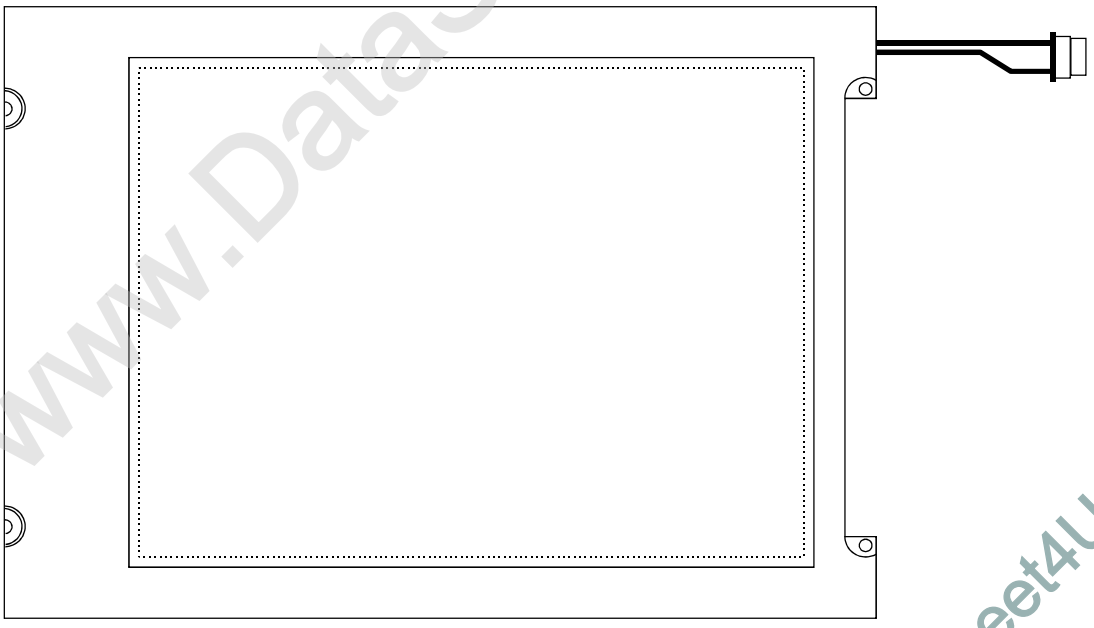
HANTRONIX

PRODUCT SPECIFICATION

HDM6448ATSC

640x480 10.4” Color GRAPHICS
LCD DISPLAY MODULE
with TOUCH SCREEN



HANTRONIX, INC. 10080 BUBB RD. CUPERTINO, CA 95014	**Q.A.:** JK	**REV.:** 1.0	HDM6448ATSC	SHEET 1 OF 22 **DATE:** 8/28/02

1. MECHANICAL DATA

(1) Product No.	**HDM6448ATSC**
(2) Module Size	264.0 (W)mm x 183.0 (H)mm x MAX 12.0 (D)mm
(3) Dot Size	0.09 (W)mm x 0.31 (H)mm
(4) Dot Pitch	0.11 (W)mm x 0.33 (H)mm
(5) Number of Dots	640 (W)xRGB x 480 (H)DOTS
(6) Duty	1/240
(7) LCD	/Color Transmissive Type
(8) Viewing Direction	6 O'clock
(9) Backlight	CCFL
(10) Controller	Excluded
(11) DC/DC Converter	Excluded
(12) Weight	690 g(approx.)
(13) Recommended CCFT Inverter	TAD250 (TDK) 01-B099-0002(COTEK)
(14) TOUCH PANEL	ANTI-GLARE(2H min)

2. 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	25.0	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 Ta ≦ 50°C : 85%RH max
Ta > 50°C : Absolute humidity must be lower than the humidity of 85%RH at 50°C

Note 2 To 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/s²	−	5x9.8 m/s²
Vibration Width	0.2 inch	−	0.036 inch	−
Vibration Direction	X/Y/Z			
Vibration Time	20 min−1 cycle X 3 directions			

3. 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 Driving Voltage (Normal Temp. LCM)	VEE−VSS	Duty=1/240 Bias=1/13 VDD=5.0V	0°C	23.4	23.8	24.2	V
			25°C	22.6	23.0	23.4	
			50°C	21.4	21.8	22.2	
Supply Current for Logic	IDD	VDD−VSS = 5.0V VEE−VSS = 23.0V Ta= 25°C		−	33.0	40.0	mA
Supply Current for LCD	IEE			−	12.0	18.0	mA

3.1.1 CHARACTERISTICS OF TOUCH SCREEN

3.1.1.1 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	0	–	50	°C
Storage Temperature	T_{STO}		-20	–	70	
Resistance of Terminal Electrodes	R_{ETD}	X Electrode	300	–	850	Ω
		Y Electrode	100	–	600	
Linearity	L	–	–	–	2.0	%
Insulation Resistance	R_{OFF}	V_{DC} =25V	10	–	–	MΩ
Activation Force	F_{ON}	NOTE 1	10	–	80	g
Transparency	T	According to JIS-K7015	–	78	–	%
Surface Hardness	S_H	According to JIS-K5400	2	–	–	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	80°C, 120 Hours
Exposure to Low Temperature	-20°C, 120 Hours
Exposure to Constant Temperature and Humidity	60°C 90%RH, 120 Hours
Repetition of High and Low Temperatures	-20°C(30Minutes)---80°C(30Minutes) 10 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%

