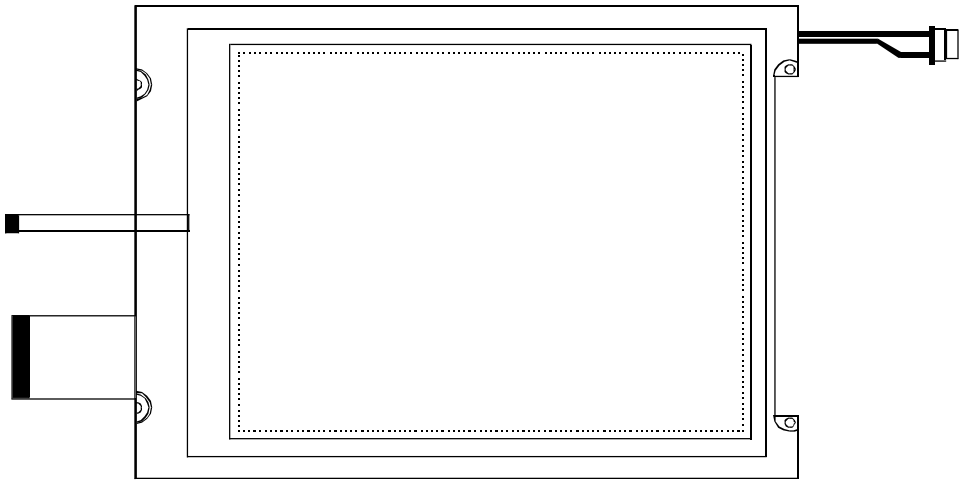
HANTRONIX

PRODUCT SPECIFICATION

HDM6448ATSC-7

640x480 COLOR GRAPHICS
LCD DISPLAY MODULE
w/TOUCH SCREEN



HANTRONIX, INC. 10080 BUBB RD. CUPERTINO, CA 95014	**Q.A.:** JB	**REV.:** 1.0	HDM6448ATSC-7	SHEET 1 OF 21 **DATE:** 5/15/00

ABSOLUTE MAXIMUM RATINGS

(1) ELECTRICAL ABSOLUTE RATINGS

VSS=0V

ITEM	SYMBOL	MIN	MAX	UNIT	COMMENT
Power Supply for Logic	VDD-VSS	-0.3	7.0	V	
Power Supply for LCD Drive	VEE-VSS	0	42.0	V	
Input Voltage	VI	VSS-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 2,4		Note 3,4	
Vibration	Note 5			

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

Note 5

Frequency	5 Hz~13.95 Hz	13.95 Hz~33 Hz	33 Hz~51 Hz	51 Hz~500 Hz
Vibration Level	-	2X9.8 m/s²	-	5x9.8 m/s²
Vibration Width	0.2 inch	-	0.036 inch	-
Vibration Direction	X/Y/Z			
Vibration Time	20 min-1cycle X 3 directions			

ELECTRICAL CHARACTERISTICS

3.1 ELECTRICAL CHARACTERISTICS OF LCM

ITEM	SYMBOL	CONDITION		MIN.	TYP.	MAX.	UNIT
Logic Circuit Power Supply	VDD−VSS	Ta= 25°C		2.7	3.0	3.3	V
				4.5	5.0	5.5	V
Input Voltage	VIH	H level		0.8VDD	−	VDD	V
	VIL	L level		0	−	0.2VDD	V
Recommended LCD Contrast Adjust Voltage	VEE−VSS	f_{FLM}=120Hz Duty=1/484 Bias=1/14 VDD=3.3V	0°C	37.1	37.5	37.9	V
			25°C	36.1	36.5	36.9	
			50°C	35.2	35.6	36.0	
Supply Current for Logic	IDD	VDD−VSS = 3.3V VEE−VSS = 36.5V Ta= 25°C		−	16.0	24.0	mA
Supply Current for LCD	IEE			−	8.0	12.0	mA

CHARACTERISTICS OF TOUCH SCREEN

ELECTRICAL AND MECHANICAL TERMS

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Applied Rating Voltage	V_R	–	–	–	5.0	V
Applied Rating Current	I_R	At Contact Point of Top Layer with Bottom Layer	–	–	1.0	mA
Operating Temperature	T_{OPR}	20%~85% R.H. Max. Avoid Dew Condensation at Any Time	-10	–	60	°C
Storage Temperature	T_{STO}		-20	–	70	
Resistance of Terminal Electrodes	R_{ETD}	X Electrode	260	580	1060	Ω
		Y Electrode	155	350	640	
Linearity	L	–	–	–	1.5	%
Insulation Resistance	R_{OFF}	V_{DC} =25V	20	–	–	MΩ
Activation Force	F_{ON}	NOTE 1	10	–	80	g
Transparency	T	According to JIS-K7015	–	83	–	%
Surface Hardness	S_H	According to JIS-K5400	3	–	–	H

NOTE 1 : The force is given with R0.8 Polyacetal pen or R3, HS60 silicon rubber and the analog output could be detected stablely.

