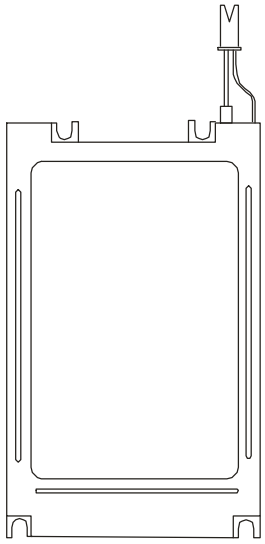
HANTRONIX

PRODUCT SPECIFICATION

HDM3224C-S-LP

320 x 240 COLOR GRAPHICS
LCD DISPLAY MODULE



HANTRONIX, INC. 10080 BUBB RD. CUPERTINO, CA 95014	**Q.A.:** JK	**REV.:** 1.0	HDM3224C-S-LP	SHEET 1 OF 17 **DATE:** 5/22/01

1. MECHANICAL DATA

(1) Product No.		**HDM3224C-S-LP**
(2) Module Size		76.8 (W)mm x 103.7 (H)mm x 5.5(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		**6** O'clock
(9) Backlight		CCFL
(10) Controller		Excluded
(11) DC/DC Converter		Excluded
(12) Weight		65.0 g(approx.)

2. ABSOLUTE MAXIMUM RATINGS

(1) ELECTRICAL ABSOLUTE RATINGS

VSS=0V

ITEM	SYMBOL	MIN	MAX	UNIT	COMMENT
Power Supply for Logic	VDD−VSS	−0.3	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	−10	50	−20	70
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 70°C will be < 120 hrs

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

3. 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
Input Voltage		VIH	H level		0.8VDD	−	VDD	V
		VIL	L level		0	−	0.2VDD	V
Recommended LCD Driving Voltage		VEE−VSS	Duty=1/240 Bias=1/14 VDD=3.3V	−10°C	25.2	25.5	25.8	V
				0°C	24.7	25.0	25.3	
				25°C	23.3	23.6	23.9	
				50°C	22.4	22.7	23.0	
Supply Current for Logic		IDD	VDD−VSS = 3.3V VEE−VSS = 23.6V Ta= 25°C PATTERN: ■□■□■□■□ □■□■□■□■		−	0.4	0.8	mA
Supply Current for LCD		IEE			−	2.9	4.3	mA
LCM	Surface Luminance	L	VDD−VSS=3.3V VEE−VSS=23.6V Ta= 25°C I_L=1.0mArms	PATTERN: (Dots All On of White Color)	−	54.0	−	cd/m²
				PATTERN: (Dots All Off)	−	1.9	−	cd/m²
			VDD−VSS=3.3V VEE−VSS=23.6V Ta= 25°C I_L=1.4mArms	(Dots All On of White Color)	−	70	−	cd/m²
				PATTERN: (Dots All Off)	−	2.5	−	cd/m²

CCFL

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	REMARK
Lamp Voltage	V_L	−	270	−	Vrms	I_L = 1.0mArms
Lamp current	I_L	−	1.0	−	mArms	
Lamp power consumption	P_L	−	0.3	−	W	
Lamp frequcncy	F_L	−	40	−	KHz	
Lamp life time	L_L	−	20000	−	hrs	

4. OPTICAL CHARACTERISTICS

4-1 Optical Char. of Normal Temp. Mode

AT Vop

ITEM / MODE		Cr(Contrast Ratio)								θ(Viewing Angle)		ϕ(Viewing Angle)	
		-10℃		0℃		25℃		50℃		25℃		25℃	
		MIN.	TYP.	MIN.	TYP.	MIN.	TYP.	MIN.	TYP.	MIN.	TYP.	MIN.	TYP.
T	M	–	25	–	28	–	30	–	8	–	98	–	±48
NOTE		NOTE 6								NOTE 5			

note:

T: TRANSMISSION
M: 6 O'CLOCK COLOR STN MODULE

AT ϕ=0° θ=0°

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Response Time (rise)	Tr	-10℃	950	1200	1450	ms	NOTE 2
		0℃	580	730	880		
		25℃	235	285	340		
		50℃	95	120	145		
Response Time (fall)	Tf	-10℃	580	600	720	ms	NOTE 2
		0℃	250	310	370		
		25℃	60	75	90		
		50℃	45	60	75		

