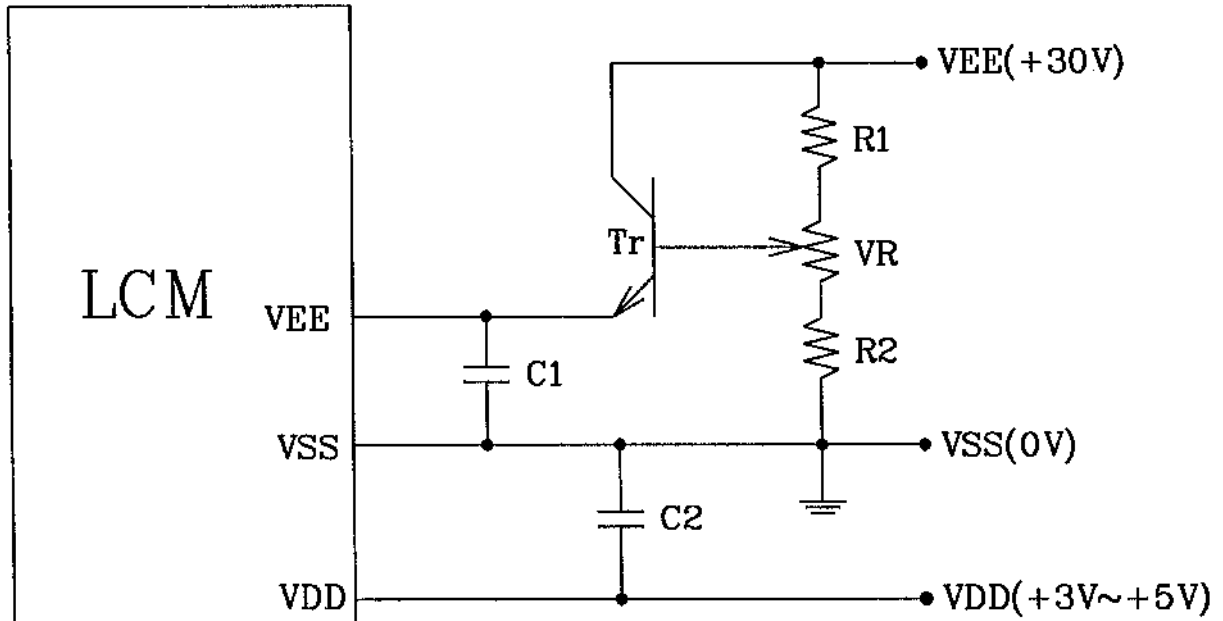
Used CCFT Connector : MITSUMI/M63M83-04

Correspondable CCFT Connector : MITSUMI/M60-04-30-134P or M60-04-30-114P or M61M73-04

INTERFACE	PIN NO.	SYMBOL	FUNCTION
CCFT	1	HV	High Voltage Line (Inverter)
	2	N.C	No Connection
	3	N.C	No Connection
	4	GND	Ground Line (Inverter)