3.2 ELECTRICAL CHARACTERISTICS OF BACKLIGHT

Used lamp : Rating

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	REMARK
Lamp Voltage	V_L	–	640	–	Vrms	
Lamp current	I_L	3	5	7	mArms	
Lamp power consumption	P_L	–	3.2	–	W	
Lamp frequency	F_L	30	45	55	kHz	
Starting voltage	Vs	–	750	1500	Vrms	T_a =25°C
Color Degree	X	0.287	0.297	0.307	–	
	Y	0.287	0.297	0.307		
Lamp life time	L_L	–	20000	–	hrs	

LCM : Rating

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	REMARK
Surface Luminance	L	–	88	–	cd/m^2	ALL ON(I_L=5mA) ONE LAMP
		–	5.6	–	cd/m^2	ALL OFF(I_L=5mA) ONE LAMP
Luminance Uniformity	Lu	–	78	–	%	White

3.3 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

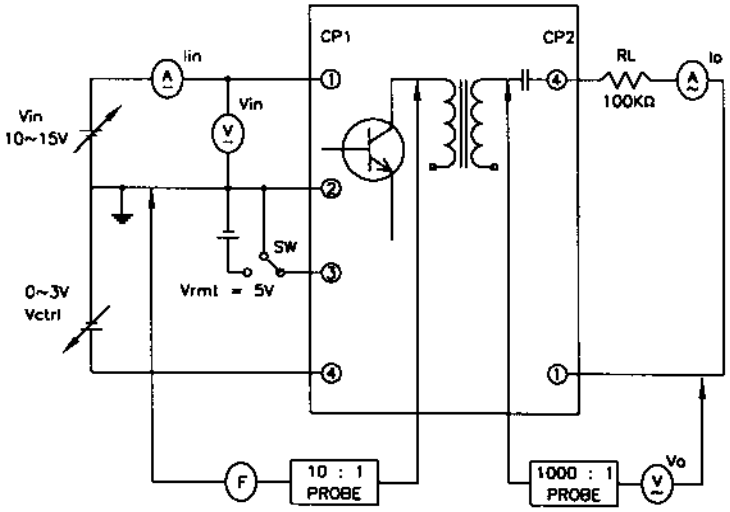
3.3.2 INPUT CHARACTERISTICS

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	

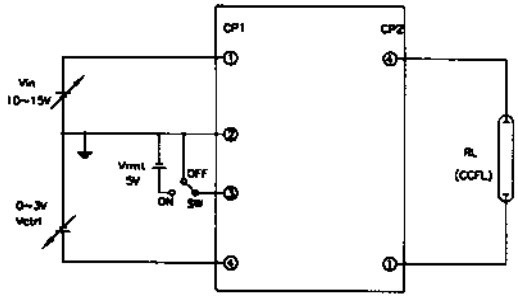
3.3.4 MEASUREMENT



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	Vctrl
5	NC

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

NO.	SIGNAL
1	RTN
2	NC
3	NC
4	HV

4. OPTICAL CHARACTERISTICS

4-1. 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	–	20	–	30	–	6	–	40–X	–	60–36
note		NOTE6						NOTE5			

AT $\phi=0°$ $\theta=0°$

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Response Time (rise)	Tr	0℃	–	650	1000	ms	NOTE 2
		25℃	–	230	350		
		50℃	–	115	180		
Response Time (fall)	Tf	0℃	–	250	400	ms	NOTE 2
		25℃	–	80	120		
		50℃	–	60	90		

note:

T : TRANSMISSIVE
M : NORMALLY BLACK(COLOR)

4-2. Color of CIE Coordinate

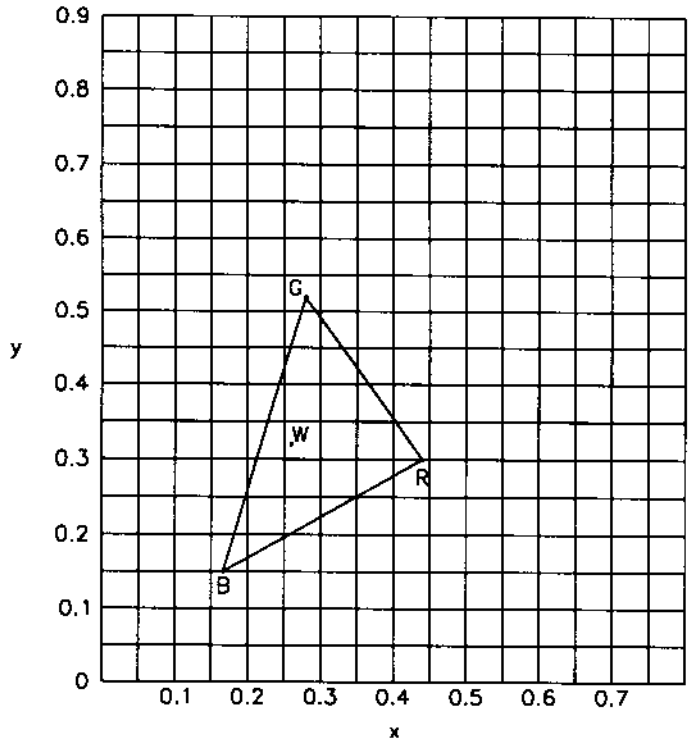
Ta = 25°C

ITEM		SYMBOL	CONDITION	VALUE	NOTE
Color of CIE Coordinate	Red	X	$\phi=0°$, $\theta=0°$ CCFL BACKLIGHT COLOR DEGREE X=0.297 Y=0.297	0.4433	Note✱
		y		0.3089	
	Green	X		0.2795	
		y		0.5225	
	Blue	X		0.1641	
		y		0.1537	
	White	X		0.2635	
		y		0.3296	