3.1.1.2 RELIABILITY TERMS

ITEM	SPECIFICATION
Exposure to High Temperature	70°C, 120 Hours
Exposure to Low Temperature	-40°C, 120 Hours
Exposure to Constant Temperature and Humidity	60°C 90%RH, 120 Hours
Repetition of High and Low Temperatures	-10°C(60Minutes)---60°C(60Minutes) 20 Cycles 1 Cycle
Finger Touches Life	Polyacetal Tip Load 250±50 gf Silicone Rubber Load 300±100 gf Each One Million times
Writing Friction Life	Polyacetal Tip Load 250±50 gf 60mm/sec 20mm 100,000 times

Test condition : T/P is placed horizonally in a vessel and no power is supplied to T/P.
Normal state is temperature : 25±10°C, relative humidity : 60±25%

ELECTRICAL CHARACTERISTICS OF BACKLIGHT

Used lamp : Rating

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	REMARK
Lamp Voltage	V_L	–	450	–	Vrms	
Lamp current	I_L	3	4	5	mArms	
Lamp power consumption	P_L	–	1.8	–	W	
Lamp frequency	F_L	35	40	45	kHz	
Starting voltage	Vs	–	800	1500	Vrms	T_a=25°C
Color Degree	X	0.32	0.33	0.34	–	
	Y	0.30	0.31	0.32		
Lamp life time	L_L	10000	–	–	hrs	

LCM : Rating

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	REMARK
Surface Luminance	L	–	65	–	cd/m^2	ALL ON(I_L=4mA)
		–	4	–	cd/m^2	ALL OFF(I_L=4mA)

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

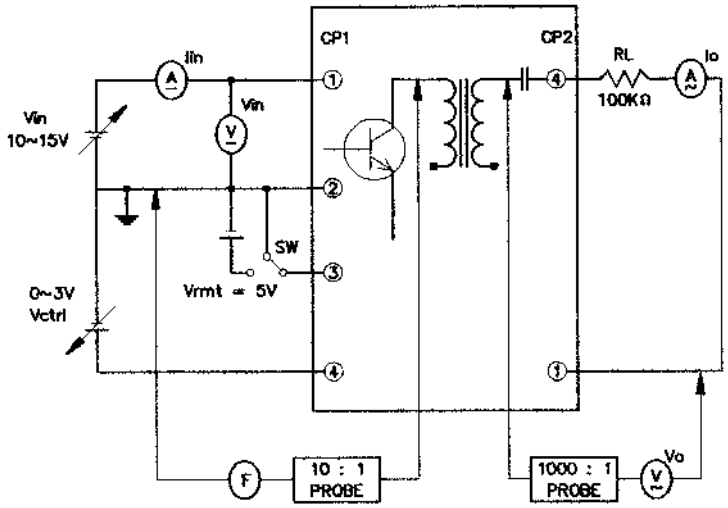
3.3.2 INPUT CHARACTERISTICS

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	REMARKS
Input Voltage	Vin	10	12	15	V	
Input Current	Iin	–	450	550	mA	RL = 100KΩ, Vin = 12V
Input Power	Pin	–	5.4	6.6	W	RL = 100KΩ, Vin = 12V
Standby Standby Input Current	Iin Standby	–	0.1	1.0	μA	OFF state
Control Terminal Input Voltage	Vrmt	3.5	5	10	V	ON state
		-0.5	0	0.4	V	OFF state
Control Terminal Input Current	Irmt	–	0.5	1.0	mA	Vrmt = 5V
		–	–	-0.3	μA	Vrmt = 0V

3.3.3 OUTPUT CHARACTERISTICS

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	REMARKS
NO Load Output Voltage	Vs	1400	–	–	Vrms	
Tube Current	IL	2.7	3	3.3	mArms	Vctrl = 3V Min. Brightness
		5.4	6	6.6	mArms	Vctrl = 0V Max. Brightness
Working Frequency	f	35	45	55	kHz	

MEASUREMENT



3.3.5 MEASURE INSTRUMENTS

(A) DIGITAL MULTIMETER
HP 3478A or equivalent

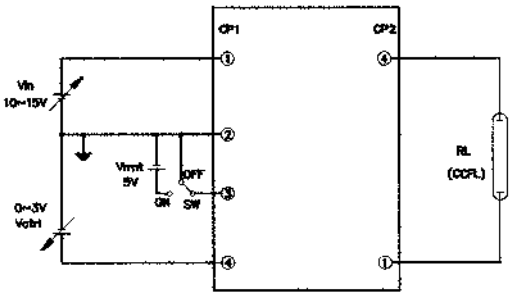
(V) DIGITAL MULTIMETER
HP 3478A or equivalent

(A~) TRUE RMS MULTIMETER
FLUKE 8060A or equivalent

(V~) TRUE RMS VOLTMETER
HP 3400A or equivalent

(F) TRUE RMS MULTIMETER
FLUKE 8060A or equivalent

3.3.6 APPLICATION EXAMPLES



3.3.7 PIN ASSIGNMENTS

INPUT (CP1) CONNECTOR :
MOLEX 53261-0590

NO.	SIGNAL
1	Vin
2	Gnd
3	Vrmt
4	Vctri
5	NC

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

NO.	SIGNAL
1	RTN
2	NC
3	NC
4	HV

OPTICAL CHARACTERISTICS

Optical Char. of Normal Temp. Mode

AT V_{OP}

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.
T	M	–	25	–	35	–	10	–	±38	–	36-28
note		NOTE6						NOTE5			

