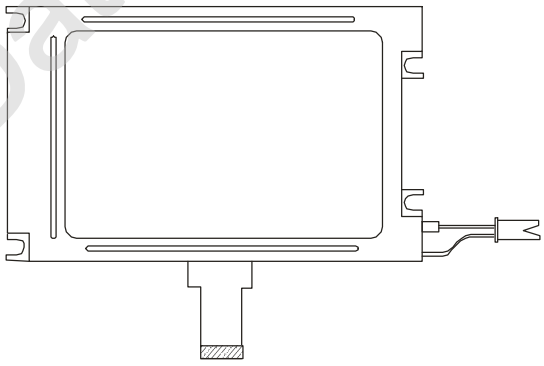
HANTRONIX

PRODUCT SPECIFICATION

HDM3224TSC-S-L

3224 COLOR GRAPHICS
LCD DISPLAY MODULE



HANTRONIX, INC. 10080 BUBB RD. CUPERTINO, CA 95014	**Q.A.:** JB	**REV.:** 1.0	HDM3224TSC-S-L	SHEET 1 OF 17 **DATE:** 2/22/01

MECHANICAL DATA

(1) Product No.		HDM3224TSC-S-L
(2) Module Size		76.8 (W)mm x 103.75 (H)mm x 7.9(D)mm
(3) Dot Size		0.234 (W)mm x 0.068 (H)mm
(4) Dot Pitch		0.249 (W)mm x 0.083 (H)mm
(5) Number of Dots		240 (W) x (320 xRGB (H)) Dots
(6) Duty		1/240
(7) LCD Display Mode	FSTN:	Color STN Module
	REAR POLARIZER:	Color Transmissive Type
(8) Viewing Direction		3 O'clock
(9) Backlight		CCFL
(10) Controller		Excluded
(11) DC/DC Converter		Excluded
(12) Weight		65.0 g(approx.)

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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	7.0	V	
Power Supply for LCD Drive	VEE−VSS	0	30.0	V	
Input Voltage	VI	−0.3	VDD+0.3	V	
Static Electricity	−	−	−	−	Note 1

(2) ENVIRONMENTAL ABSOLUTE MAXIMUM RATINGS

ITEM	NORMAL TEMP.			
	OPERATING		STORAGE	
	MIN.	MAX.	MIN.	MAX.
Ambient Temperature	0	50	−20	60
Humidity (Without Condensation)	Note 2,4		Note 3,4	

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 60°C will be < 120 hrs

Note 4 Background will color change slightly depending on ambient temperature. That phenomenon is reversible.

ELECTRICAL CHARACTERISTICS

LCD

ITEM		SYMBOL	CONDITION		MIN.	TYP.	MAX.	UNIT
Logic Circuit Power Supply		VDD−VSS	Ta= 25°C		3.0	3.3	3.6	V
					4.5	5.0	5.5	
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=1/14 VDD=5.0V	0°C	24.9	25.2	25.5	V
				25°C	23.7	24.0	24.3	
				50°C	22.7	23.0	23.3	
Supply Current for Logic		IDD	VDD−VSS = 5.0V VEE−VSS = 24.0V Ta= 25°C PATTERN: ■□■□■□■□ □■□■□■□■		−	2.0	3.5	mA
Supply Current for LCD		IEE			−	12.0	18.0	mA
LCM	Surface Luminance	L	VDD−VSS=5.0V VEE−VSS=24.0V Ta= 25°C I_L=2.5mArms	PATTERN: (Dots All On of White Color) □□□□ □□□□	−	66.7	−	cd/m²
				PATTERN: (Dots All Off) ■■■■ ■■■■	−	5.5	−	cd/m²

CCFL

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	REMARK
Lamp Voltage	V_L	−	300	−	Vrms	I_L = 2.5mArms
Lamp current	I_L	1.5	2.5	3	mArms	(*1)
Lamp power consumption	P_L	0.5	0.8	1	W	(*2)
Lamp frequcncy	F_L	30	40	50	KHz	
Lamp life time	L_L	−	20000	−	hrs	

(*1) It is recommended that I_L be not more than 2.5 mArms so that heat radiation of CCFT backlight may least affect the display quality .

(*2) Power consumption exclud inverter .

OPTICAL CHARACTERISTICS

Optical Char. of Normal Temp. Mode

AT Vop

ITEM / MODE		Cr(Contrast Ratio)						θ(Viewing Angle)		ϕ(Viewing Angle)	
		0°C		25°C		50°C		25°C		25°C	
		MIN.	TYP.	MIN.	TYP.	MIN.	TYP.	MIN.	TYP.	MIN.	TYP.
T	R	–	25	–	35	–	10	–	42	–	(L) 37 (R) 60
NOTE		NOTE 6						NOTE 5			

note:

T: TRANSMISSIVE
R: NORMALLY BLACK 3 O'CLOCK

AT ϕ=0° θ=0°

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Response Time (rise)	Tr	0°C	550	700	850	ms	NOTE 2
		25°C	210	260	310		
		50°C	80	100	120		
Response Time (fall)	Tf	0°C	220	270	320	ms	NOTE 2
		25°C	65	80	95		
		50°C	45	60	75		