4-2 Color of CIE Coordinate

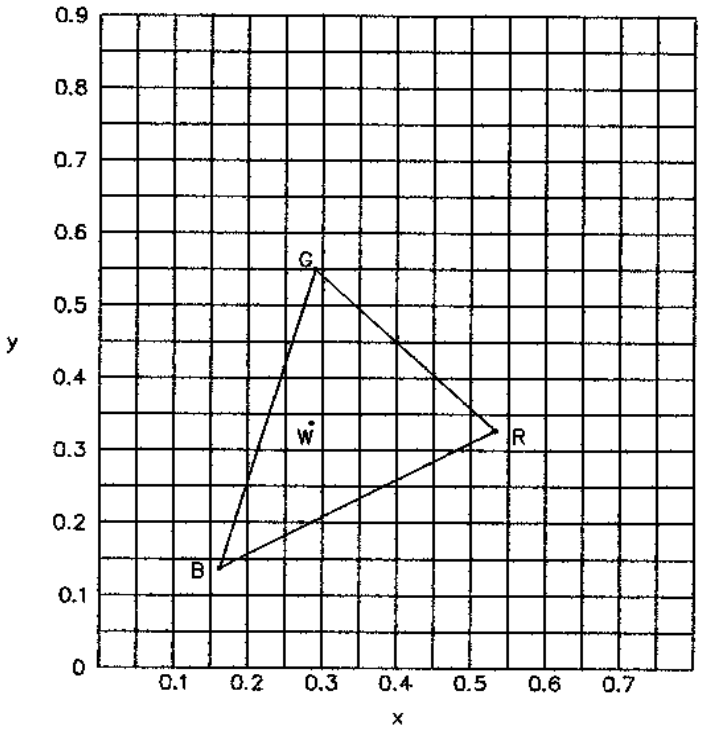
Ta = 25°C

ITEM		SYMBOL	CONDITION	VALUE	BRIGHTNESS (cd/m²)	NOTE
Color of CIE Coordinate	Red	X	$\phi=0°$, $\theta=0°$	0.53	12.3	Note✱
		y		0.33		
	Green	X		0.29	36.9	
		y		0.55		
	Blue	X		0.16	10.7	
		y		0.14		
	White	X		0.28	54.0	
		y		0.33		

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

Tolerance : ±0.05

Fig.1



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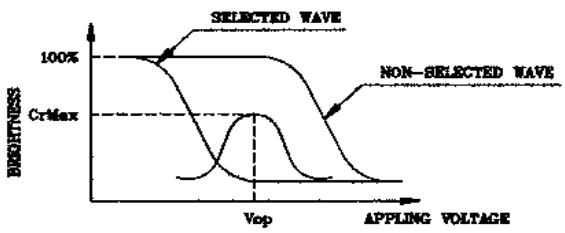
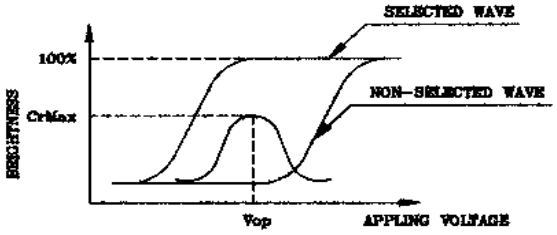
(NOTE 1)

Definition of Operation Voltage(Vop)



(positive type)



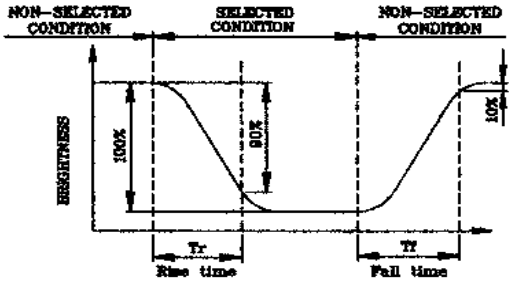
(negative type)

*Conditions

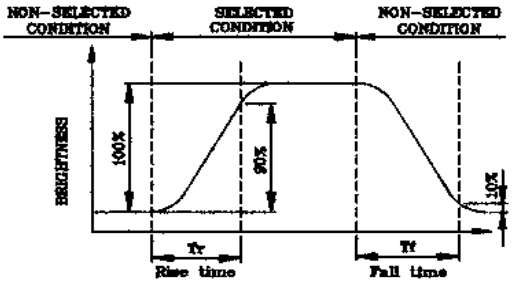
Viewing Angle : 0
Frame Frequency : 70Hz
Appling Waveform : I/N duty 1/a bias

(NOTE 2)

Definition of Response Time(Tr,Tf)



(positive type)



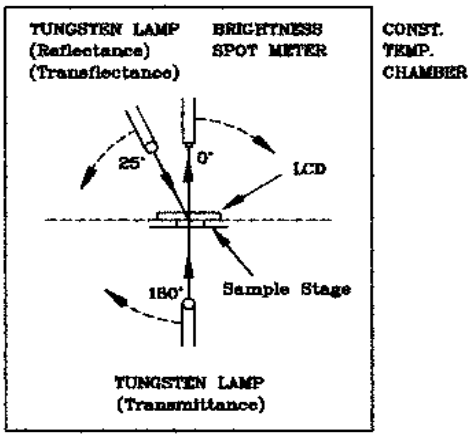
(negative type)