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

Tolerance : ±0.05

Fig.1



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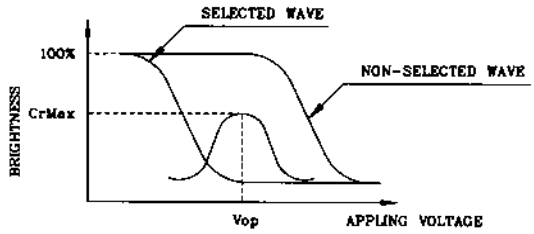
(NOTE 1)

Definition of Operation Voltage(Vop)



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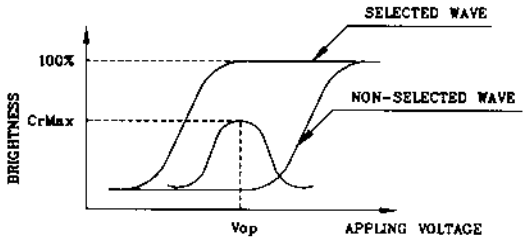


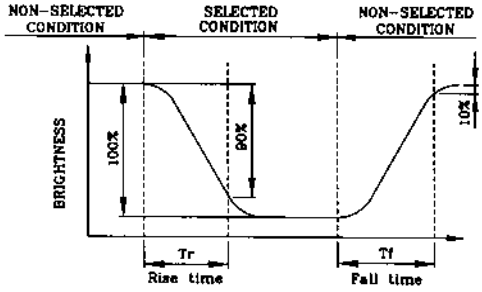
(negative type)

*Conditions

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

(NOTE 2)

Definition of Response Time(Tr,Tf)



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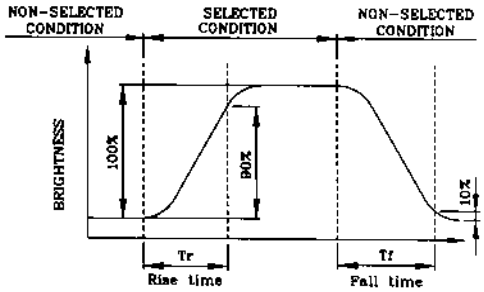


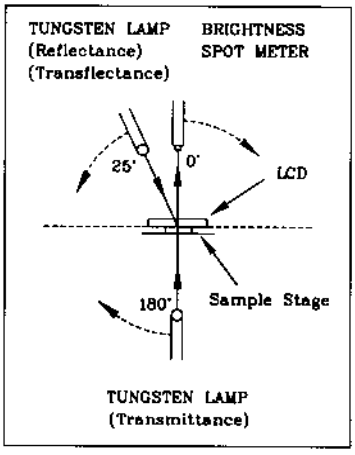
(negative type)

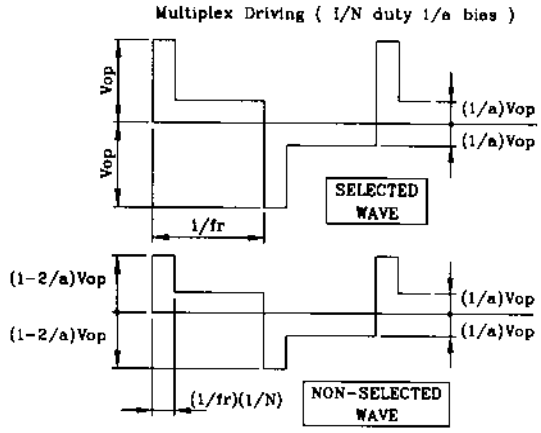
*Conditions

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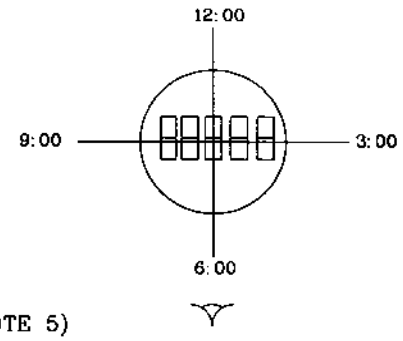
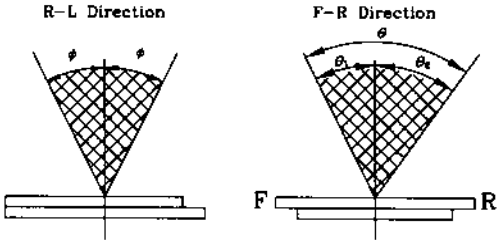
(NOTE 4)

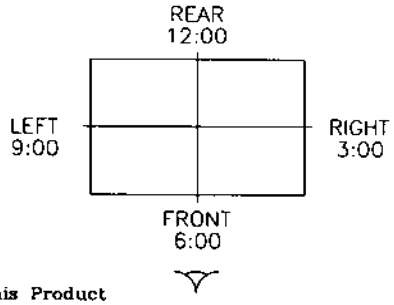
Definition of Viewing Direction



(NOTE 5)

Definition of Viewing Angle





*For This Product

The Viewing Direction Is 6 O'clock

So $\theta 1 > \theta 2$

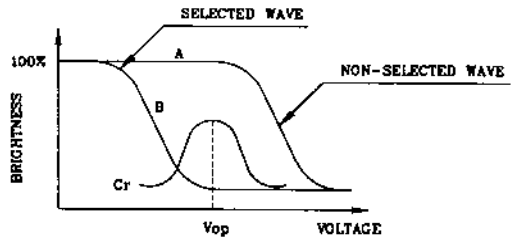
$\theta = \theta_1 + \theta_2$

*Conditions

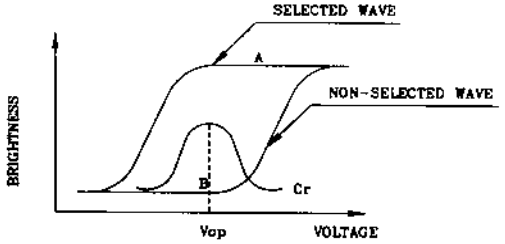
Operating Voltage : Vop
Frame Frequency : 70Hz
Appling Waveform : 1/N duty 1/a bias
Contrast Ratio : larger than 2