Color of CIE Coordinate

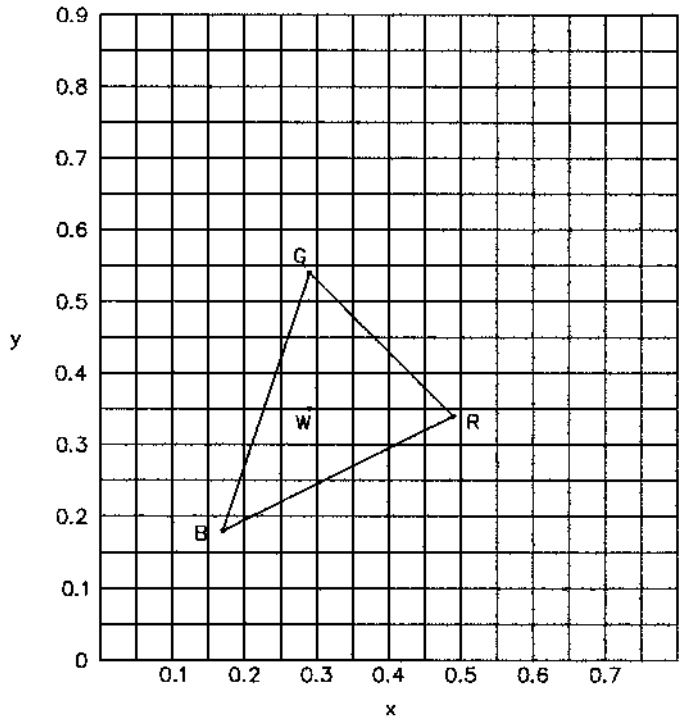
Ta = 25°C

ITEM		SYMBOL	CONDITION	VALUE	BRIGHTNESS (cd/m²)	NOTE
Color of CIE Coordinate	Red	X	$\phi=0°$, $\theta=0°$	0.49	17.2	Note✱
		y		0.34		
	Green	X		0.29	46.1	
		y		0.53		
	Blue	X		0.17	16.1	
		y		0.18		
	White	X		0.29	66.7	
		y		0.35		

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

Tolerance : ±0.05

Fig.1



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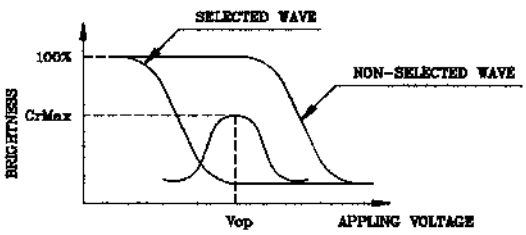
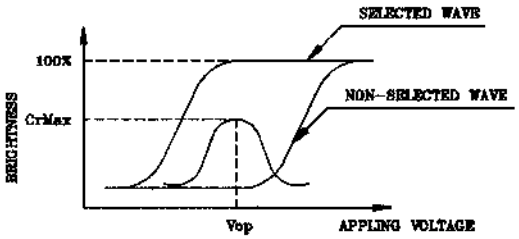
(NOTE 1)

Definition of Operation Voltage(Vop)



(positive type)



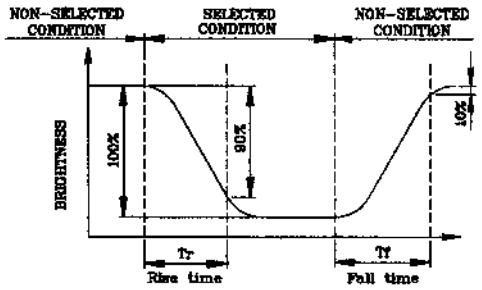
(negative type)

*Conditions

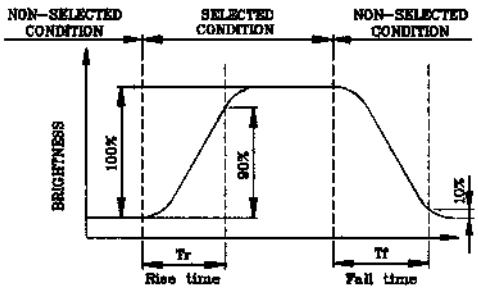
Viewing Angle : 0
Frame Frequency : 70Hz
Appling Waveform : I/N duty 1/a bias

(NOTE 2)

Definition of Response Time(Tr,Tf)



(positive type)



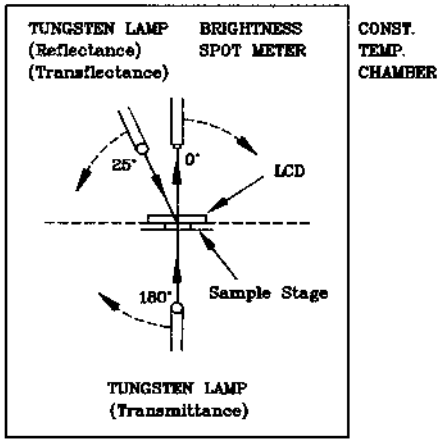
(negative type)