AT $\phi=0°$ $\theta=0°$

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Response Time (rise)	Tr	0℃	–	820	–	ms	NOTE 2
		25℃	–	230	–		
		50℃	–	130	–		
Response Time (fall)	Tf	0℃	–	550	–	ms	NOTE 2
		25℃	–	150	–		
		50℃	–	90	–		

note:

T : TRANSMISSIVE
M : NORMALLY BLACK(COLOR)

Color of CIE Coordinate

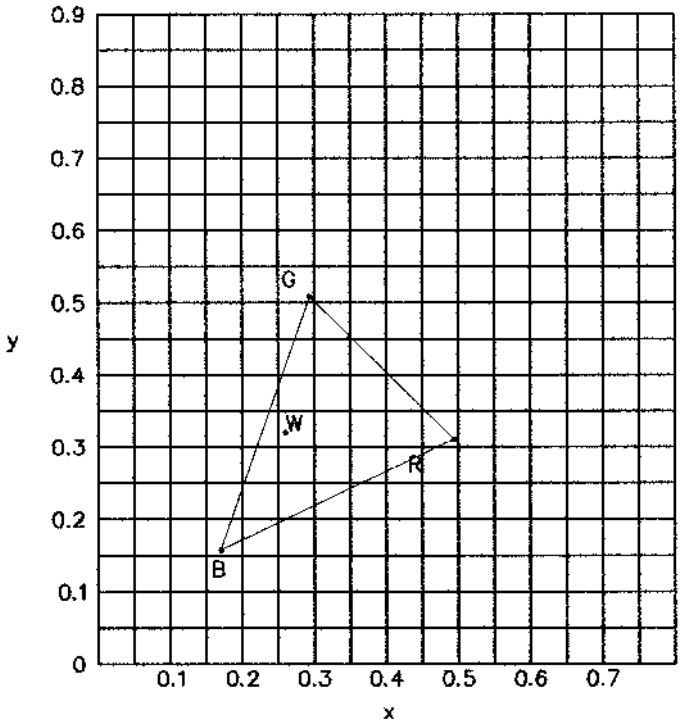
Ta = 25°C

ITEM		SYMBOL	CONDITION	VALUE	NOTE
Color of CIE Coordinate	Red	X	ϕ=0°, θ=0° CCFL BACKLIGHT COLOR DEGREE X=0.33 Y=0.31	0.4850	Note✱
		y		0.3234	
	Green	X		0.2924	
		y		0.5113	
	Blue	X		0.1734	
		y		0.1552	
	White	X		0.2635	
		y		0.3119	

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

Tolerance : ±0.05

Fig.1



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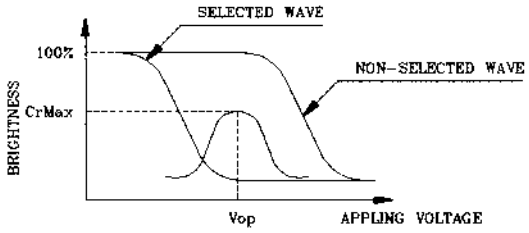
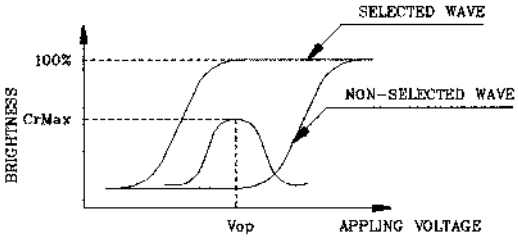
(NOTE 1)

Definition of Operation Voltage(Vop)



(positive type)



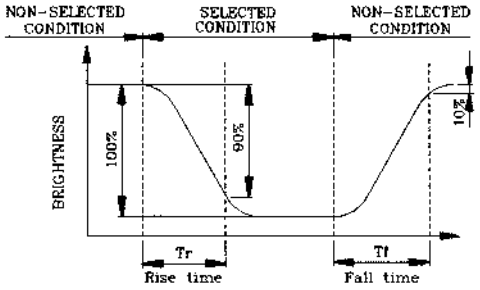
(negative type)

*Conditions

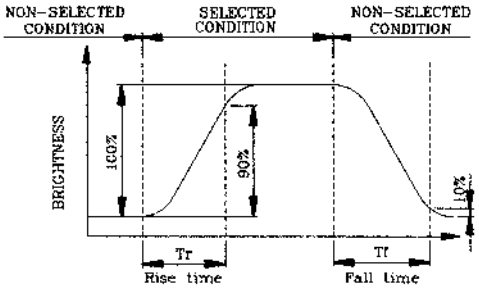
Viewing Angle : 0
Frame Frequency : 70Hz
Appling Waveform : I/N duty 1/a bias

(NOTE 2)

Definition of Response Time(Tr,Tf)



(positive type)



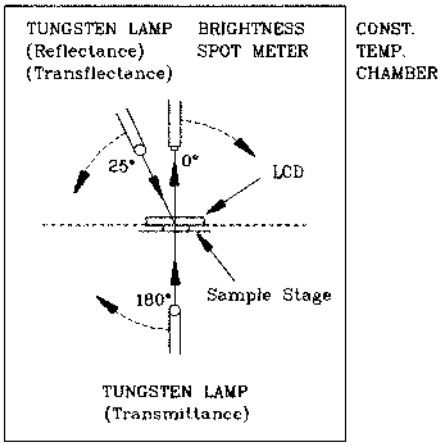
(negative type)

