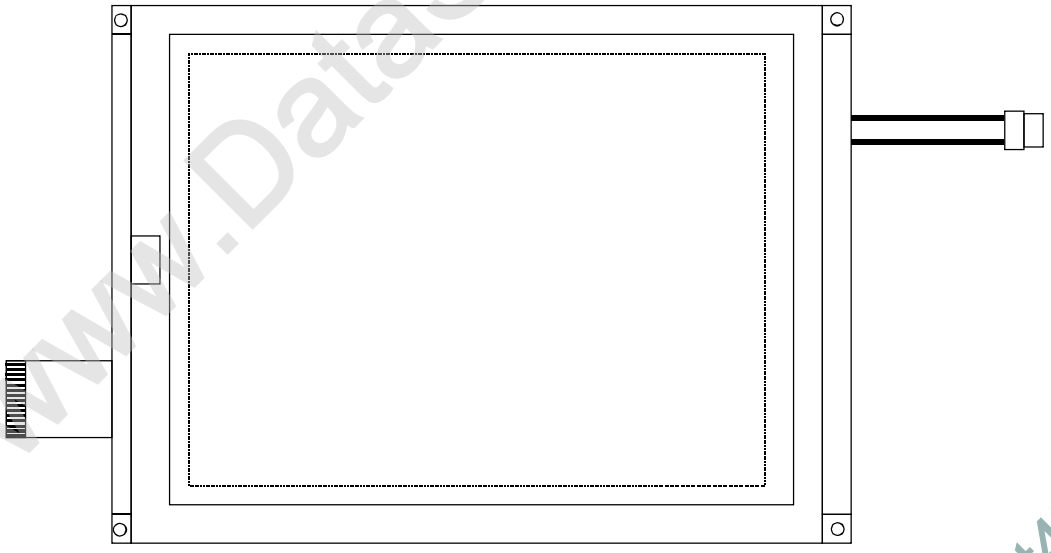
HANTRONIX

PRODUCT SPECIFICATION

HDM6448-7

640 x 480 MONOCHROME GRAPHICS
LCD DISPLAY MODULE



HANTRONIX, INC. 10080 BUBB RD. CUPERTINO, CA 95014	**Q.A.:** JK	**REV.:** 1.0	HDM6448-7	SHEET 1 OF 17 **DATE:** 2/25/02

1. MECHANICAL DATA

(1) Product No.	**HDM6448-7**
(2) Module Size	197.0 (W)mm x 145.0 (H)mm x 11.0 (D)mm
(3) Dot Size	0.217 (W)mm x 0.217 (H)mm
(4) Dot Pitch	0.237 (W)mm x 0.237 (H)mm
(5) Number of Dots	640 (W) x 480 (H)DOTS
(6) Duty	1/480
(7) LCD Display Mode	FSTN: Black and White(Normally Black/Negative Image) Rear Polarizer: Transmissive
(8) Viewing Direction	6 0'clock
(9) Backlight	CCFL
(10) Controller	Excluded
(11) DC/DC Converter	Excluded
(12) Touch Panel	Nonglare (3H Min.)
(13) Weight	371 g(approx.)

2. ABSOLUTE MAXIMUM RATINGS

(1) ELECTRICAL ABSOLUTE RATINGS

VSS=0V

ITEM	SYMBOL	MIN	MAX	UNIT	COMMENT
Power Supply for Logic	VDD−VSS	0	7.0	V	
Power Supply for LCD Drive	VLCD−VSS	−	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

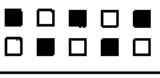
Note 34 Background color changes slightly depending on ambient temperature. This phenomenon is reversible.