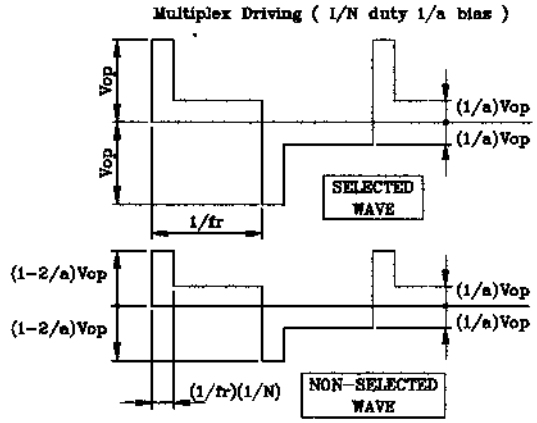
*Conditions

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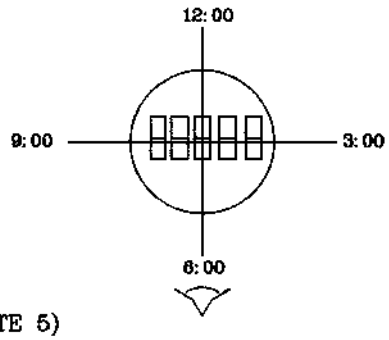
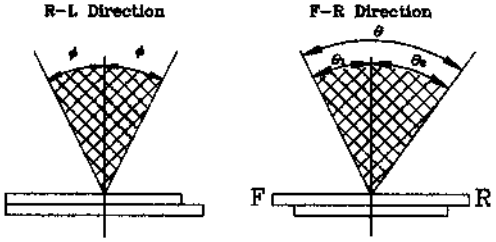
(NOTE 4)