(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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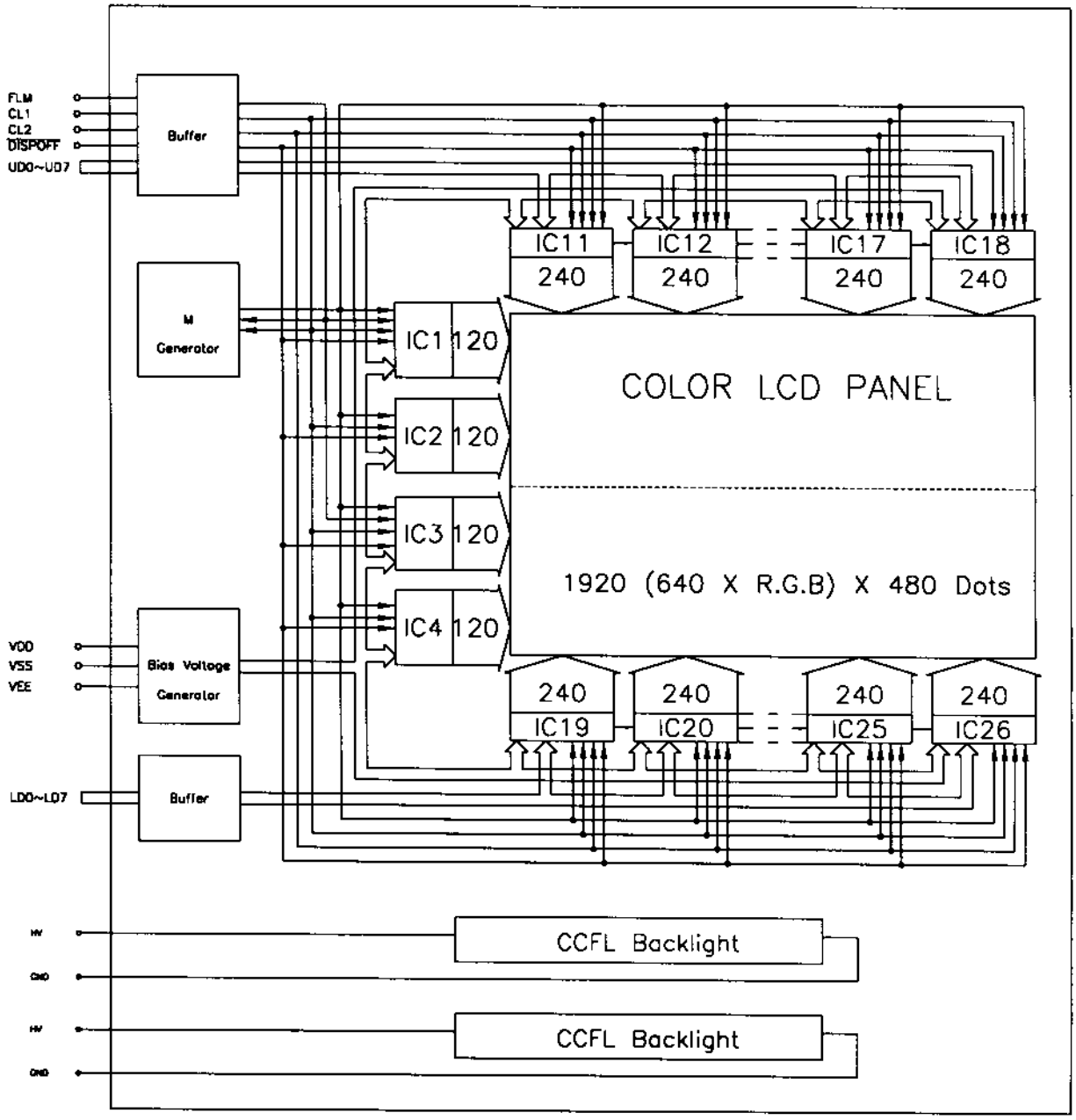
5. BLOCK DIAGRAM



* M GENERATOR SETTING

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

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6. INTERFACE PIN CONNECTION

INTERFACE		PIN NO.	SYMBOL	FUNCTION
LCM	CN1	1	FLM	The FLM signal indicates the beging of each display cycle.
		2	NC	
		3	$\overline{\text{DISPOFF}}$	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
	CN2	1	LD0	Display data for lower column driver
		2	LD1	Display data for lower column driver
		3	LD2	Display data for lower column driver
		4	LD3	Display data for lower column driver
		5	LD4	Display data for lower column driver
		6	LD5	Display data for lower column driver
		7	LD6	Display data for lower column driver
		8	LD7	Display data for lower column driver
		9	VDD	+5V
		10	VSS	GND
		11	VSS	GND
		12	VEE	Power supply voltage for LCD (+)
		13	VEE	Power supply voltage for LCD (+)
		14	VEE	Power supply voltage for LCD (+)