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			

3. ELECTRICAL CHARACTERISTICS

3.1 ELECTRICAL CHARACTERISTICS OF LCM

ITEM		SYMBOL	CONDITION		MIN.	TYP.	MAX.	UNIT
Recommended LC Driving Voltage		VEE−VSS	Duty=1/240 Bias=1/13	0°C	38.8	39.1	39.4	V
				25°C	37.1	37.4	37.7	
				50°C	35.9	36.2	36.5	
Input Voltage		VIH	H level		0.8VDD	−	VDD	V
		VIL	L level		0	−	0.2VDD	V
Power Supply Current		IDD	FLM = 70 Hz VDD = 3.3 V VLCD−VSS = 37.4V		−	0.5	−	mA
		ILCD	PATTERN : 		−	23.2	−	mA
CCFL LAMP	Starting Voltage	Vs			−	600	−	Vrms
	Lamp Voltage	VL			−	380	−	Vrms
	Lamp Current	IL			4	5	6	mArms
	Lamp Consumption	PL			−	−	1.63	W
	Lamp Frequency	FL			−	40	−	KHz
	Lamp Life Time	LL	NOTE 1		15000	−	−	hrs
LCM	Surface Luminance	L	ALL ON		−	229	−	cd/m²
			ALL OFF		−	19	−	

NOTE 1: The life is defined by the time when the brightness gets down to 50% of the initial brightness.

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	-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%

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	G	7.0	10.0	10.0	15.0	3.0	5.0	–	50–30	–	±50
note		NOTE6						NOTE5			

AT ø=0° θ=0°

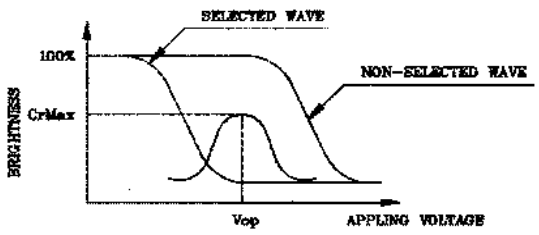
ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Response Time (rise)	Tr	0℃	1000	1500	2200	ms	NOTE 2
		25℃	290	410	610		
		50℃	120	170	250		
Response Time (fall)	Tf	0℃	350	500	750	ms	NOTE 2
		25℃	90	130	200		
		50℃	50	70	100		

note:

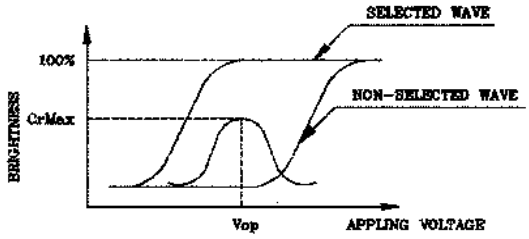
T : Transmission
G : Normally Black , 6 O'clock

(NOTE 1)

Definition of Operation Voltage(Vop)



(positive type)



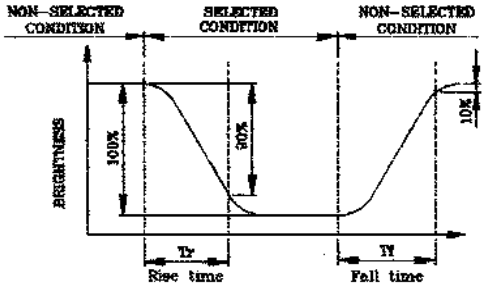
(negative type)

*Conditions

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

(NOTE 2)

Definition of Response Time(Tr,Tf)



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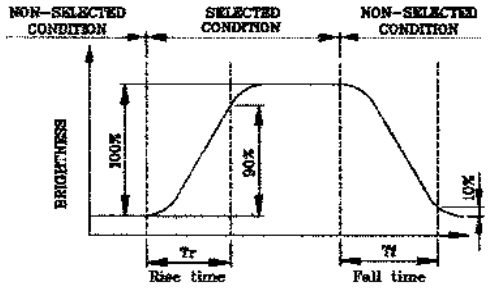


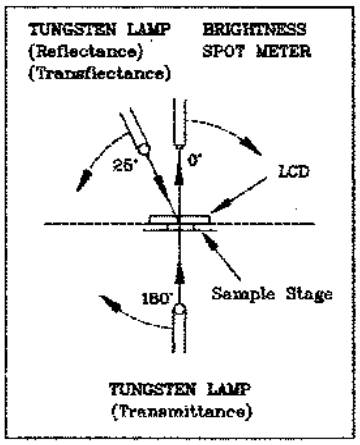
(negative type)