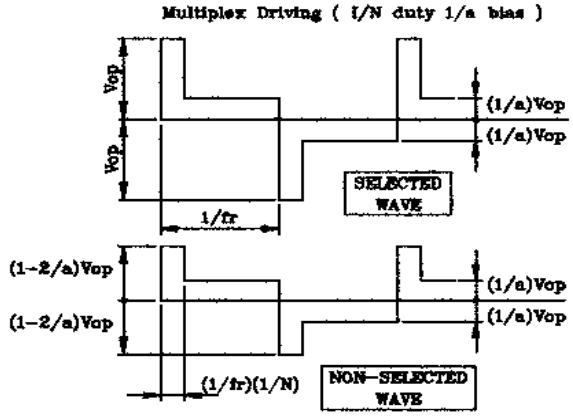
*Conditions

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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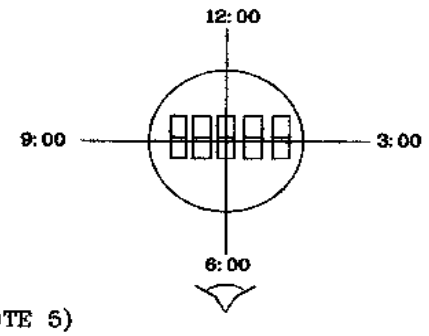
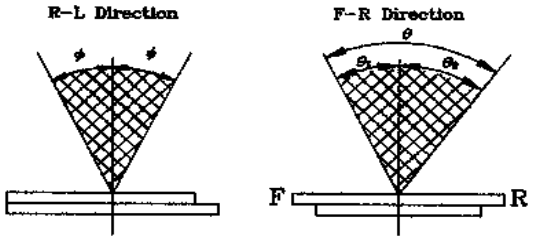
(NOTE 4)