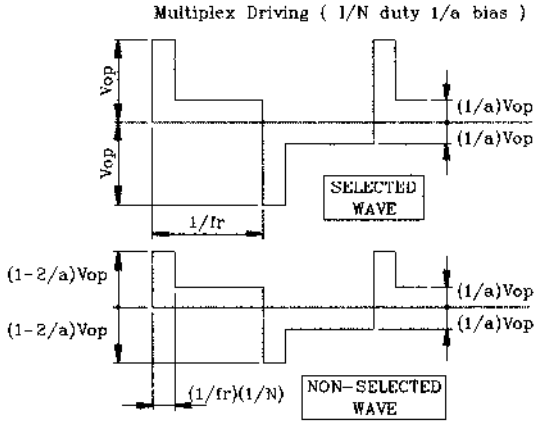
*Conditions

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

(NOTE 3)

Description of Measuring Equipment and Driving Waveforms





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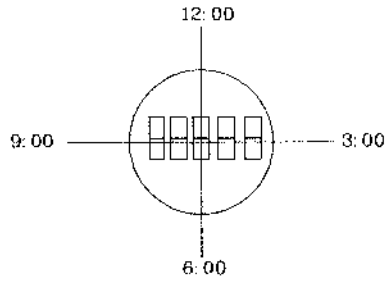
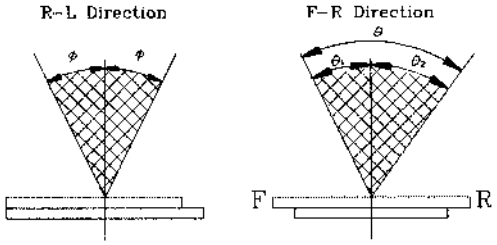
(NOTE 4)

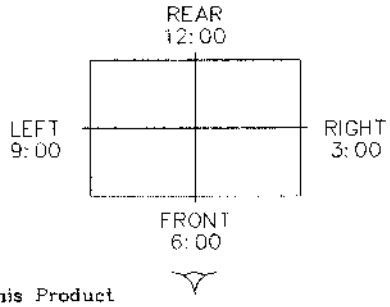
Definition of Viewing Direction



(NOTE 5)

Definition of Viewing Angle





*For This Product

The Viewing Direction Is 6 O'clock

So $\theta 1 > \theta 2$

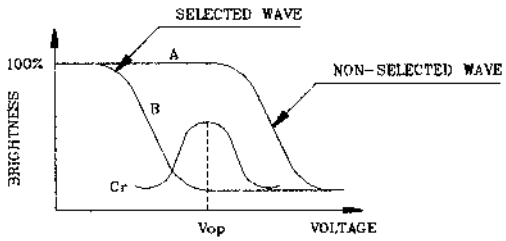
$\theta = \theta_1 + \theta_2$

*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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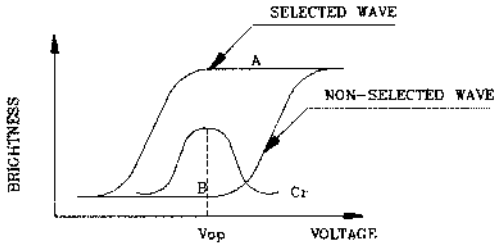

(negative type)