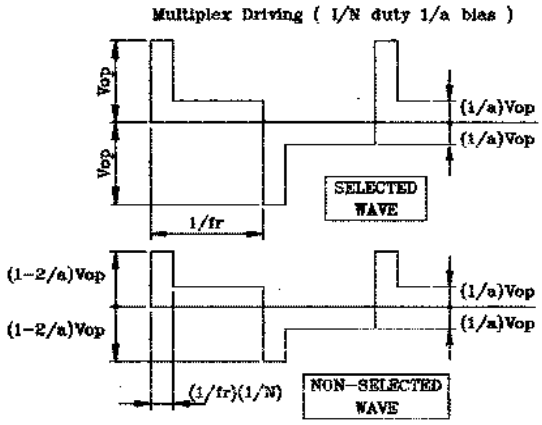
*Conditions

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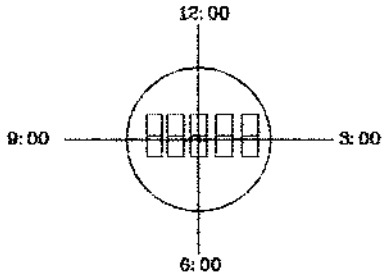
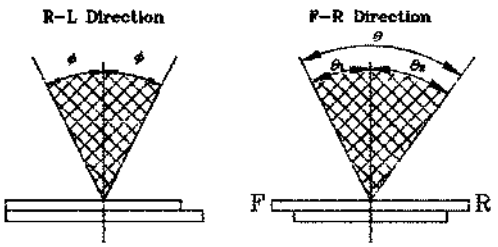
(NOTE 4)

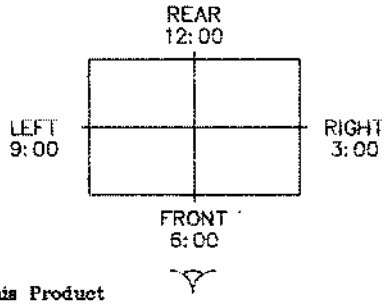
Definition of Viewing Direction



(NOTE 5)

Definition of Viewing Angle





*For This Product

The Viewing Direction is 6 O'clock

So $\theta 1 > \theta 2$

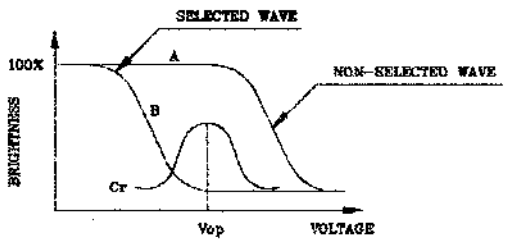
$\theta = \theta_1 + \theta_2$

*Conditions

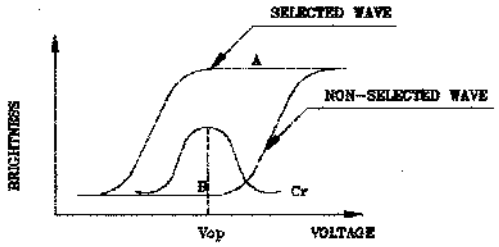
Operating Voltage : Vop
Frame Frequency : 70Hz
Appling Waveform : 1/N duty 1/a bias
Contrast Ratio : larger than 2

(NOTE 6)

Definition of Contrast Ratio (Cr)