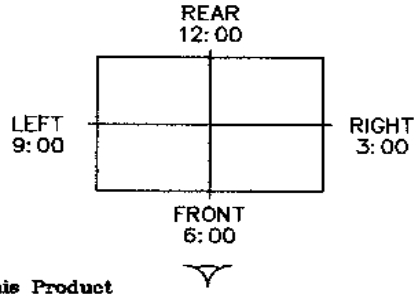
Definition of Viewing Direction



(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

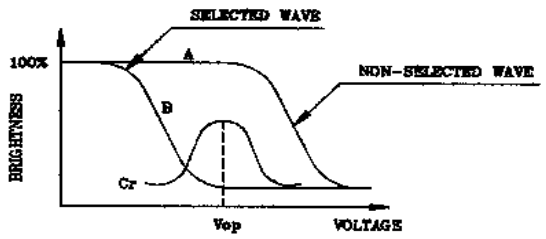
Frame Frequency : 70Hz

Appling Waveform : 1/N duty 1/a bias

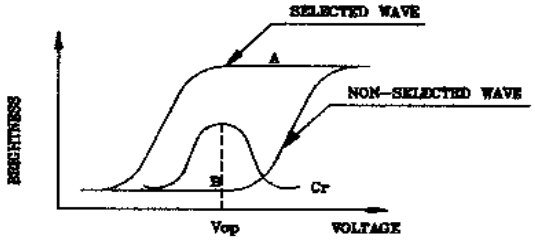
Contrast Ratio : larger than 2

(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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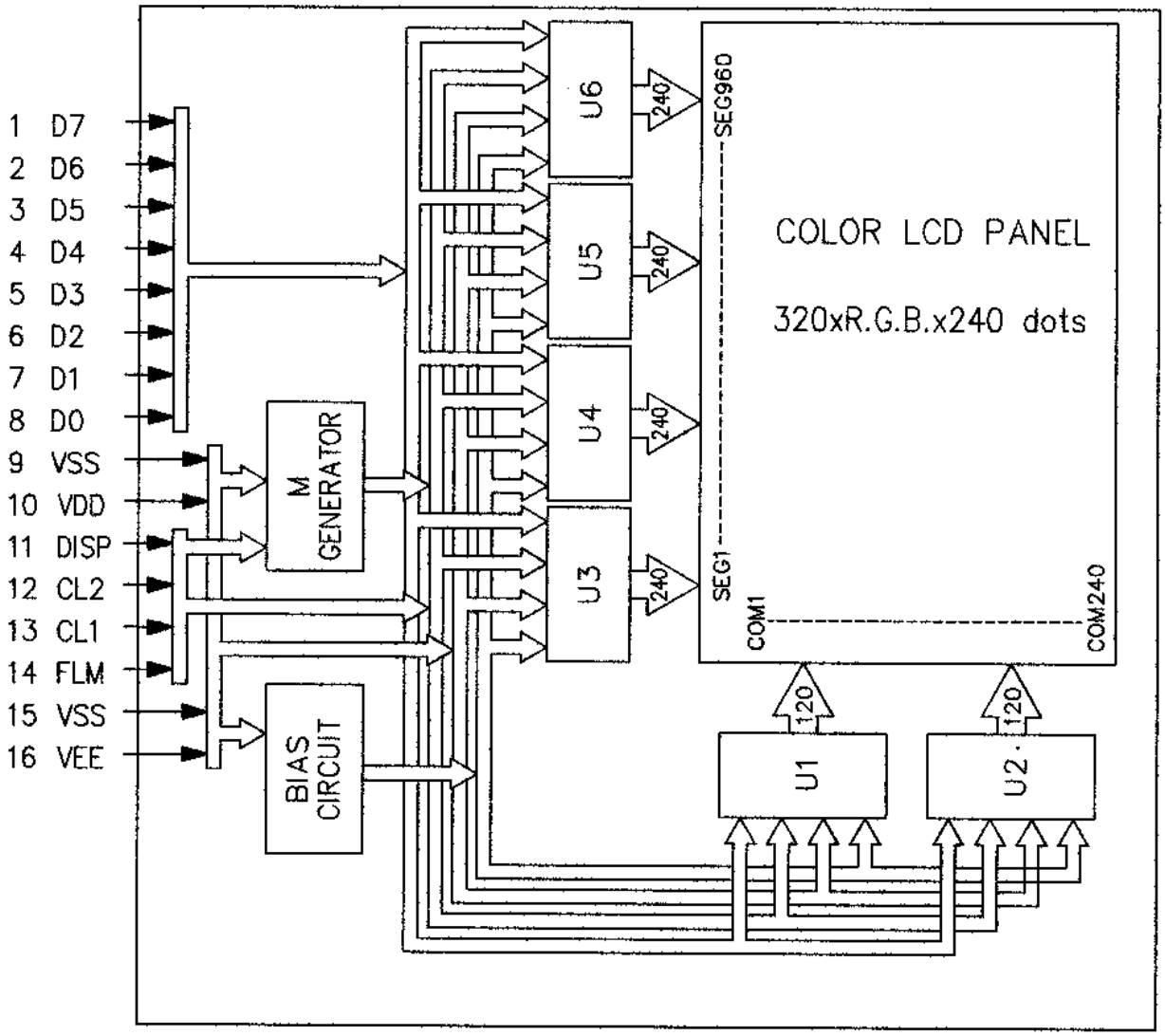
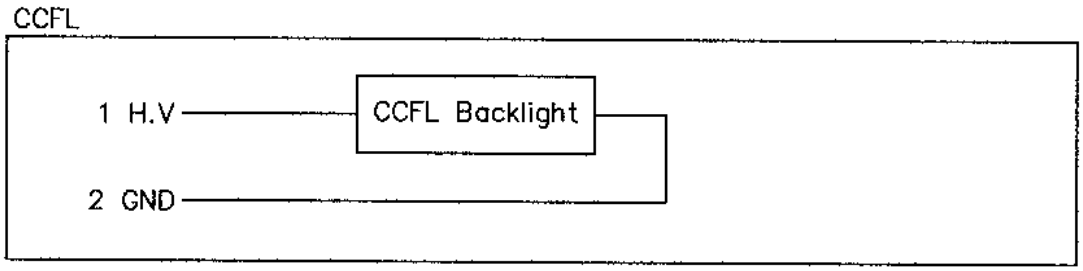
5. BLOCK DIAGRAM





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6. 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