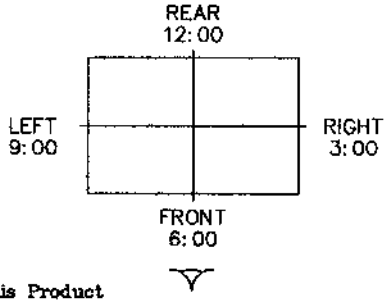
Definition of Viewing Direction



(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

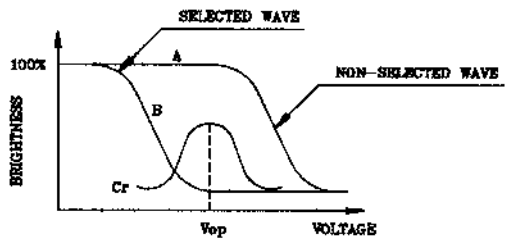
Frame Frequency : 70Hz

Appling Waveform : 1/N duty 1/a bias

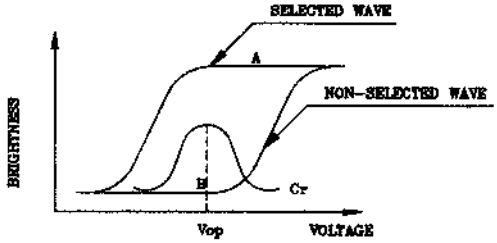
Contrast Ratio : larger than 2

(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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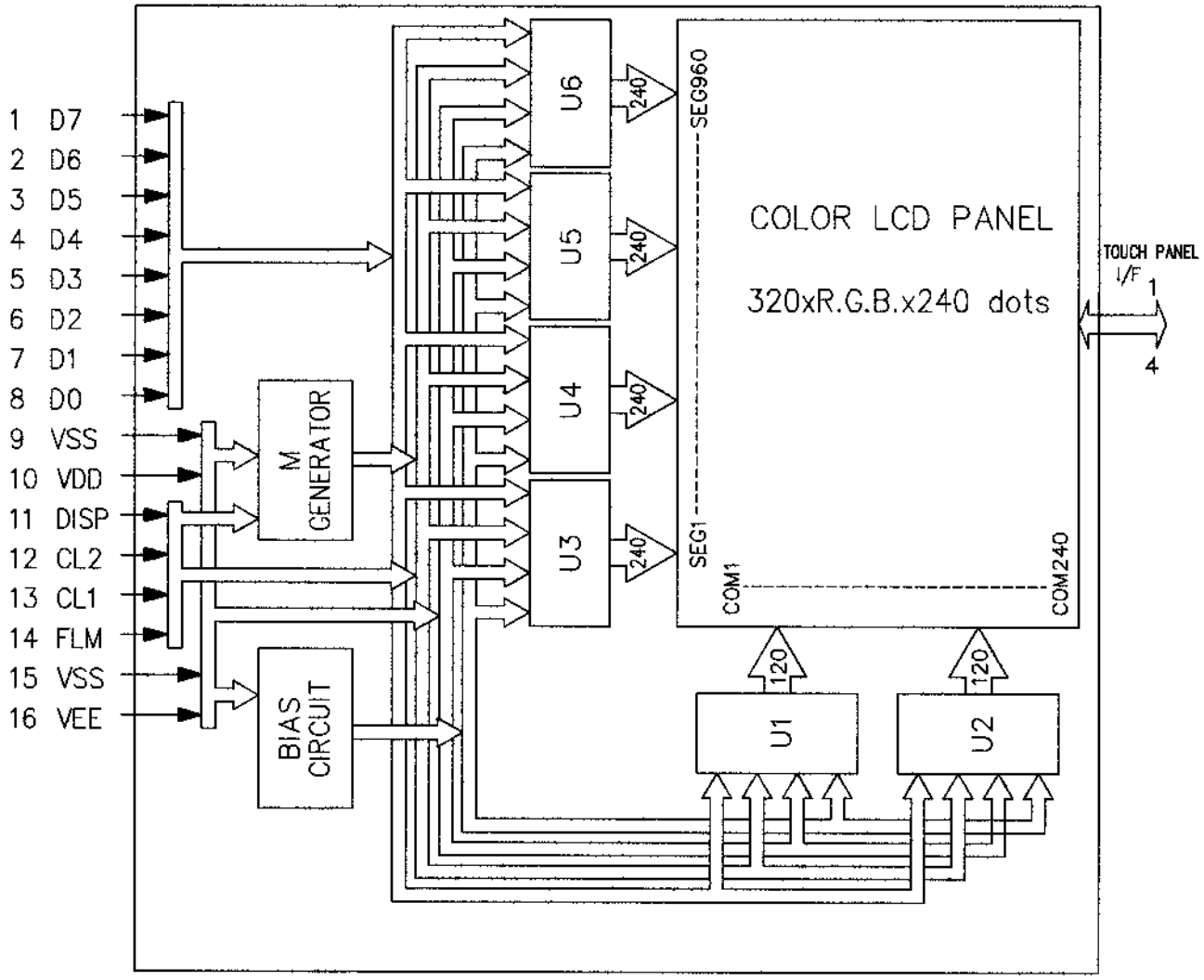
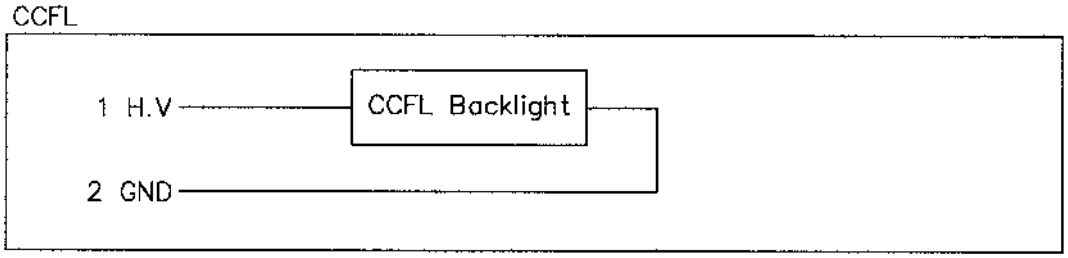
5. BLOCK DIAGRAM





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INTERNAL PIN CONNECTION

LCD

Pin No.	Symbol	Level	Function
1	D7	H/L	Display Data
2	D6	H/L	Display Data
3	D5	H/L	Display Data
4	D4	H/L	Display Data
5	D3	H/L	Display Data
6	D2	H/L	Display Data
7	D1	H/L	Display Data
8	D0	H/L	Display Data
9	VSS	–	GND
10	VDD	–	Power Supply for Logic
11	DISP	H/L	Display Control Signal, H :Display on L :Display off
12	CL2	H/L	Data input clock
13	CL1	H/L	Input data latch signal
14	FLM	H/L	Scan start-up signal
15	VSS	H/L	Power Supply (0V,GND)
16	VEE	–	Power Supply for LCD