(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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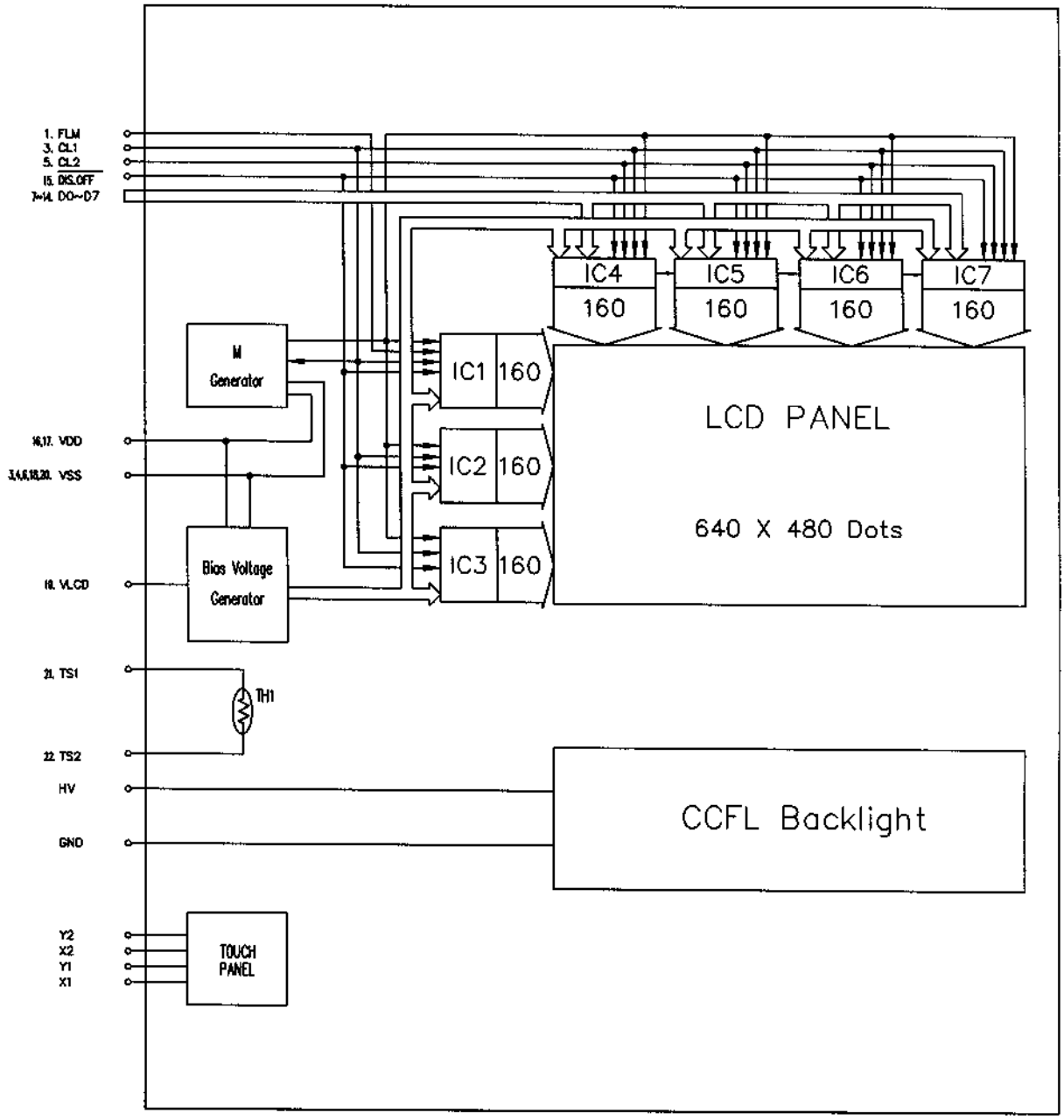
5. BLOCK DIAGRAM



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6. INTERFACE PIN CONNECTION

FFC: PITCH 1.0mm / Suitable Connector : IL-402-25S-S1L-SA(JAE)