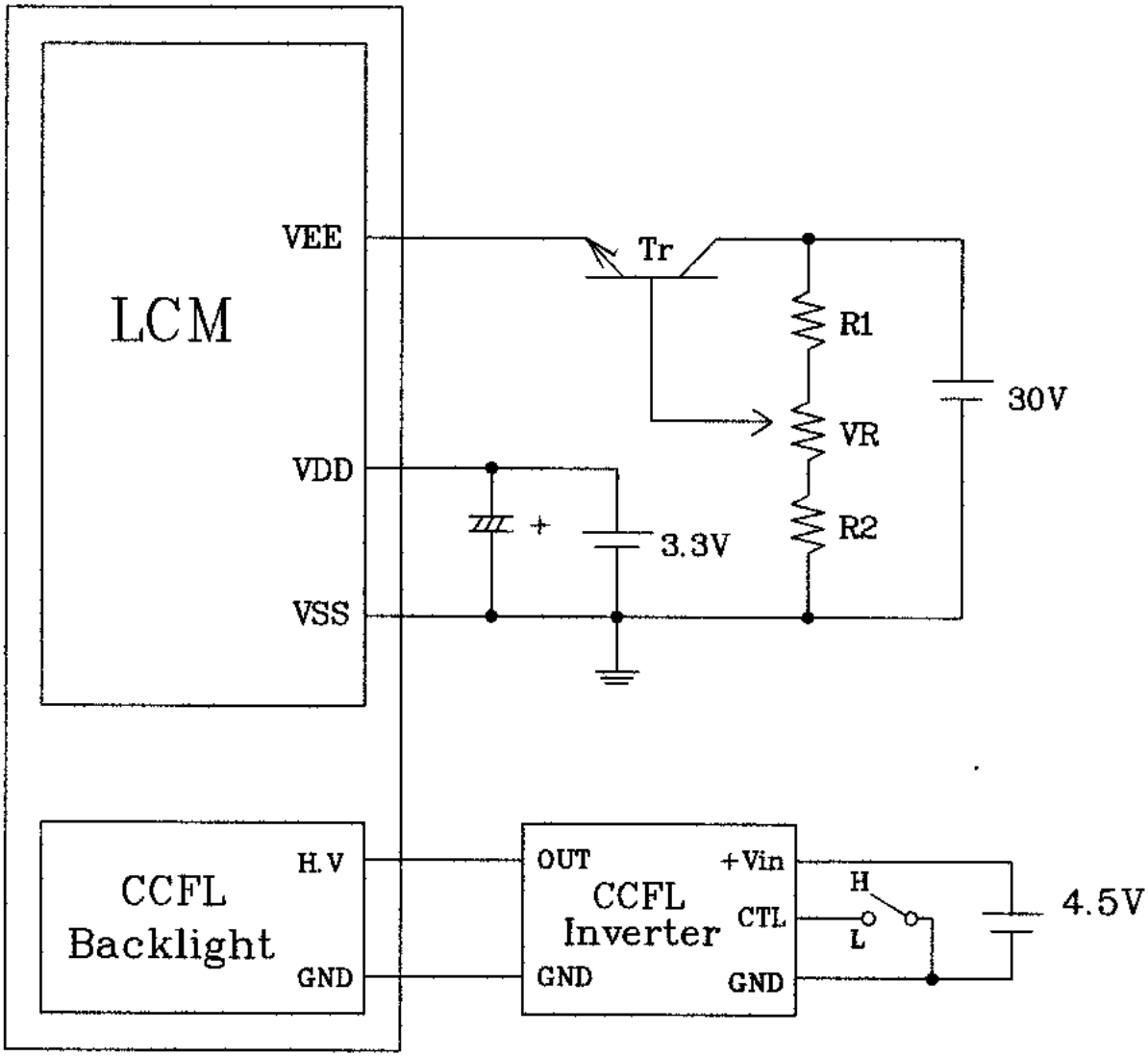
CCFL

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)

7. POWER SUPPLY



1. R1+R2+VR=10~20KΩ
2. RECOMMENDED CCFL INVERTER :
   COTEK INV-087

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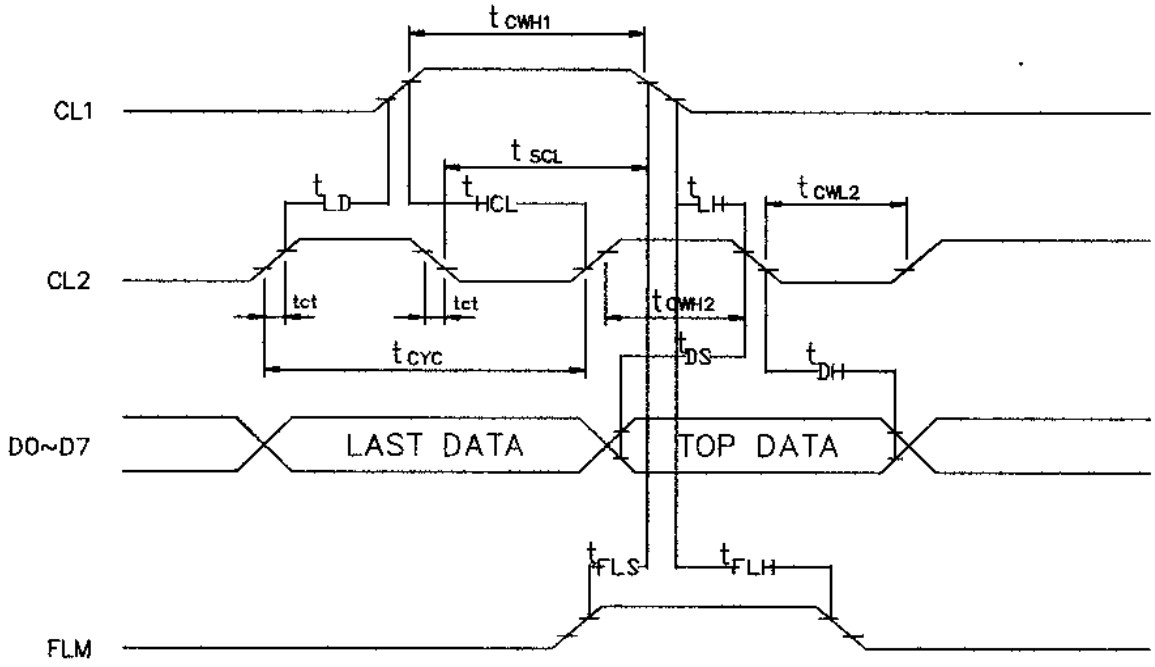
8. TIMING CHARACTERISTICS