Contrast Ratio : Cr=A/B

*Conditions

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

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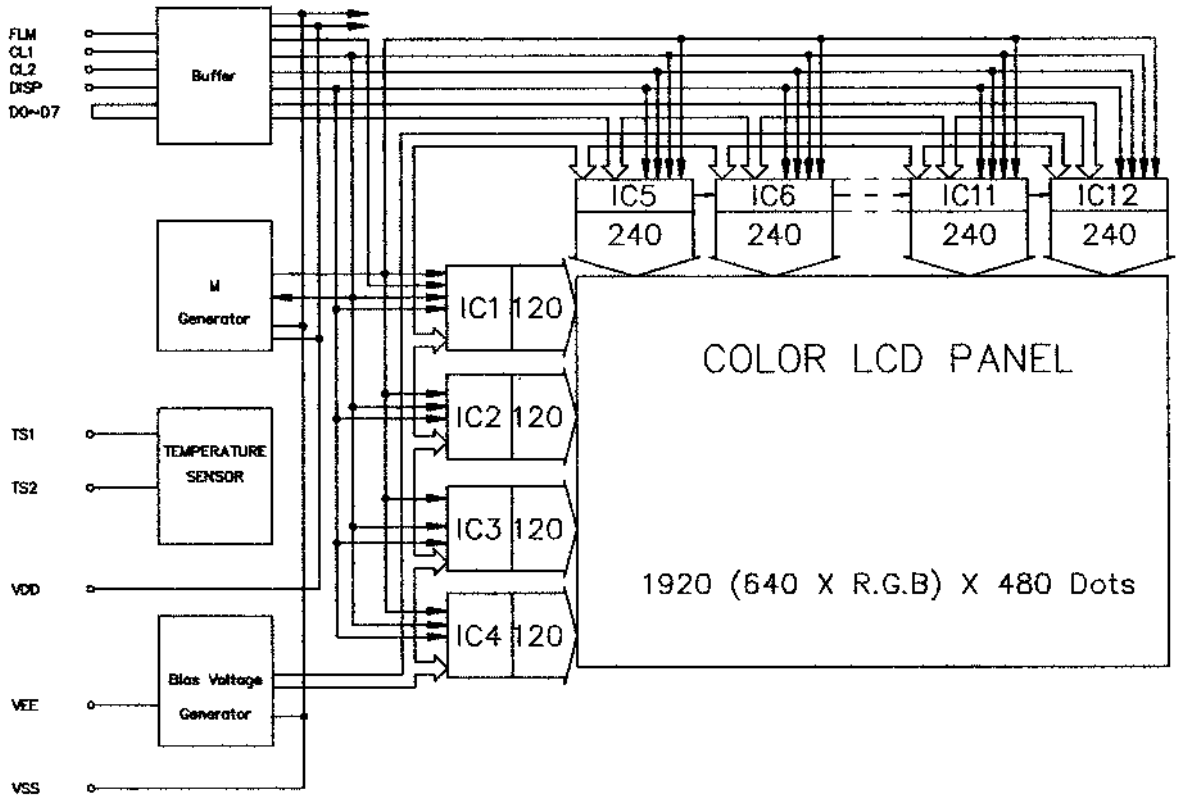
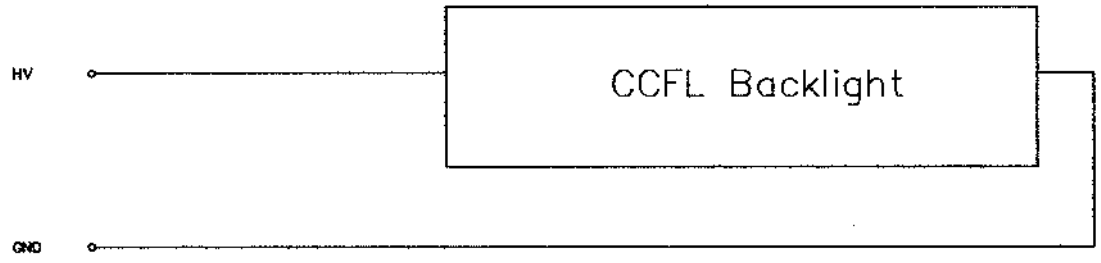
BLOCK DIAGRAM





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INTERFACE PIN CONNECTION

FFC: PITCH 1.0mm / Suitable Connector : IL-402-22S-S1L-SA(JAE)

INTERFACE		PIN NO.	SYMBOL	FUNCTION
LCM	FFC	1	FLM	Scan start-up signal
		2	VSS	GND
		3	CL1	Input data latch signal
		4	VSS	GND
		5	CL2	Data input clock
		6	VSS	GND
		7	D0	Display data
		8	D1	Display data
		9	D2	Display data
		10	D3	Display data
		11	D4	Display data
		12	D5	Display data
		13	D6	Display data
		14	D7	Display data
		15	DISP	Display control signal H: ON , L: OFF
		16	VDD	Power supply voltage for logic
		17	VDD	Power supply voltage for logic
		18	VSS	GND
		19	VEE	Power supply voltage for LCD(+)
		20	VSS	GND
		21	TS1	Temperature sensor pin1
		22	TS2	Temperature sensor pin2

FLCN: MITSUMI/M63M83-04

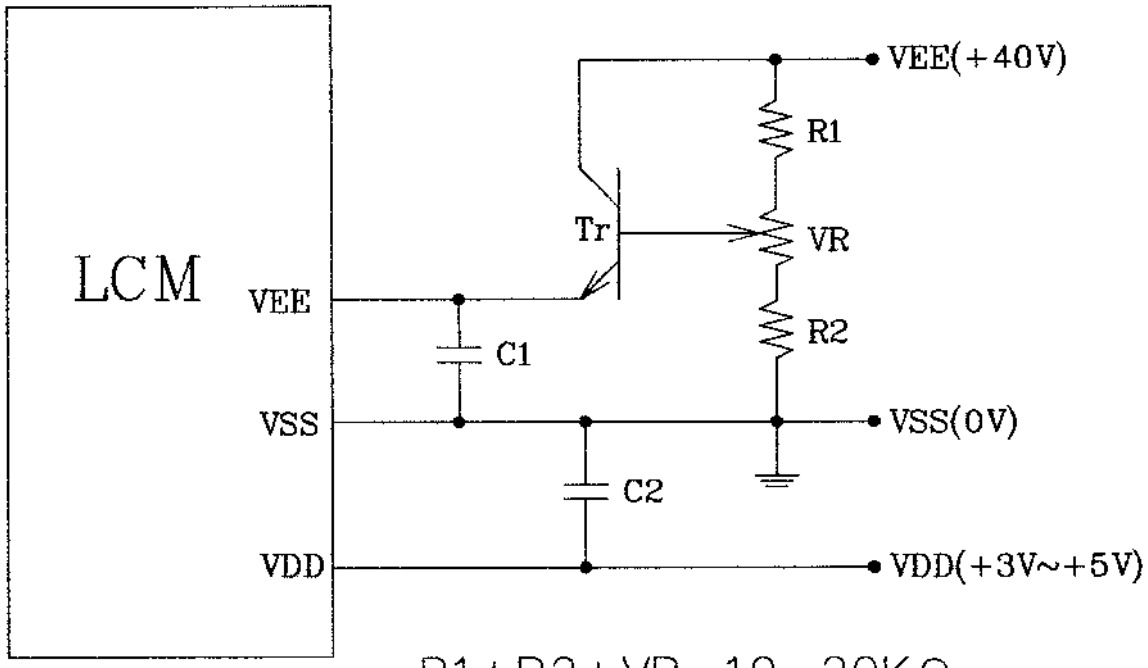
(Suitable Connector: MITSUMI/M60-04-30-134P or M60-04-30-114P or M61M73-04)