CN1:15PIN MOLEX 53261-1590 CN2:14PIN MOLEX 53261-1490

INTERFACE		PIN NO.	SYMBOL	FUNCTION
CFL	FLCN1	1	GND	CFL GND
		2	N.C	–
		3	N.C	–
		4	HV	Power supply voltage for CFL

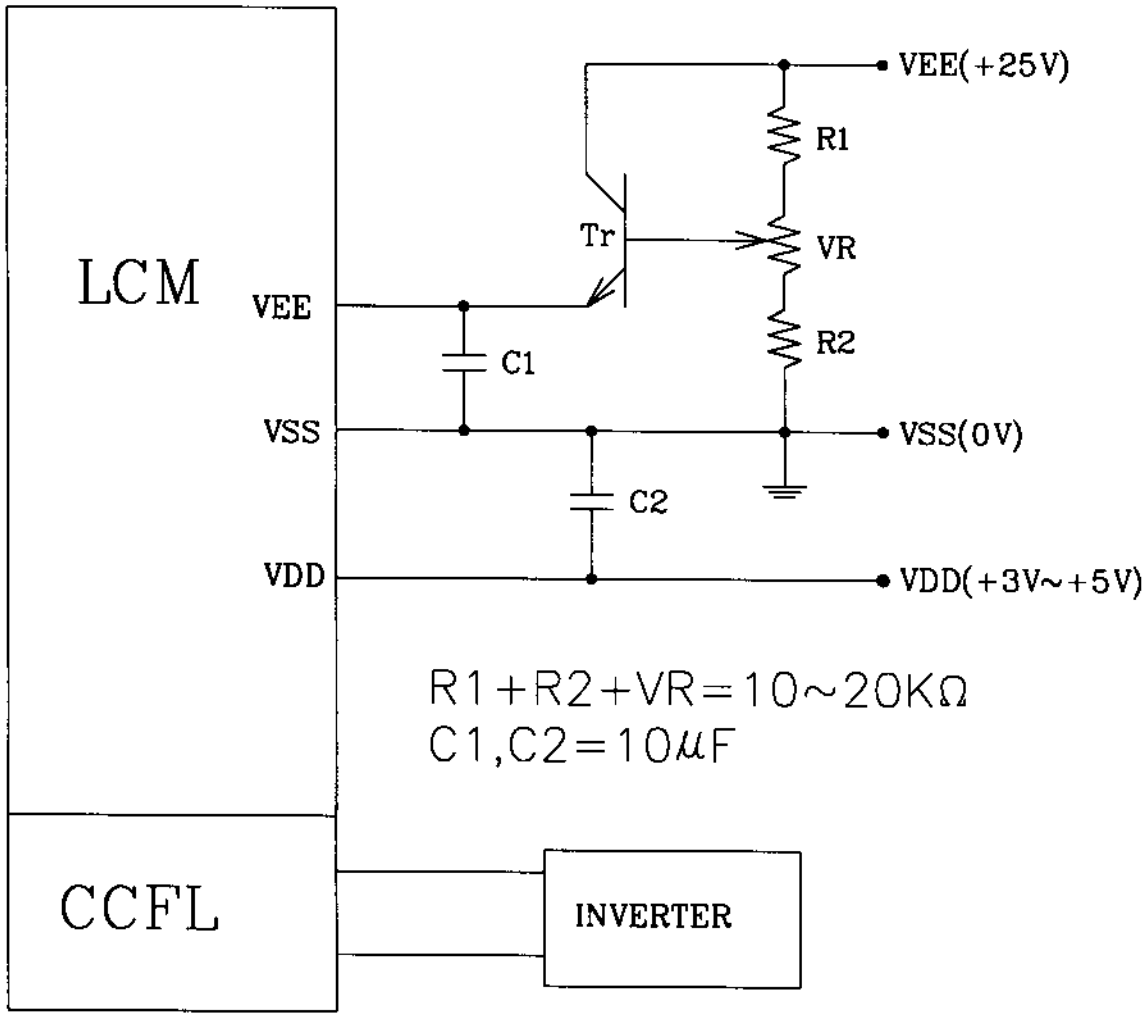
FLCN1:MITSUMI/M63M83-04

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

TOUCH PANEL CONNECTION

INTERFACE	PIN NO.	SYMBOL	PIN NO.	SYMBOL
HEATSEAL	1.	X1	3.	X2
	2.	Y1	4	Y2

7. POWER SUPPLY



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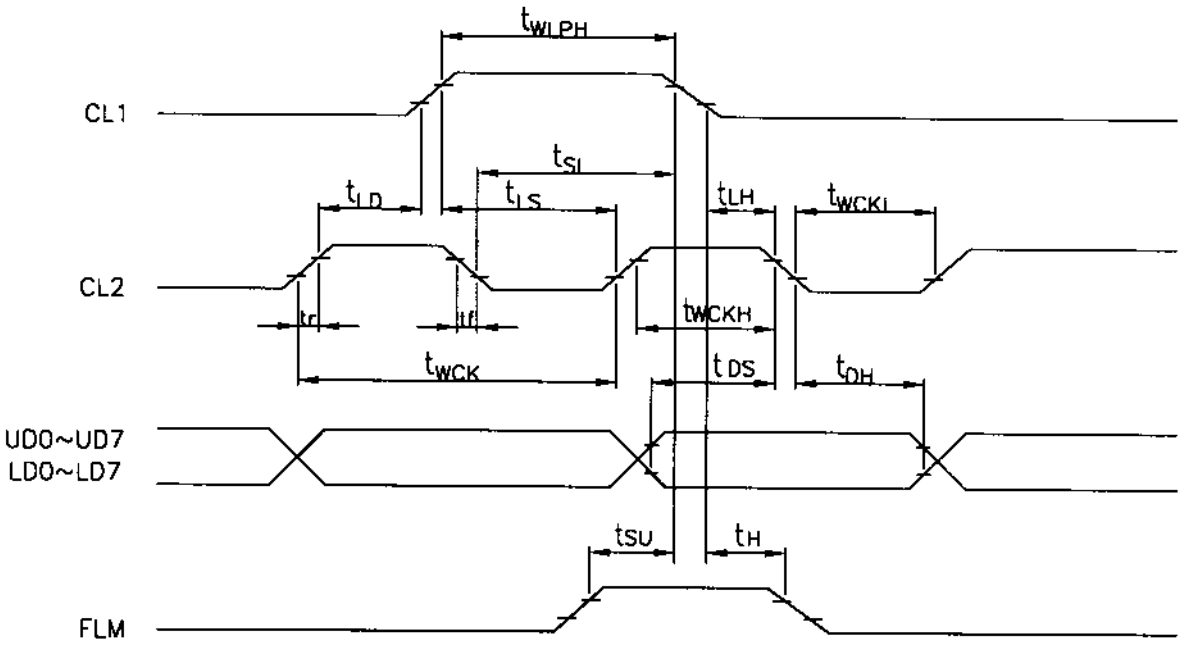
8. TIMING CHARACTERISTICS

8-1. INTERFACE TIMING

VDD=5.0V ± 10%

Parameter	SYMBOL	MIN.	MAX.	UNIT