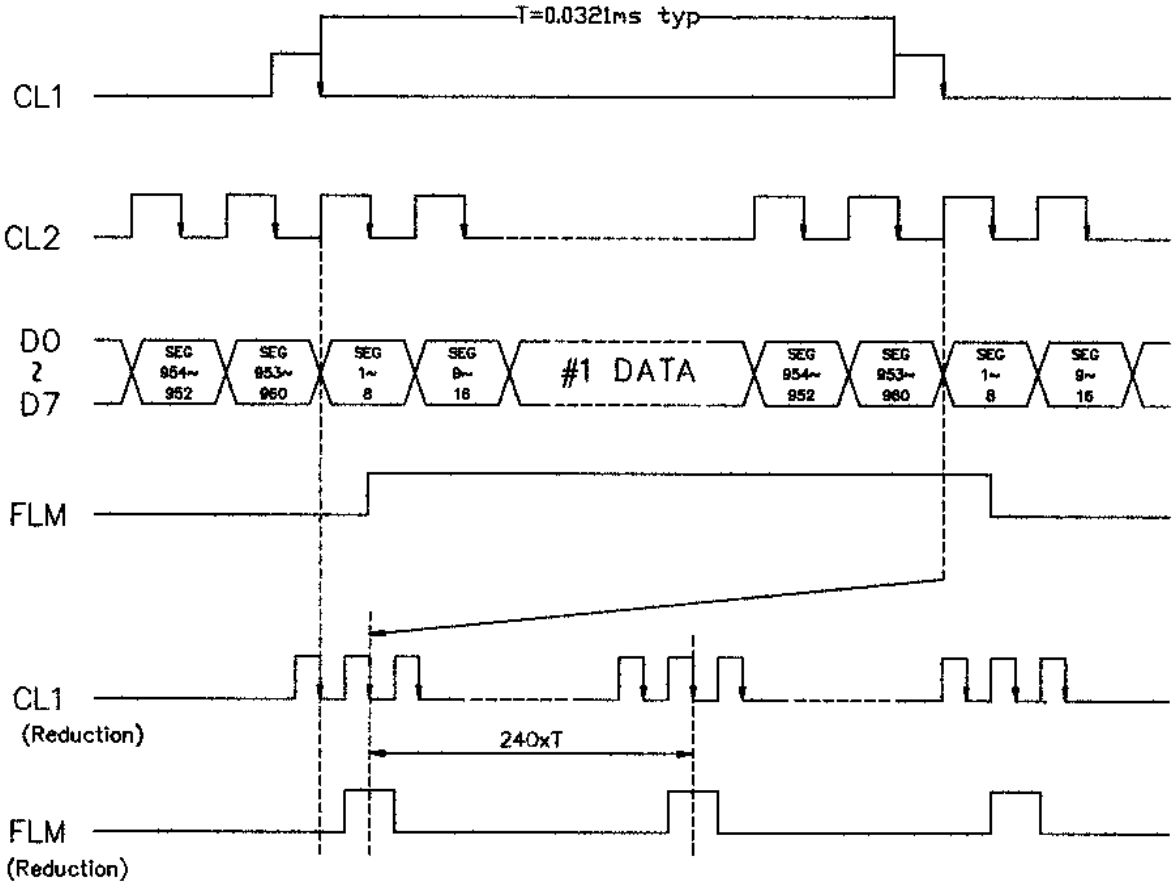
8-1 INTERFACE TIMING

VDD=3.3V ± 10%

Parameter	SYMBOL	MIN.	MAX.	UNIT
CLOCK CYCLE TIME	t_{CYC}	66	–	ns
CL2 HIGH LEVEL WIDTH	t_{CWH2}	23	–	ns
CL2 LOW LEVEL WIDTH	t_{CWL2}	23	–	ns
CL1 HIGH LEVEL WIDTH	t_{CWH1}	30	–	ns
CL2 SETUP TIME	t_{SCL}	30	–	ns
CL2 HOLD TIME	t_{HCL}	30	–	ns
CL2 – CL1 RISE TIME	t_{LD}	10	–	ns
CL1 – CL2 FALL TIME	t	30	–	ns
CLOCK RISE / FALL TIME	t_{ct}	5	–	ns
DATA SETUP TIME	t_{DS}	10	–	ns
DATA HOLD TIME	t_{DH}	25	–	ns
FLM SETUP TIME	t_{FLS}	30	–	ns
DATA HOLD TIME	t_{FLH}	50	–	ns