INTERFACE	PIN NO.	SYMBOL	FUNCTION
FLCN	1	GND	CFL GND
	2	N.C	-
	3	N.C	-
	4	HV	Power supply voltage for CFL

TOUCH PANEL PIN CONNECTION

INTERFACE	PIN NO.	FUNCTION
FPC	1	RIGHT
	2	BOTTOM
	3	LEFT
	4	TOP

POWER SUPPLY



R1+R2+VR=10~20KΩ
C1,C2=10μF

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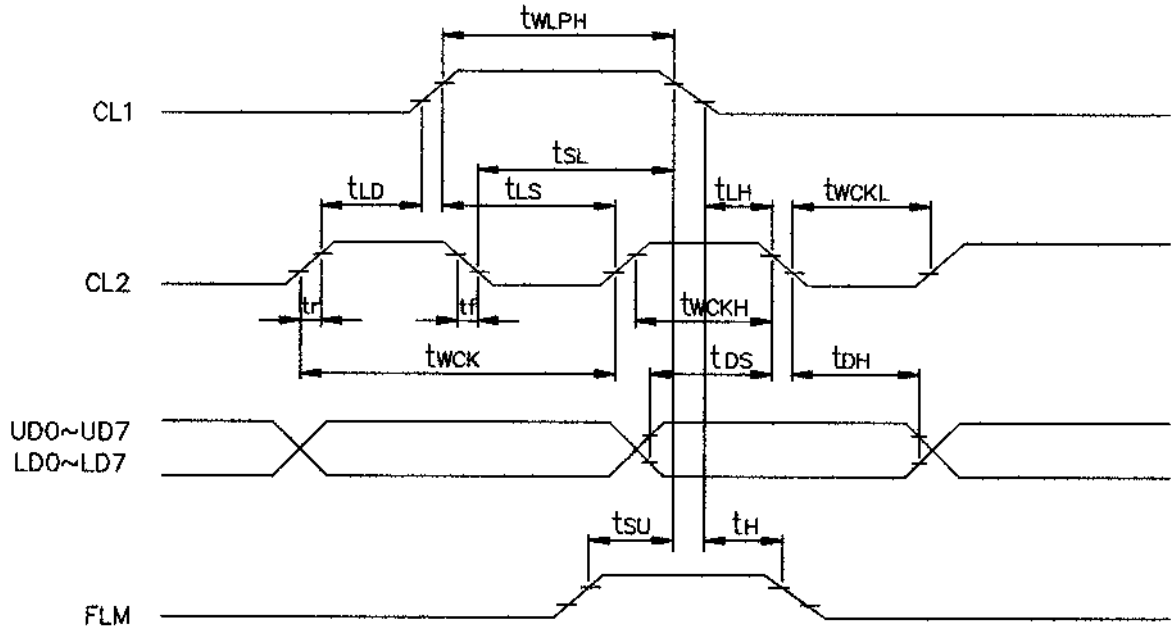
TIMING CHARACTERISTICS

8-1. INTERFACE TIMING

VDD=3V~4.5V

Parameter	SYMBOL	MIN.	MAX.	UNIT
CLOCK PULSE CYCLE TIME	t_{WCK}	66	–	ns
CLOCK PULSE HIGH LEVEL WIDTH	t_{WCKH}	23	–	ns
CLOCK PULSE LOW LEVEL WIDTH	t_{WCKL}	23	–	ns
LATCH PULSE HIGH LEVEL WIDTH	t_{WLPH}	30	–	ns
CP→LP RISE TIME	t_{LD}	10	–	ns
CP→LP FALL TIME	t_{SL}	30	–	ns
LP→CP RISE TIME	t_{LS}	30	–	ns
LP→CP FALL TIME	t_{LH}	30	–	ns
CLOCK PULSE RISE/FALL TIME	t_r , t_f	–	50	ns
DATA SETUP TIME	t_{DS}	10	–	ns
DATA HOLD TIME	t_{DH}	25	–	ns
FLM SETUP TIME	t_{SU}	30	–	ns
FLM HOLD TIME	t_H	50	–	ns



