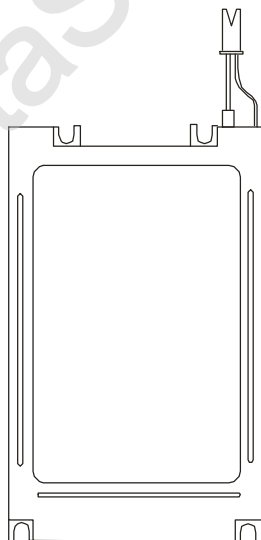


HANTRONIX

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
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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 $T_a \leq 50^{\circ}\text{C}$: 85%RH max

$T_a > 50^{\circ}\text{C}$: Absolute humidity must be lower
than the humidity of 85%RH at 50°C

Note 3 T_a 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.

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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		—	0.4	0.8	mA
Supply Current for LCD		IEE	PATTERN: 		—	2.9	4.3	mA
LCM	Surface Luminance	L	VDD-VSS=3.3V VEE-VSS=23.6V Ta= 25°C IL=1.0mArms	PATTERN: (Dots All On or 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 IL=1.4mArms	(Dots All On or White Color) 	—	70	—	cd/m²
				PATTERN: (Dots All Off) 	—	2.5	—	cd/m²

CCFL

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	REMARK
Lamp Voltage	VL	—	270	—	Vrms	IL = 1.0mArms
Lamp current	IL	—	1.0	—	mArms	
Lamp power consumption	PL	—	0.3	—	W	
Lamp frequency	FL	—	40	—	KHz	
Lamp life time	LL	—	20000	—	hrs	

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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°C		0°C		25°C		50°C		25°C		25°C	
		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 $\phi=0^\circ$ $\theta=0^\circ$

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

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4-2 Color of CIE Coordinate

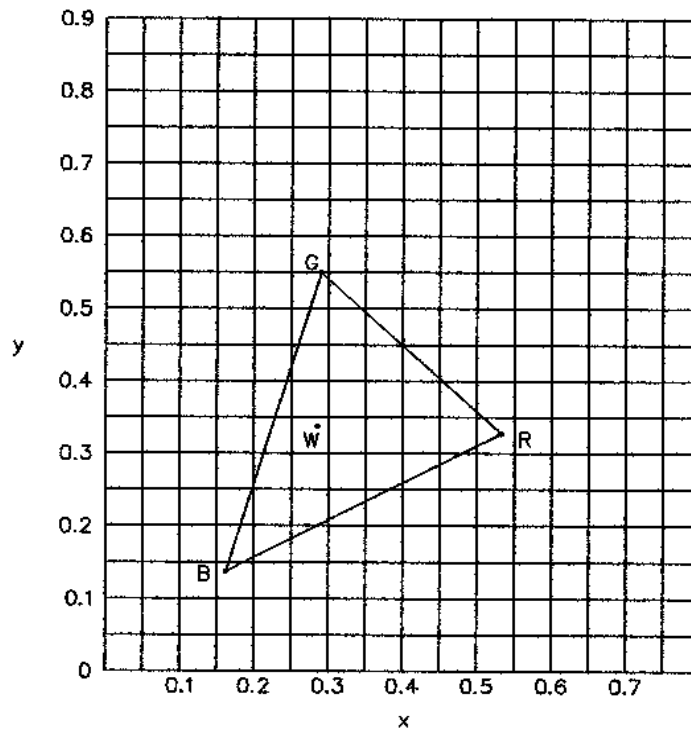
Ta = 25°C

ITEM		SYMBOL	CONDITION	VALUE	BRIGHTNESS (cd/m ²)	NOTE
Color of CIE Coordinate	Red	X	$\phi=0^{\circ}$, $\theta=0^{\circ}$	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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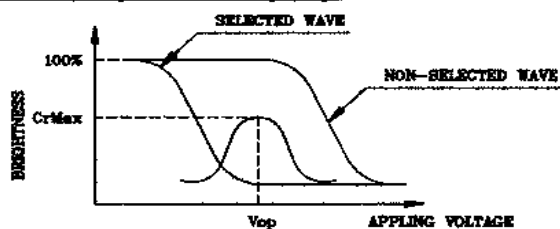
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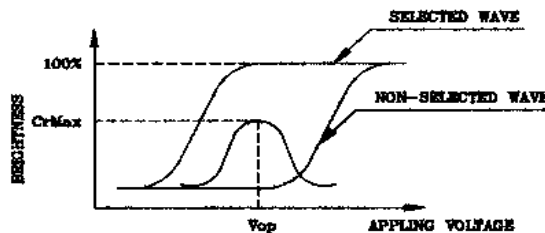
DATE:
5/22/01

(NOTE 1)

Definition of Operation Voltage(Vop)



(positive type)



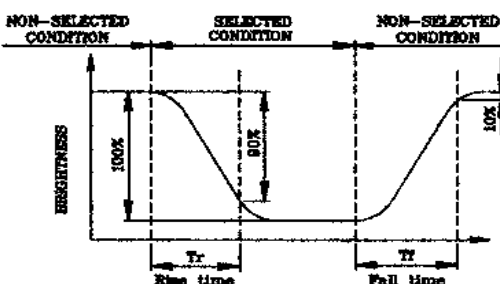
(negative type)