CLOCK PULSE CYCLE TIME	t_{WCK}	40	–	ns
CLOCK PULSE HIGH LEVEL WIDTH	t_{WCKH}	12	–	ns
CLOCK PULSE LOW LEVEL WIDTH	t_{WCKL}	14	–	ns
LATCH PULSE HIGH LEVEL WIDTH	t_{WLPH}	15	–	ns
CL2→CL1 RISE TIME	t_{LD}	5	–	ns
CL2→CL1 FALL TIME	t_{SL}	25	–	ns
CL1→CL2 RISE TIME	t_{LS}	25	–	ns
CL1→CL2 FALL TIME	t_{LH}	25	–	ns
CLOCK PULSE RISE/FALL TIME	t_r , t_f	–	50	ns
DATA SETUP TIME	t_{DS}	5	–	ns
DATA HOLD TIME	t_{DH}	15	–	ns
FLM SETUP TIME	t_{SU}	30	–	ns
FLM HOLD TIME	t_H	50	–	ns



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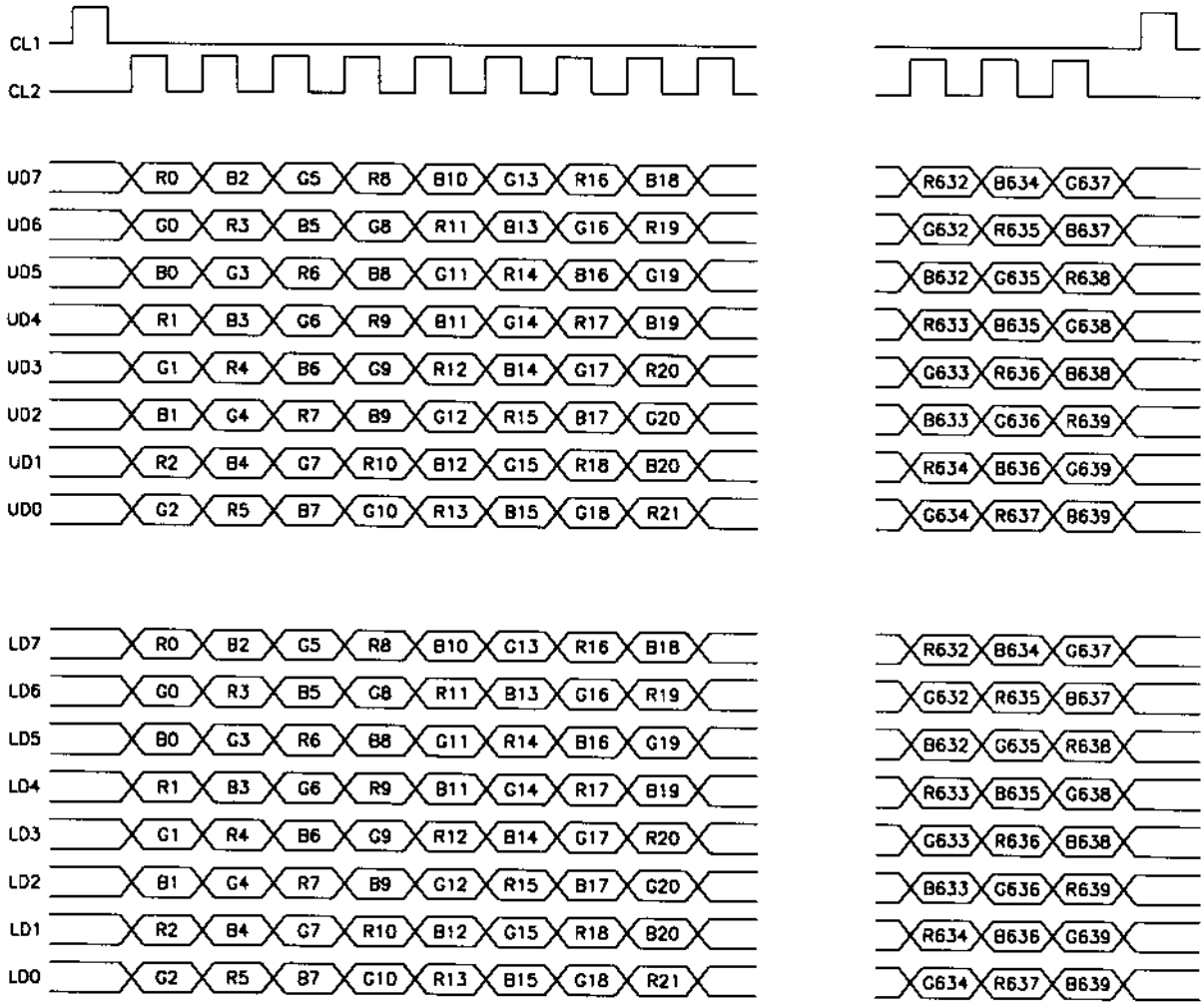
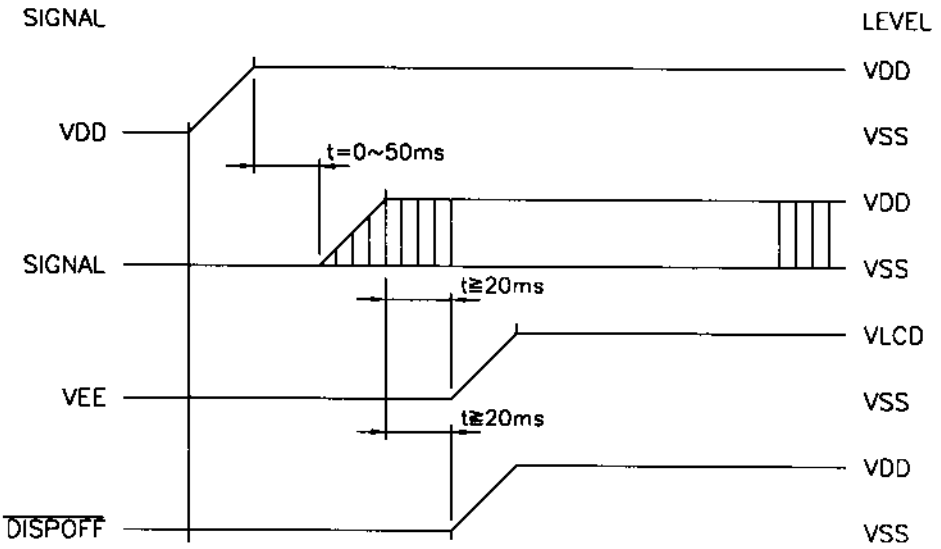
8-2. TIMING CHART