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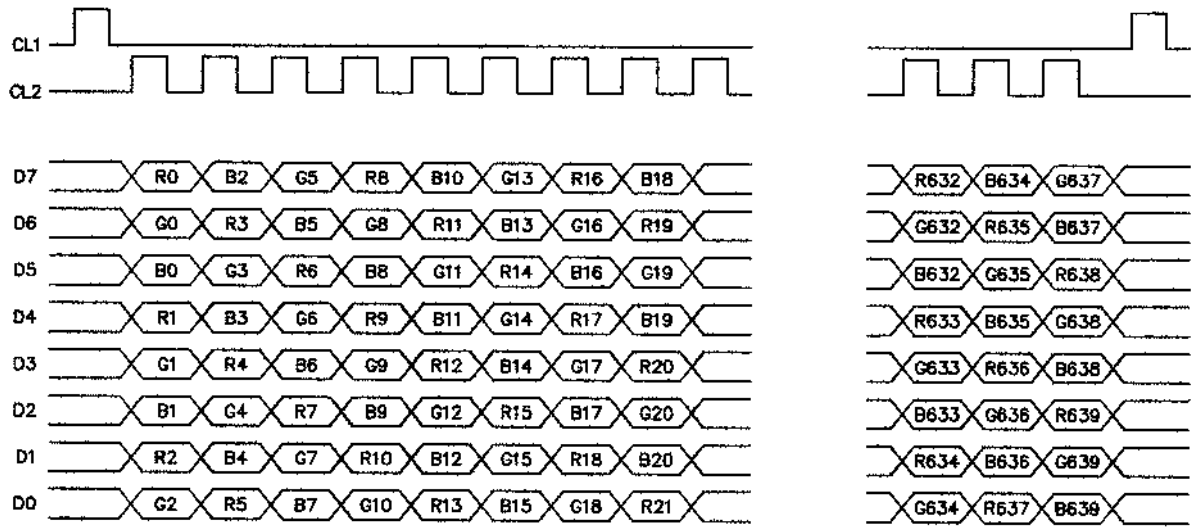
TIMING CHART



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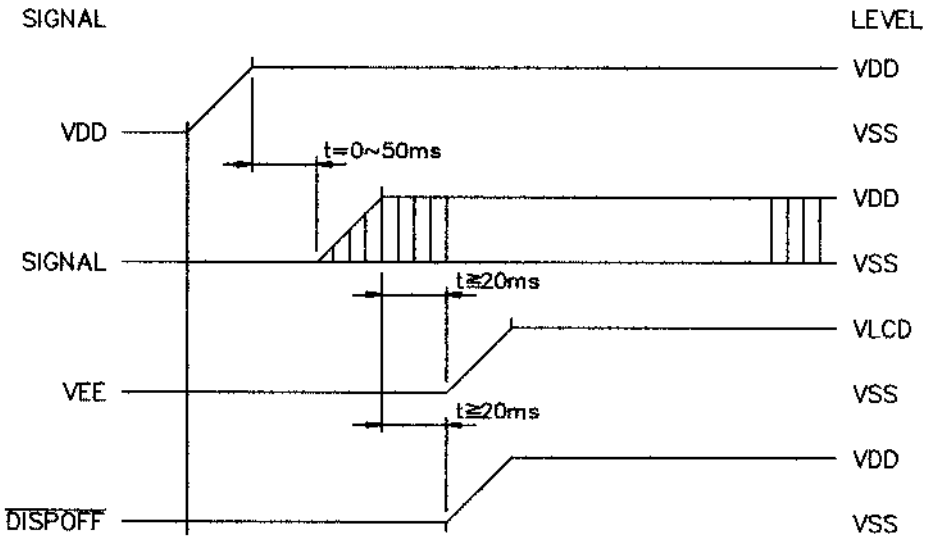
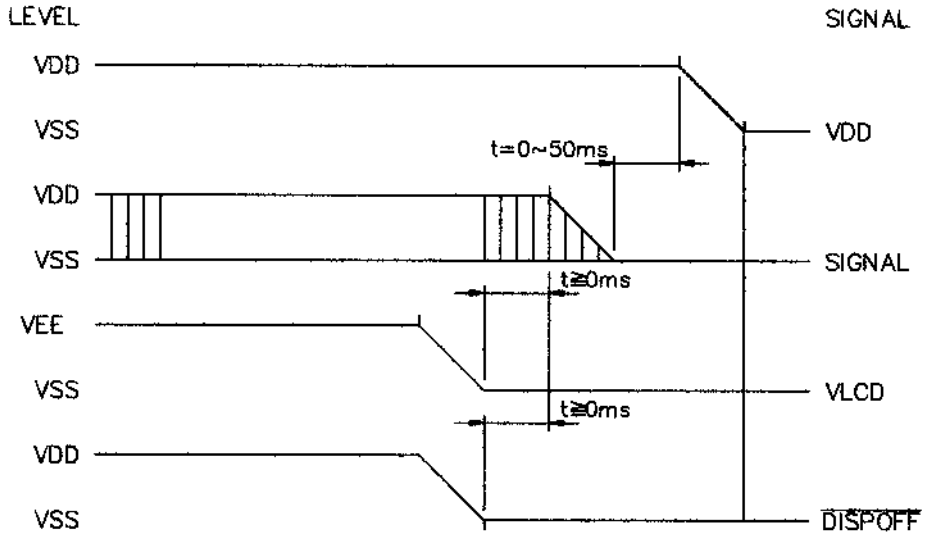
POWER ON/OFF TIMING

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.