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POWER SUPPLY



$$R1 + R2 + VR = 10 \sim 20K \Omega$$
$$C1, C2 = 10 \mu F$$

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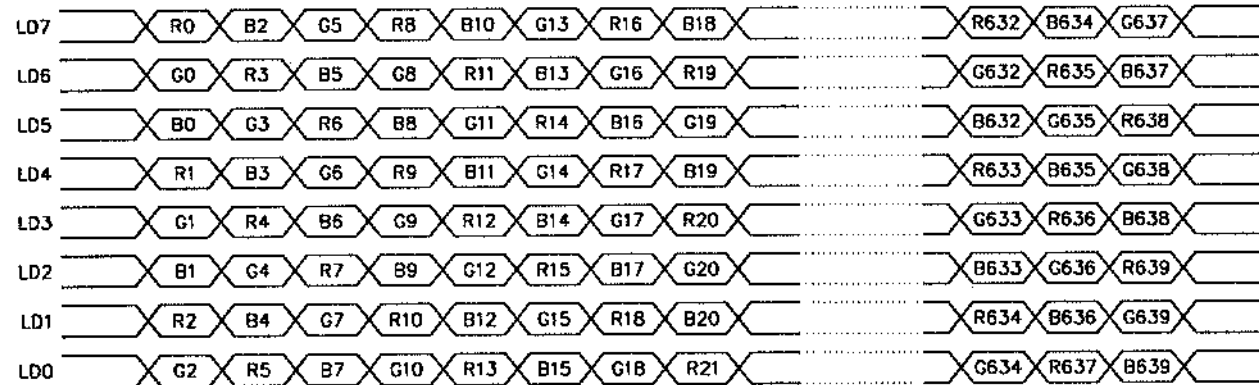
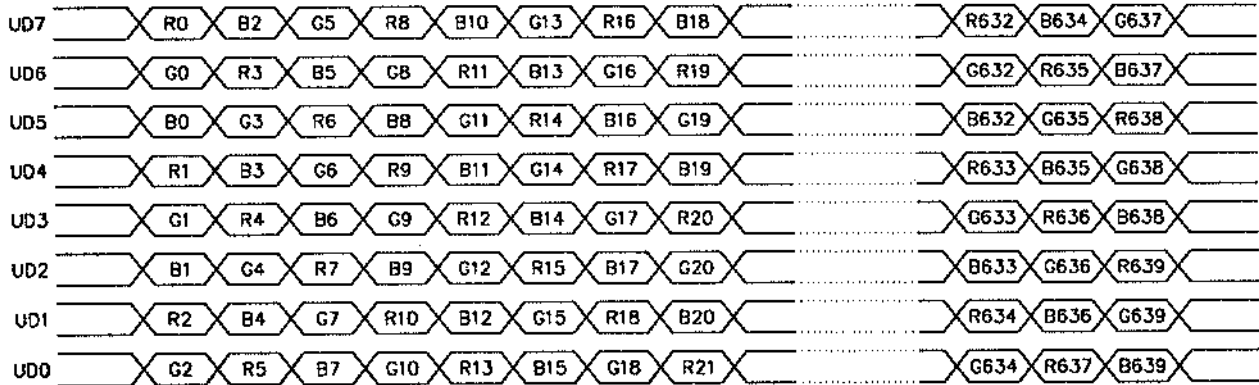
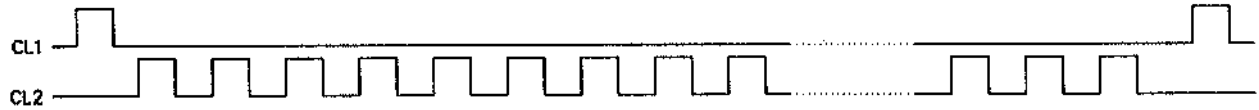
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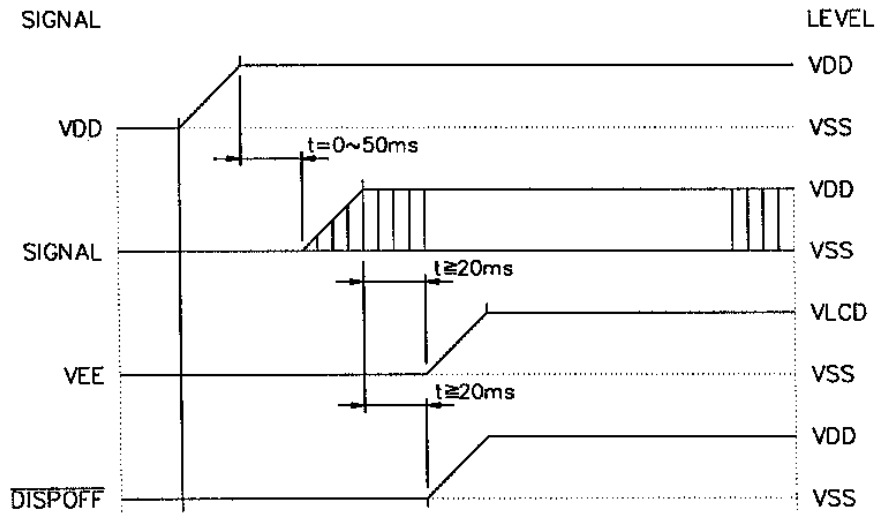
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TIMING CHART

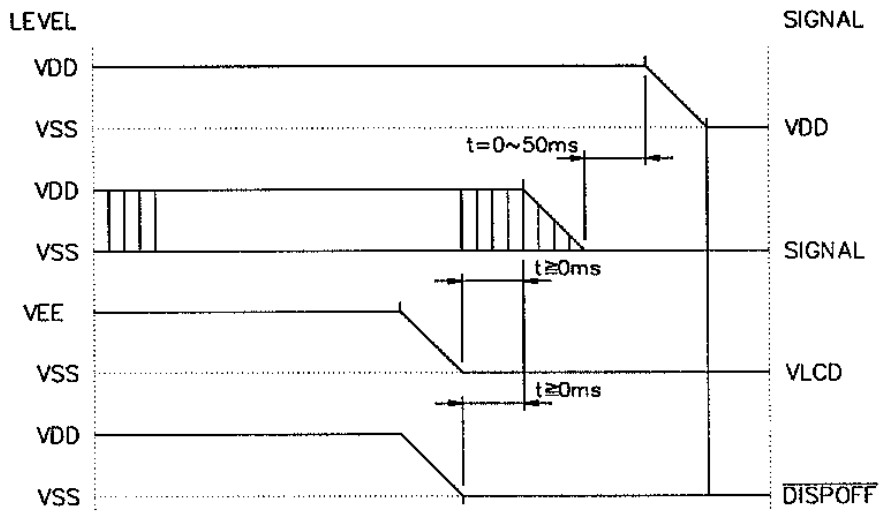


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POWER ON/OFF TIMING ON SEQUENCE



OFF SEQUENCE



Please maintain the above sequence when turning on and off the power supply of the module. If $\overline{\text{DISPOFF}}$ is supplied to the module while internal alternate signal for LCD driving(M) is unstable, DC component will be supplied to the LCD panel. This may cause damage the LCD module.