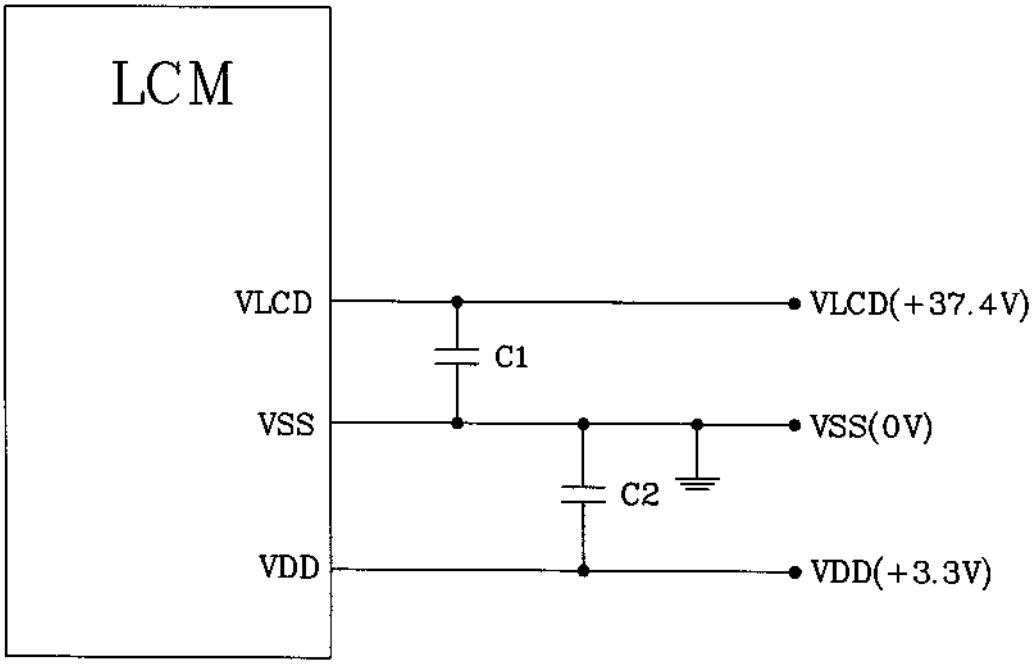
INTERFACE	PIN NO.	SYMBOL	FUNCTION
LCM	1	FLM	Scan start-up signal
	2	VSS	GND
	3	CL1	Input data latch signal
	4	VSS	GND
	5	CL2	Data input clock
	6	VSS	GND
	7	D0	Display data
	8	D1	Display data
	9	D2	Display data
	10	D3	Display data
	11	D4	Display data
	12	D5	Display data
	13	D6	Display data
	14	D7	Display data
	15	$\overline{DIS.OFF}$	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	VLCD	Power supply voltage for LC
	20	VSS	GND
	21	TS1	TEMPERATURE SENSOR PIN1
	22	TS2	TEMPERATURE SENSOR PIN2
TOUCH PANEL	1	Y(-)	Touch Panel Right
	2	X(-)	Touch Panel Bottom
	3	Y(+)	Touch Panel Left
	4	X(+)	Touch Panel Top