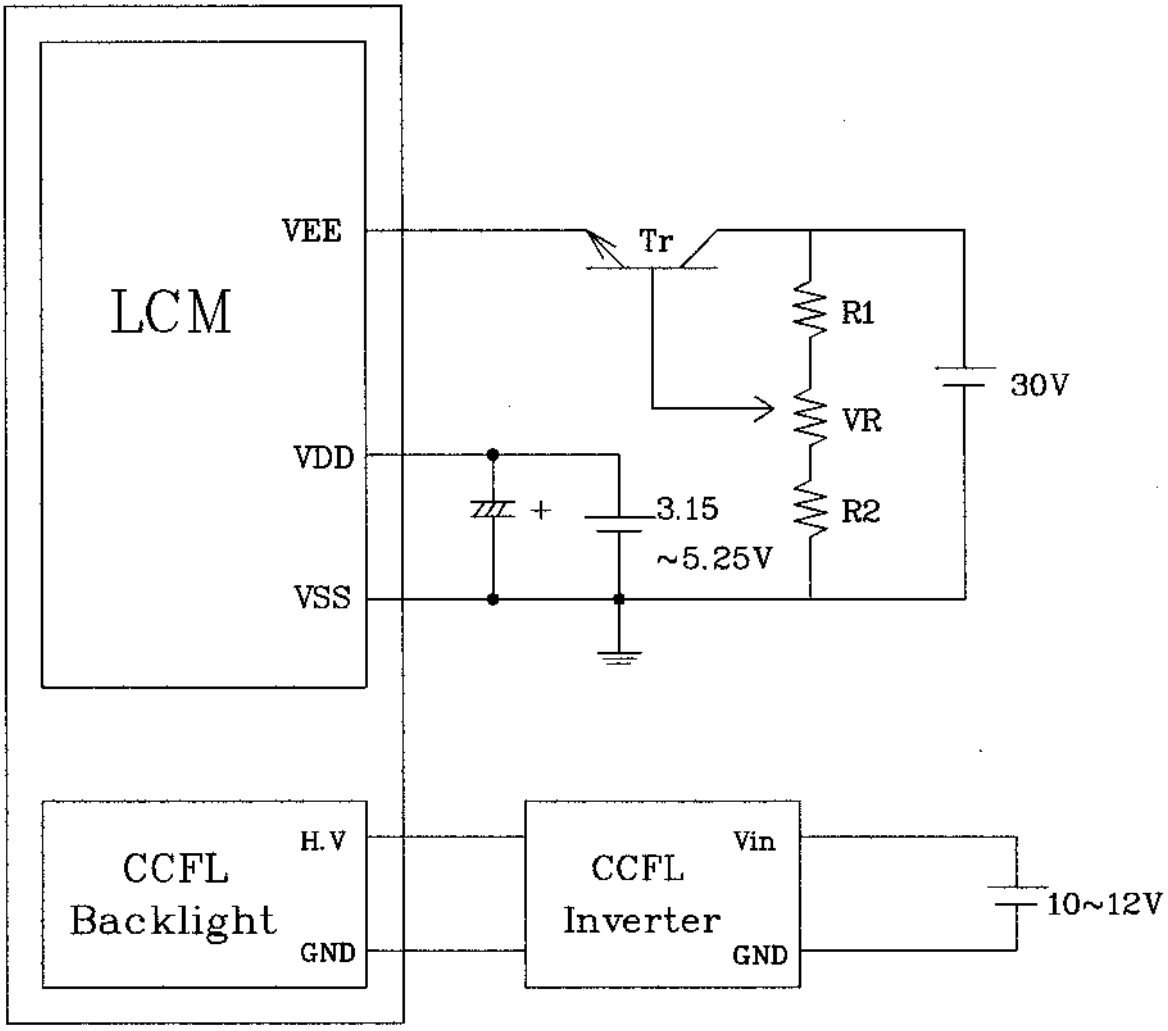
CCFL

Pin No.	Symbol	Level	Function
1	H.V	–	Power Supply for CFL
2	GND	–	CFL GND

LCD INTERFACE CONNECTOR
FH12-16S-0.5SV (HIROSE)/Suitable FFC :pitch 0.5mm ,width 8.5mm

CCFL CONNECTOR :
BHSR -02VS-1 (JST)/Suitable Connector :SM02B-BHSS-1-TB (JST)

POWER SUPPLY



1. R1+R2+VR=10~20KΩ
2. RECOMMENDED CCFL INVERTER :
   COTEK INV-B1

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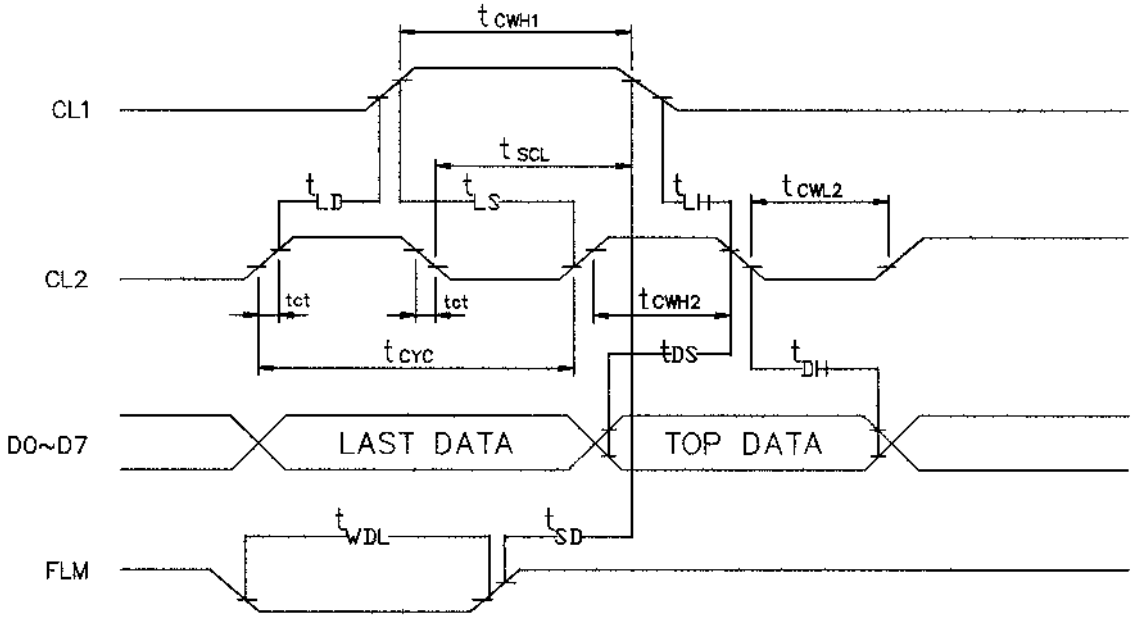
TIMING CHARACTERISTICS