DISPLAY

	1	2	3	4	5	6	7	8
1	R0	G0	B0	R1	G1	B1	R2	G2
	D7	D6	D5	D4	D3	D2	D1	D0
2	R0	G0	B0	R1	G1	B1	R2	G2
	D7	D6	D5	D4	D3	D2	D1	D0

	1913	1914	1915	1916	1917	1918	1919	1920
	G637	B637	R638	G638	B638	R639	G639	B639
	D7	D6	D5	D4	D3	D2	D1	D0
	G637	B637	R638	G638	B638	R639	G639	B639
	D7	D6	D5	D4	D3	D2	D1	D0

479	R0	G0	B0	R1	G1	B1	R2	G2
	D7	D6	D5	D4	D3	D2	D1	D0
480	R0	G0	B0	R1	G1	B1	R2	G2
	D7	D6	D5	D4	D3	D2	D1	D0

	G637	B637	R638	G638	B638	R639	G639	B639
	D7	D6	D5	D4	D3	D2	D1	D0
	G637	B637	R638	G638	B638	R639	G639	B639
	D7	D6	D5	D4	D3	D2	D1	D0

RELIABILITY TEST

NO	ITEM	CONDITION			STANDARD	NOTE
1	High Temp. Storage	70°C 30%RH	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→R.T.5min →60°C,30min→R.T.5min (1cycle)			Appearance without defect	5 cycles

NOTE:

- 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.

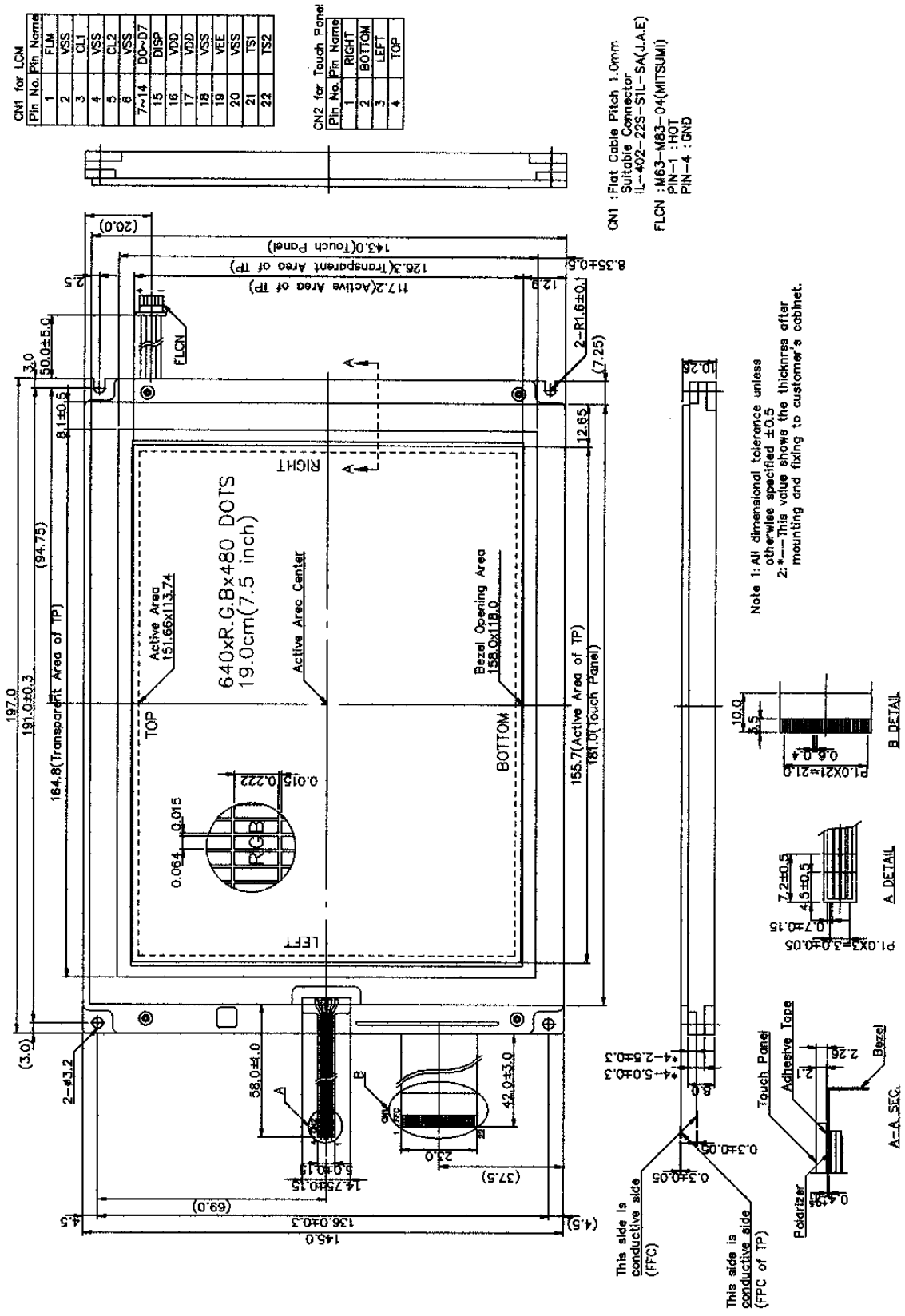
- HANDLING
  1.Avoid static electricity which can damage the CMOS LSI.
  2.Do not remove the panel or frame from the module.
  3.The polarizing plate of the display is very fragile. So, please handle it very carefully.
  4.Do not wipe the polarizing plate with a dry cloth, as it may easily scratch the 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°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.

- THE OPERATING LIFE TIME OF BACK LIGHT

  CCFT : 10,000HR



HANTRONIX, INC. 10080 BUBB RD. CUPERTINO, CA 95014	**Q.A.:** JB	**REV.:** 1.0	HDM6448ATSC-7	SHEET 21 OF 21 **DATE:** 5/15/00