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

7. POWER SUPPLY



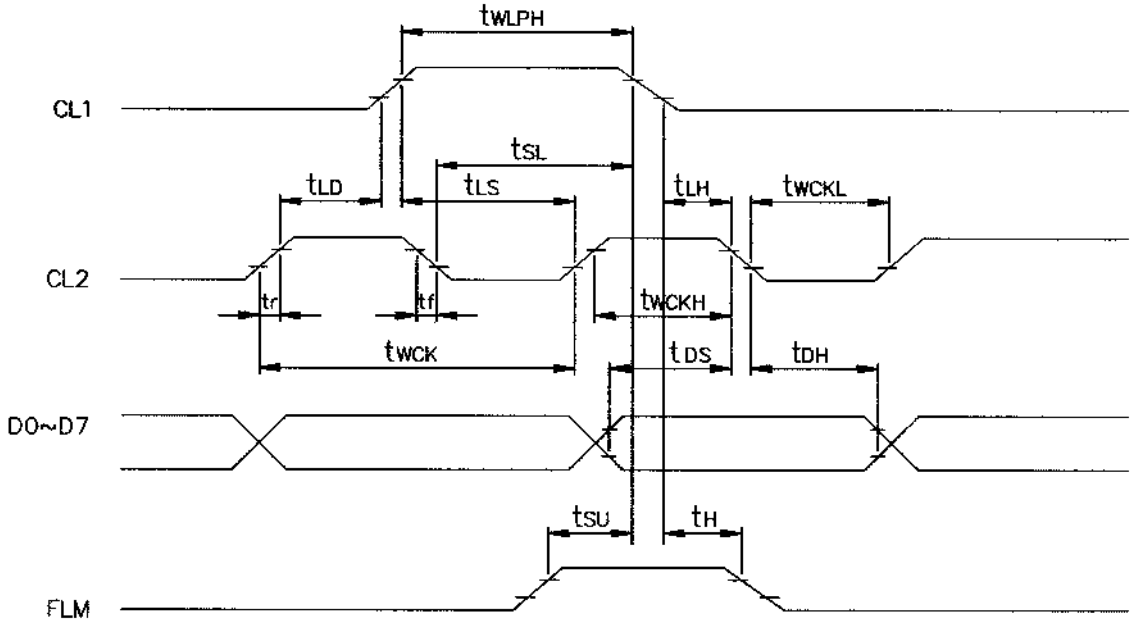
C1,C2=10μF

8. 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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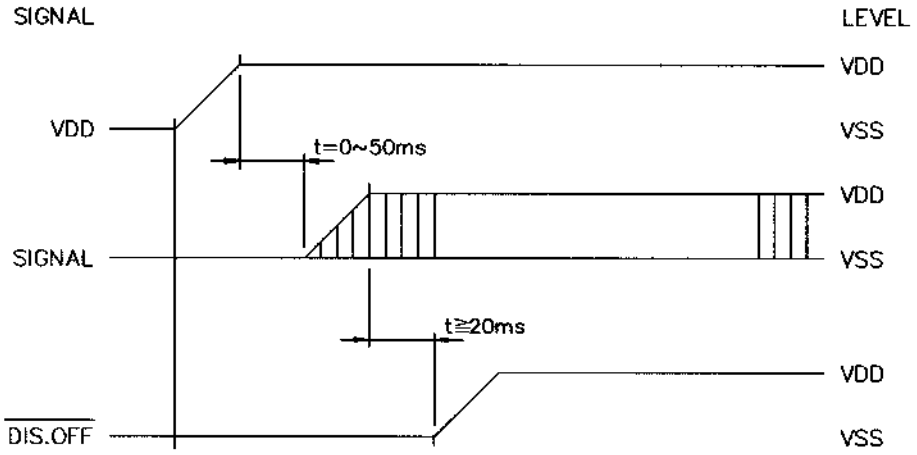
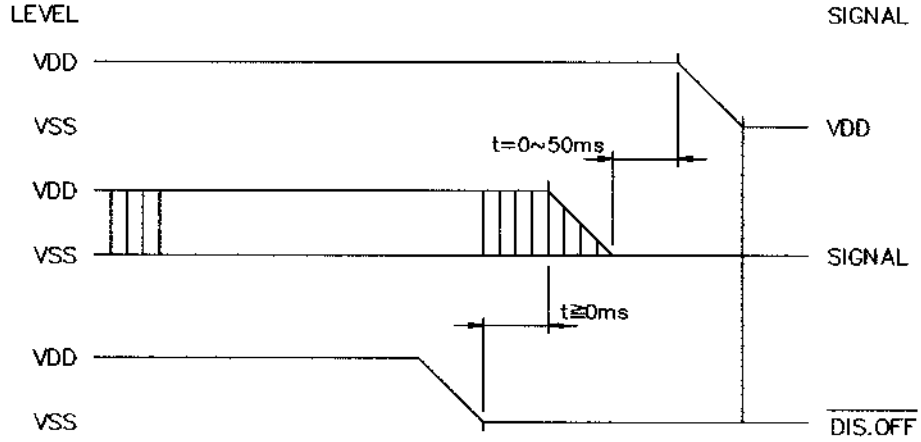
8-2.POWER ON/OFF TIMING

ON SEQUENCE



OFF SEQUENCE



Please maintain the above sequence when turning on and off the power supply of the module. If $\overline{\text{DIS.OFF}}$ 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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9. DISPLAY

	1	2	3	4	5	6	7	8	
1	D7	D6	D5	D4	D3	D2	D1	D0	
2	D7	D6	D5	D4	D3	D2	D1	D0	

	633	634	635	636	637	638	639	640
	D7	D6	D5	D4	D3	D2	D1	D0
	D7	D6	D5	D4	D3	D2	D1	D0

479	D7	D6	D5	D4	D3	D2	D1	D0	
480	D7	D6	D5	D4	D3	D2	D1	D0	

	D7	D6	D5	D4	D3	D2	D1	D0
	D7	D6	D5	D4	D3	D2	D1	D0

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

NOTICE:

- 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.