INTERFACE TIMING

VDD=5.0V ± 10%

Parameter	SYMBOL	MIN.	MAX.	UNIT
CLOCK CYCLE TIME	t_{CYC}	50	–	ns
CL2 HIGH LEVEL WIDTH	t_{CWH2}	15	–	ns
CL2 LOW LEVEL WIDTH	t_{CWL2}	15	–	ns
CL1 HIGH LEVEL WIDTH	t_{CWH1}	25	–	ns
CL2 SETUP TIME	t_{SCL}	100	–	ns
CL2 HOLD TIME	t_{HCL}	100	–	ns
CL2 – CL1 RISE TIME	t_{LD}	5	–	ns
CLOCK RISE / FALL TIME	t_{CT}	–	–	ns
DATA SETUP TIME	t_{DS}	10	50	ns
DATA HOLD TIME	t_{DH}	15	–	ns
FLM SETUP TIME	t_{FS}	30	–	ns
DATA HOLD TIME	t_{FH}	50	–	μs
FRAME FREQUENCY	t_{FLM}	60	–	ns



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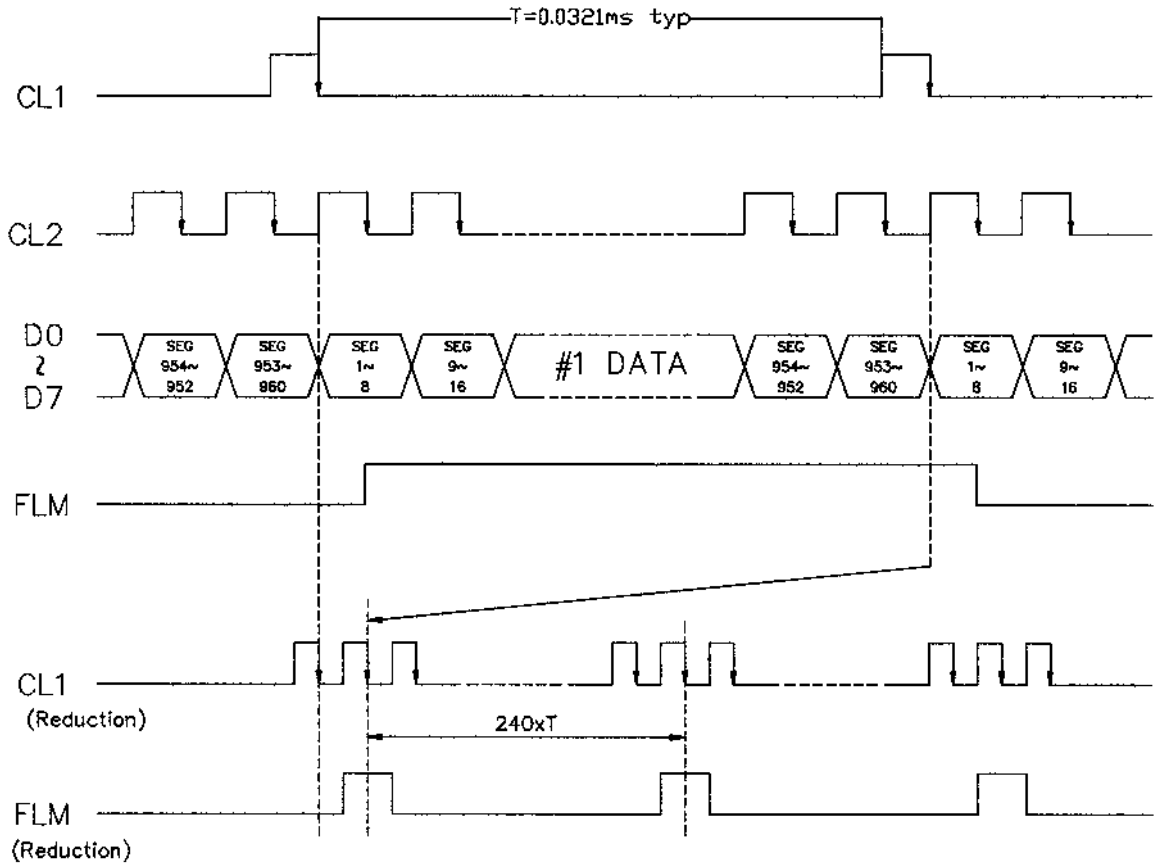
TIMING CHART OF INPUT SIGNAL