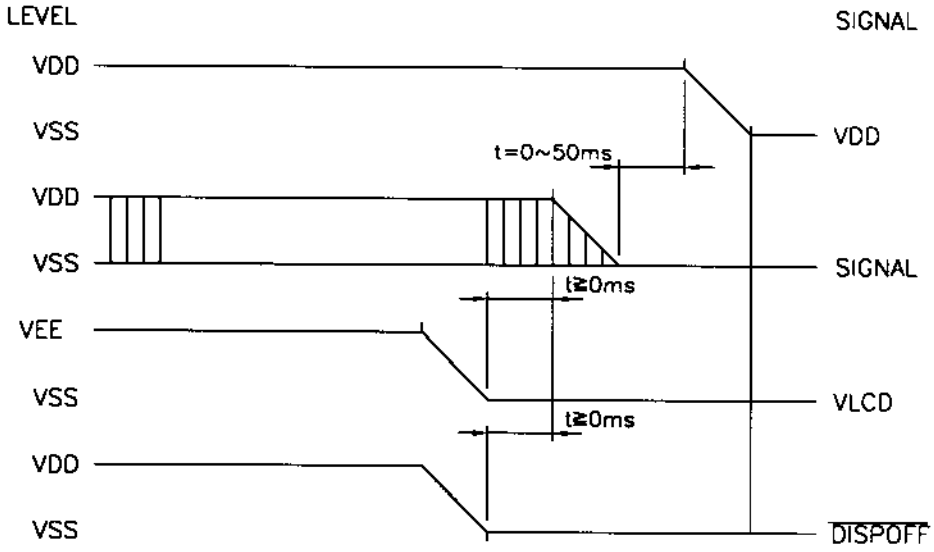


8-3. POWER ON/OFF TIMING

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.

9. DISPLAY

	1	2	3	4	5	6	7	8
1	R0 UD7	G0 UD6	B0 UD5	R1 UD4	G1 UD3	B1 UD2	R2 UD1	G2 UD0
2	R0 UD7	G0 UD6	B0 UD5	R1 UD4	G1 UD3	B1 UD2	R2 UD1	G2 UD0

	1913	1914	1915	1916	1917	1918	1919	1920
	G637 UD7	B637 UD6	R638 UD5	G638 UD4	B638 UD3	R639 UD2	G639 UD1	B639 UD0
	G637 UD7	B637 UD6	R638 UD5	G638 UD4	B638 UD3	R639 UD2	G639 UD1	B639 UD0

239	R0 UD7	G0 UD6	B0 UD5	R1 UD4	G1 UD3	B1 UD2	R2 UD1	G2 UD0
240	R0 UD7	G0 UD6	B0 UD5	R1 UD4	G1 UD3	B1 UD2	R2 UD1	G2 UD0
241	R0 LD7	G0 LD6	B0 LD5	R1 LD4	G1 LD3	B1 LD2	R2 LD1	G2 LD0
242	R0 LD7	G0 LD6	B0 LD5	R1 LD4	G1 LD3	B1 LD2	R2 LD1	G2 LD0