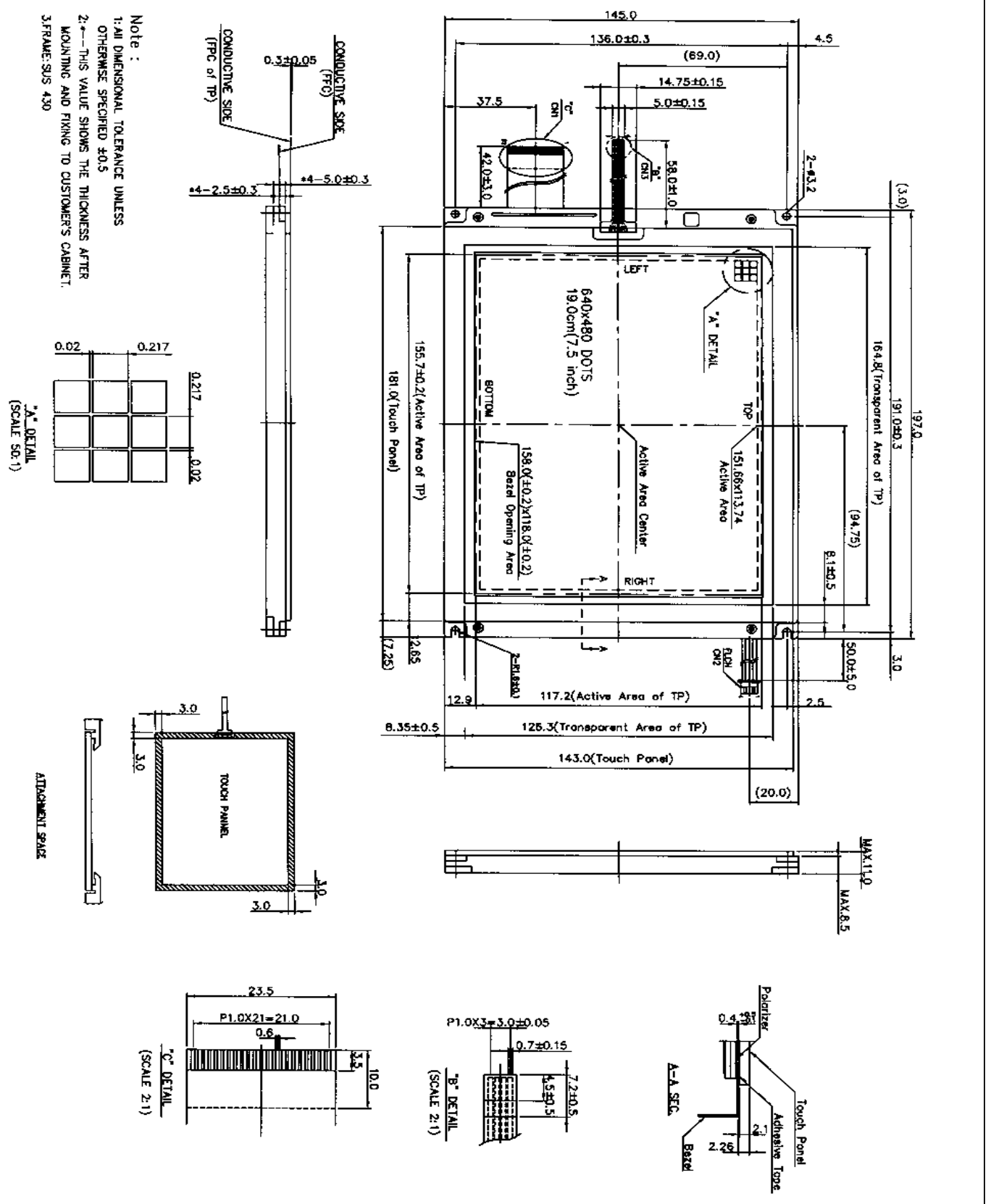
- HANDLING
  1. Avoid static electricity which can damage the CMOS LSI.
  2. Do not remove the panel or frame from the module.
  3. The polarizing plate of the display is very fragile. So, please handle it very carefully.
  4. Do not wipe the polarizing plate with a dry cloth, as it may easily scratch 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 : 15000 hrs for lamp-current 5mA, 35KHz, 25°C
  (Operating life time is defined as follows : The final brightness is at 50% of original brightness.)



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