8-2 TIMING CHART OF INPUT SIGNAL



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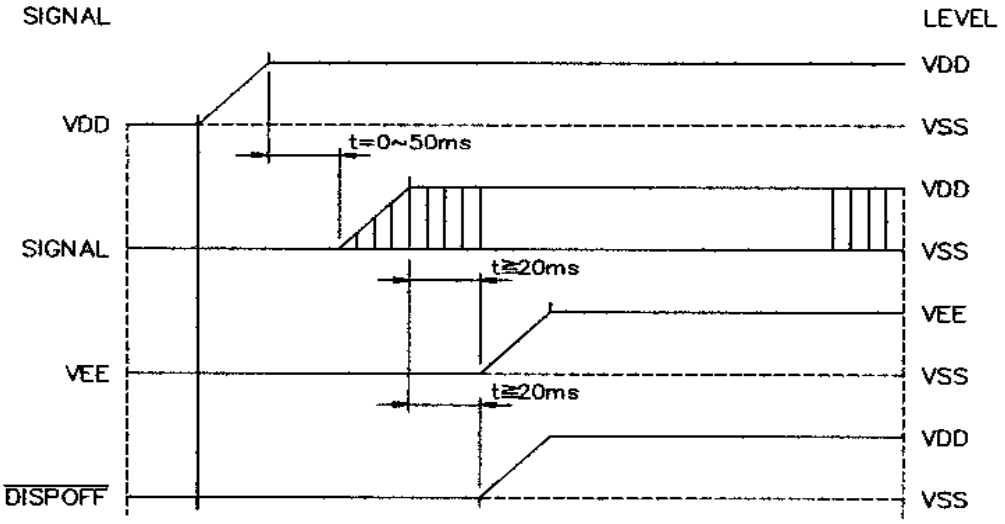
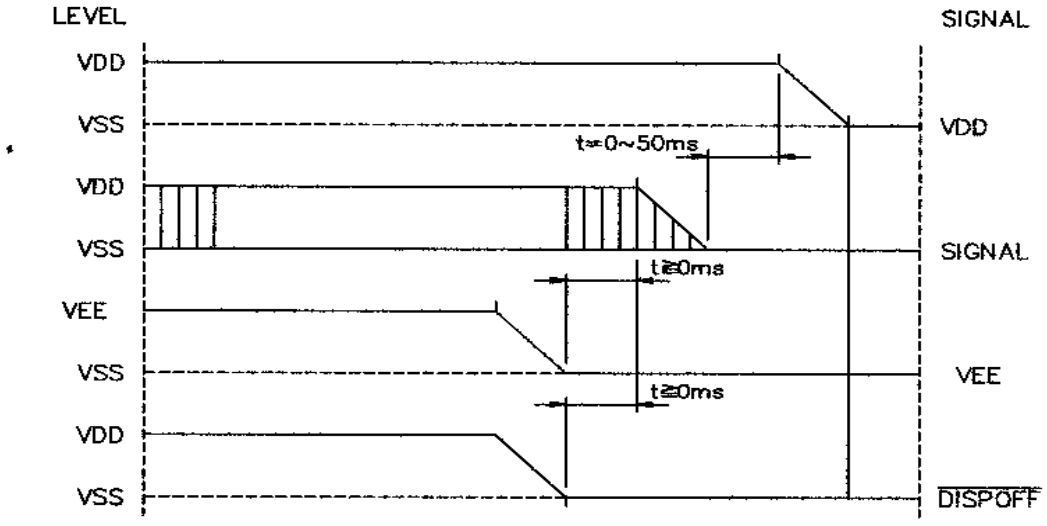
8-3. POWER ON/OFF TIMING

ON SEQUENCE

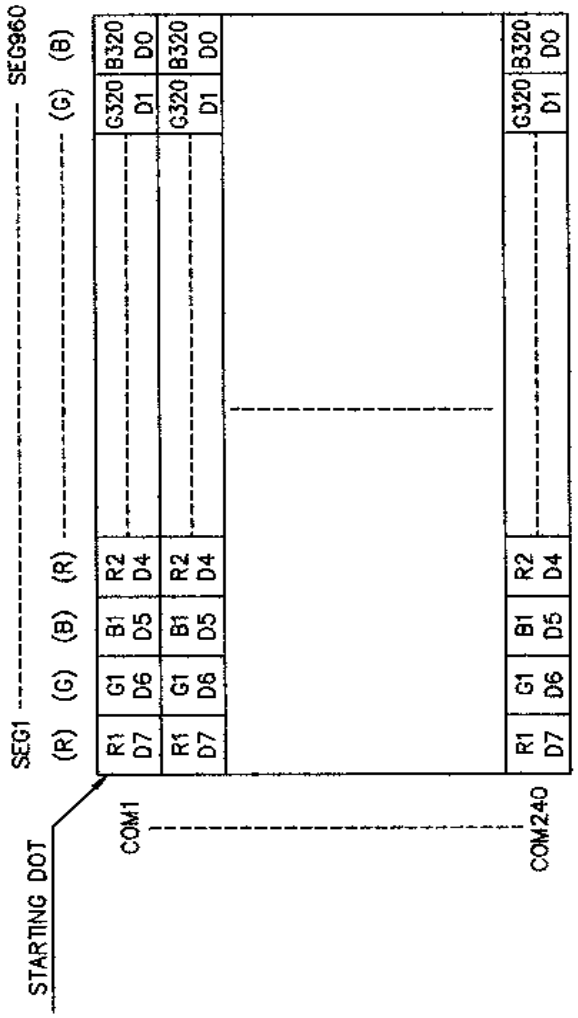


OFF SEQUENCE



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.