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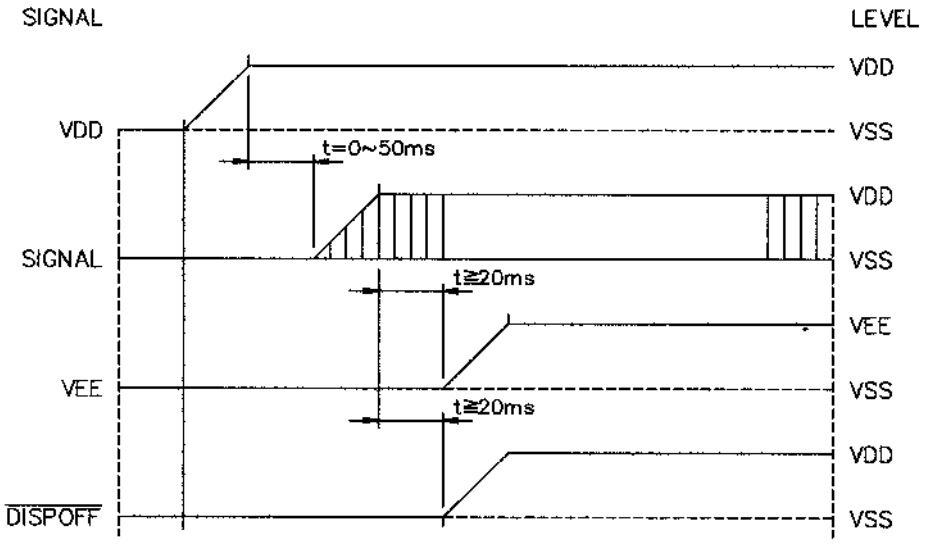
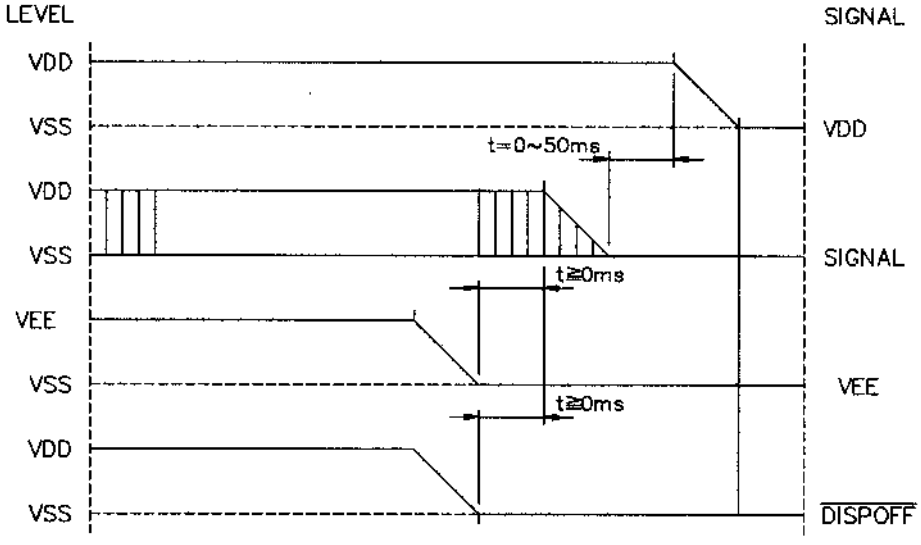
POWER ON/OFF TIMING

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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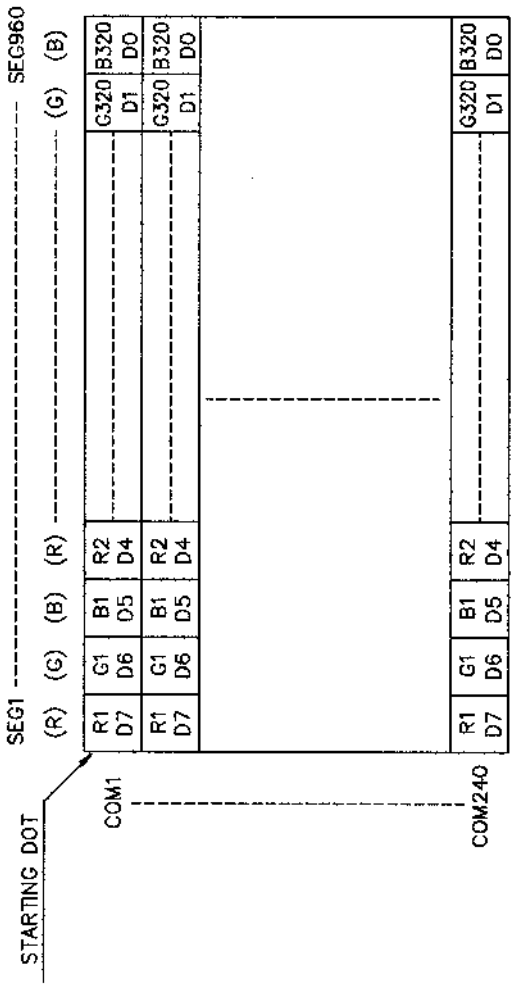
DISPLAY PATTERN



D0~D7 are 8 bits transmitted data, where D0 is LSB and D7 is MSB.