	G637 UD7	B637 UD6	R638 UD5	G638 UD4	B638 UD3	R639 UD2	G639 UD1	B639 UD0
	G637 UD7	B637 UD6	R638 UD5	G638 UD4	B638 UD3	R639 UD2	G639 UD1	B639 UD0
	G637 LD7	B637 LD6	R638 LD5	G638 LD4	B638 LD3	R639 LD2	G639 LD1	B639 LD0
	G637 LD7	B637 LD6	R638 LD5	G638 LD4	B638 LD3	R639 LD2	G639 LD1	B639 LD0

479	R0 LD7	G0 LD6	B0 LD5	R1 LD4	G1 LD3	B1 LD2	R2 LD1	G2 LD0
480	R0 LD7	G0 LD6	B0 LD5	R1 LD4	G1 LD3	B1 LD2	R2 LD1	G2 LD0

	G637 LD7	B637 LD6	R638 LD5	G638 LD4	B638 LD3	R639 LD2	G639 LD1	B639 LD0
	G637 LD7	B637 LD6	R638 LD5	G638 LD4	B638 LD3	R639 LD2	G639 LD1	B639 LD0

10. 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

(2) 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.

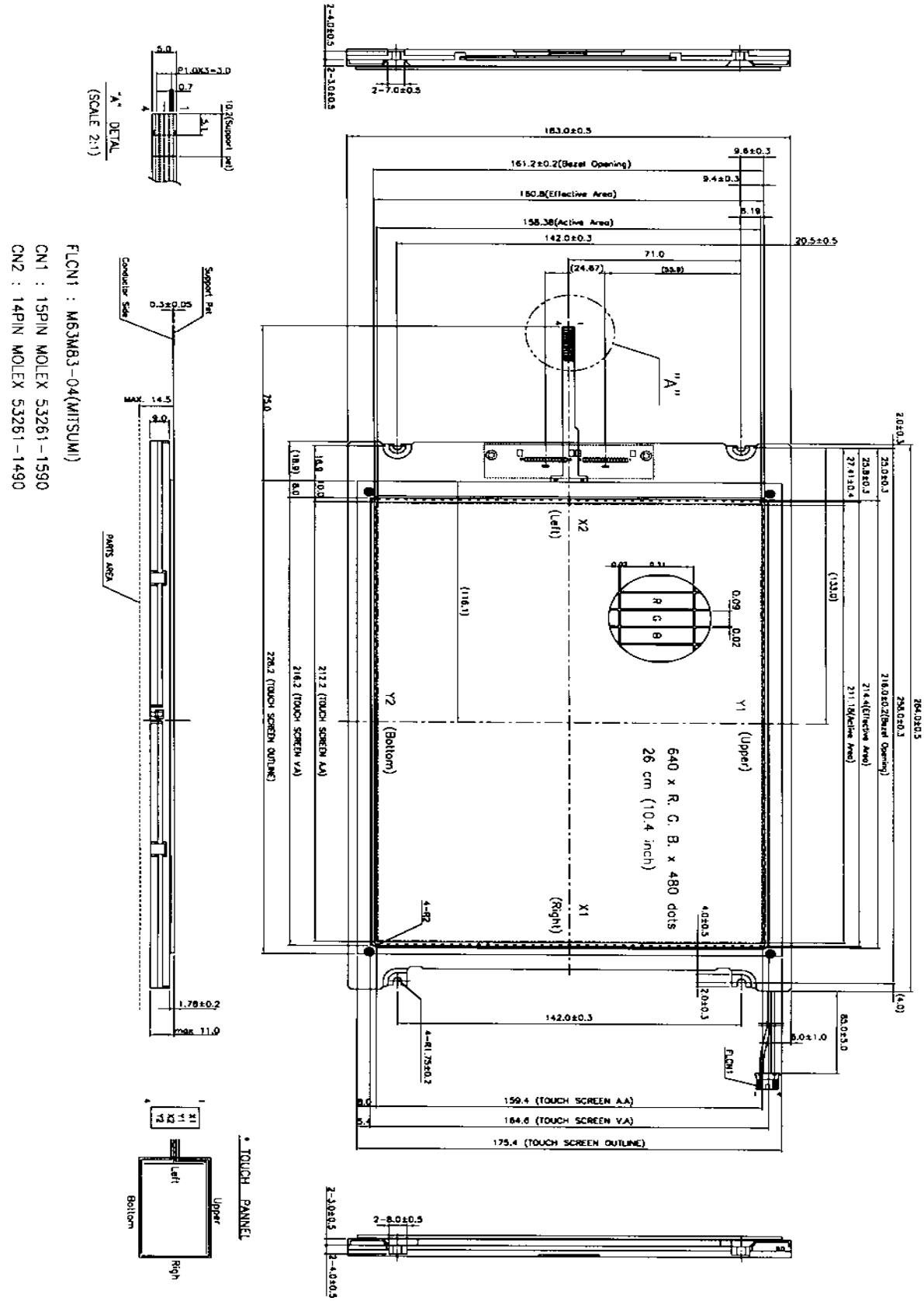
- HANDLING
  1.Avoid static electricity which can damage the CMOS LSI.
  2.Do not remove the panel or frame from the module.
  3.The polarizing plate of the display is very fragile. So, please handle it very carefully.
  4.Do not wipe the polarizing plate with a dry cloth, as it may easily scratch the 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 : 20,000HR



HANTRONIX, INC. 10080 BUBB RD. CUPERTINO, CA 95014	**Q.A.:** JK	**REV.:** 1.0	HDM6448ATSC	SHEET 22 OF 22 **DATE:** 8/28/02