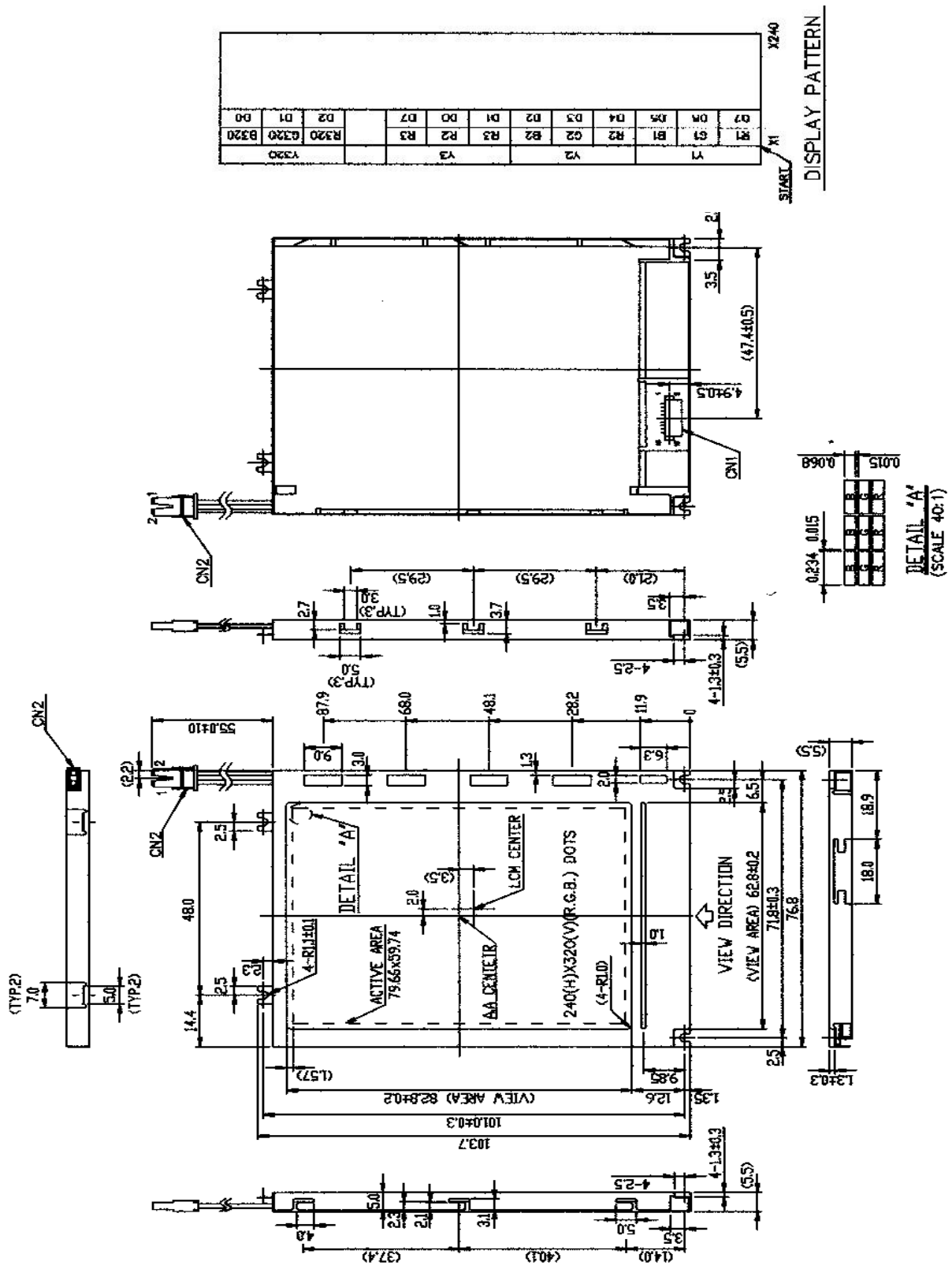
8−4. DISPLAY PATTERN



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

9. RELIABILITY TEST

NO	ITEM	CONDITION			STANDARD	NOTE
1	High Temp. Storage	70°C	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→25°C,5min →70°C,30min→25°C,5min (1cycle)			Appearance without defect	5 cycles



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