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DISPLAY

	1	2	3	4	5	6	7	8			1913	1914	1915	1916	1917	1918	1919	1920
1	R0	G0	B0	R1	G1	B1	R2	G2			G637	B637	R638	G638	B638	R639	G639	B639
	UD7	UD6	UD5	UD4	UD3	UD2	UD1	UD0			UD7	UD6	UD5	UD4	UD3	UD2	UD1	UD0
2	R0	G0	B0	R1	G1	B1	R2	G2			G637	B637	R638	G638	B638	R639	G639	B639
	UD7	UD6	UD5	UD4	UD3	UD2	UD1	UD0			UD7	UD6	UD5	UD4	UD3	UD2	UD1	UD0

239	R0	G0	B0	R1	G1	B1	R2	G2			G637	B637	R638	G638	B638	R639	G639	B639
	UD7	UD6	UD5	UD4	UD3	UD2	UD1	UD0			UD7	UD6	UD5	UD4	UD3	UD2	UD1	UD0
240	R0	G0	B0	R1	G1	B1	R2	G2			G637	B637	R638	G638	B638	R639	G639	B639
	UD7	UD6	UD5	UD4	UD3	UD2	UD1	UD0			UD7	UD6	UD5	UD4	UD3	UD2	UD1	UD0
241	R0	G0	B0	R1	G1	B1	R2	G2			G637	B637	R638	G638	B638	R639	G639	B639
	LD7	LD6	LD5	LD4	LD3	LD2	LD1	LD0			LD7	LD6	LD5	LD4	LD3	LD2	LD1	LD0
242	R0	G0	B0	R1	G1	B1	R2	G2			G637	B637	R638	G638	B638	R639	G639	B639
	LD7	LD6	LD5	LD4	LD3	LD2	LD1	LD0			LD7	LD6	LD5	LD4	LD3	LD2	LD1	LD0

479	R0	G0	B0	R1	G1	B1	R2	G2			G637	B637	R638	G638	B638	R639	G639	B639
	LD7	LD6	LD5	LD4	LD3	LD2	LD1	LD0			LD7	LD6	LD5	LD4	LD3	LD2	LD1	LD0
480	R0	G0	B0	R1	G1	B1	R2	G2			G637	B637	R638	G638	B638	R639	G639	B639
	LD7	LD6	LD5	LD4	LD3	LD2	LD1	LD0			LD7	LD6	LD5	LD4	LD3	LD2	LD1	LD0

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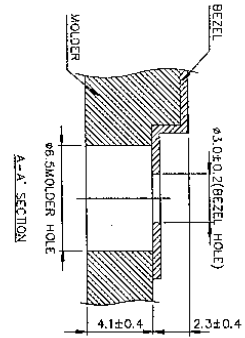
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Note:
 ① used LCD connector: DF9-31P-1V(HIROSE)
 corresponding LCD connector: DF9-31S-1V(HIROSE)
 ② used COFT connector: M63MS3-04 (MITSUMI)
 corresponding COFT connector: M80-04-30-13P (MITSUMI)
 M81M73-04 (MITSUMI)

Pin No.	Symbol	Signal Level	Function
1	FLM	H/L	First Line Marker
2	M	H/L	Alternate Signal for LCD Drive
3	OSP	H/L	Display Off (H = ON, L = OFF)
4	O-I	H-L	Date Logic Pulse
5	VSS	-	Signal Ground (GND)
6	CL2	H-L	Date Shift Pulse
7	VSS	-	Signal Ground (GND)
8	U00	H/L	-
9	U01	H/L	-
10	U02	H/L	-
11	U03	H/L	-
12	U04	H/L	-
13	U05	H/L	-
14	U06	H/L	-
15	U07	H/L	-
16	L00	H/L	-
17	L01	H/L	-
18	L02	H/L	-
19	L03	H/L	-
20	L04	H/L	-
21	L05	H/L	-
22	L06	H/L	-
23	L07	H/L	-
24	V00	-	Power Supply for Logic
25	VSS	-	Signal Ground (GND)
26	VCC	-	Signal Ground (GND)
27	VEE	-	Power Supply for LCD (+V)
28	VEE	-	Power Supply for LCD (+V)
29	VEE	-	Power Supply for LCD (+V)
30	NC	-	No Connection
31	NC	-	No Connection

Pin No.	Symbol	Signal Level	Function
1	HV	-	High Voltage Line (Inverter)
2	NC	-	No Connection
3	NC	-	No Connection
4	GND	-	Ground Line (Inverter)