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NOTICE:

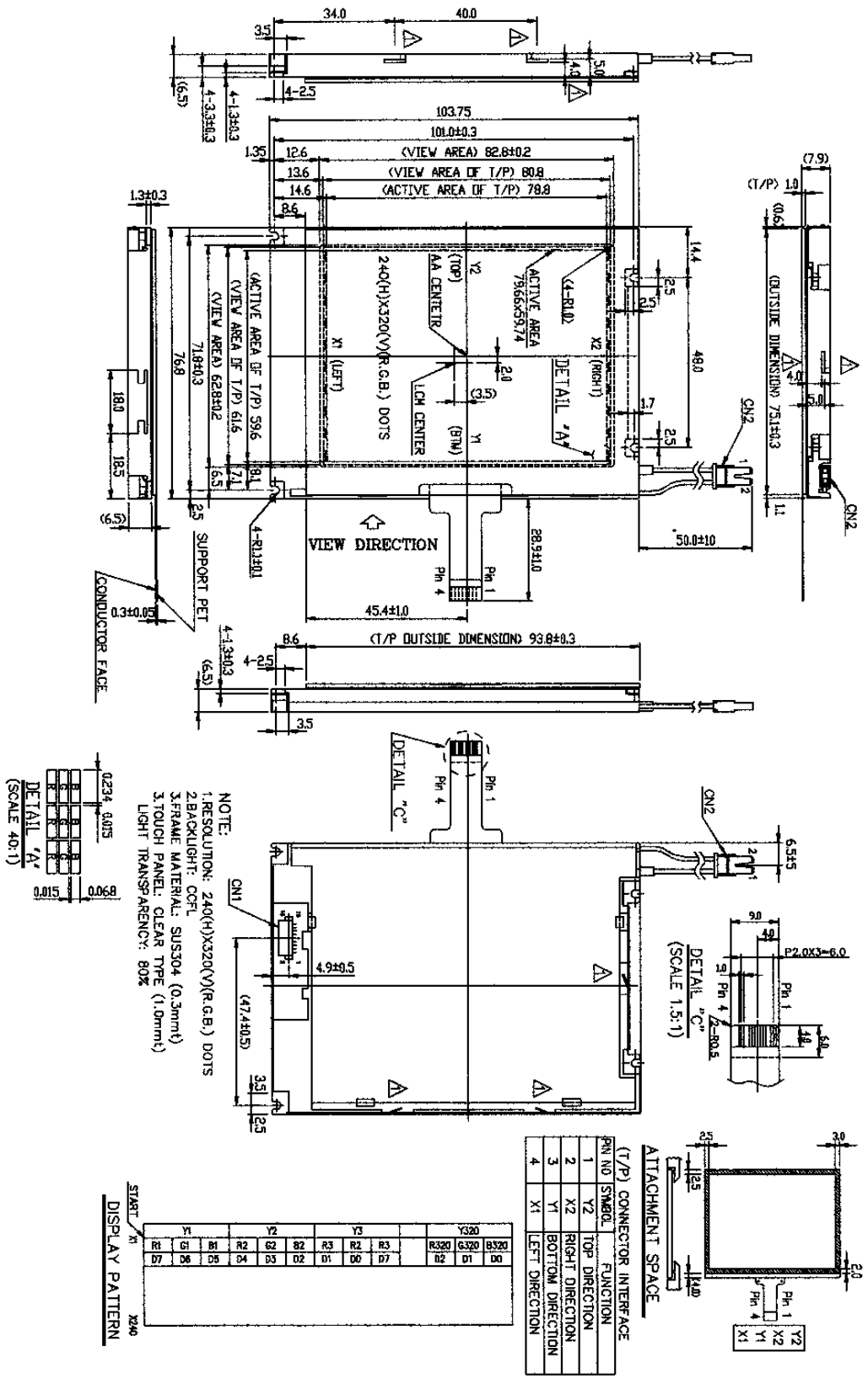
- SAFETY
  1. If the LCD panel breaks, be careful not to get the liquid crystal to touch your skin.
  2. If the liquid crystal touches your skin or clothes, please wash it off immediately by using soap and water.

- 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 : 20,000hrs for lamp-current 2.5mA, 40KHz, 25°C
  (Operating life time is defined as follows : The final brightness is at 50% of original brightness.)



(T/P) CONNECTOR INTERFACE		
PIN NO	SYMBOL	FUNCTION
1	Y2	TOP DIRECTION
2	X2	RIGHT DIRECTION
3	Y1	BOTTOM DIRECTION
4	X1	LEFT DIRECTION

START	Y1			Y2			Y3														Y320		
X1	R1	G1	B1	R2	G2	B2	R3	G3	B3												R320	G320	B320
	D7	D6	D5	D4	D3	D2	D1	D0	D7												D2	D1	D0

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