*Conditions

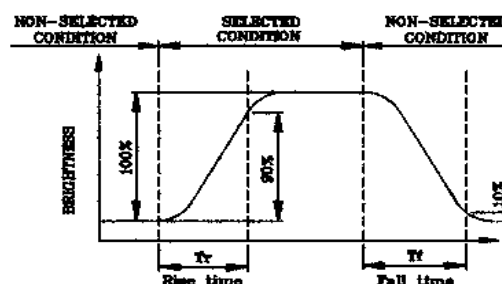
Viewing Angle : 0
Frame Frequency : 70Hz
Applying Waveform : 1/N duty 1/a bias

(NOTE 2)

Definition of Response Time(T_r , T_f)



(positive type)



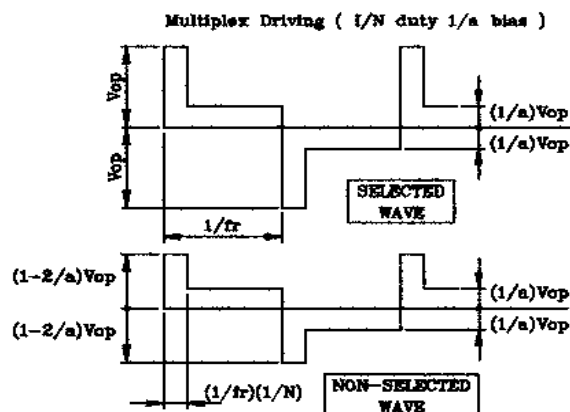
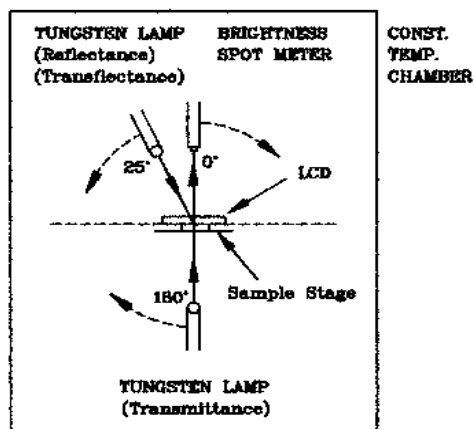
(negative type)

*Conditions

Operating Voltage : V_{op}
Viewing Angle (θ, ϕ) : (0,0)
Frame Frequency : 70Hz
Applying Waveform : 1/N duty 1/a bias

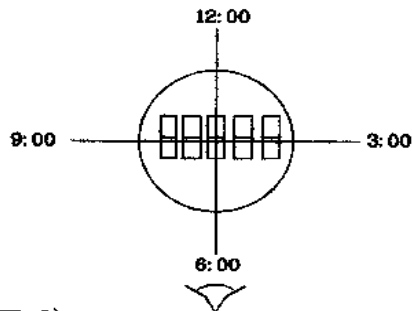
(NOTE 3)

Description of Measuring Equipment and Driving Waveforms



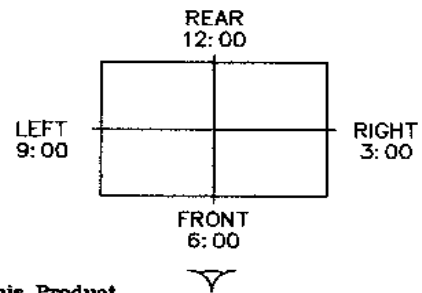
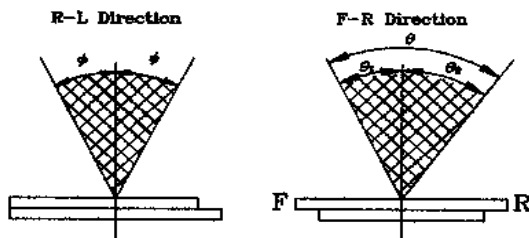
(NOTE 4)

Definition of Viewing Direction



(NOTE 5)

Definition of Viewing Angle



*For This Product

The Viewing Direction Is 6 O'clock
So $\theta_1 > \theta_2$

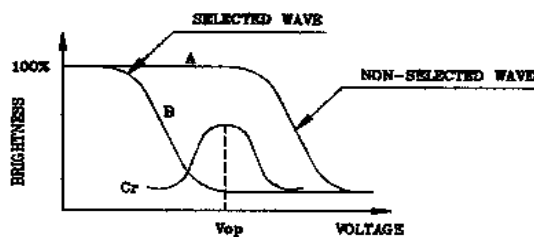
$$\theta = \theta_1 + \theta_2$$

*Conditions

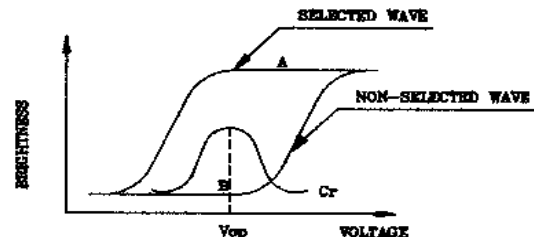
Operating Voltage : Vop
Frame Frequency : 70Hz
Applying Waveform : 1/N duty 1/a bias
Contrast Ratio : larger than 2

(NOTE 6)

Definition of Contrast Ratio (Cr)



(positive type)



(negative type)

$$\text{Contrast Ratio : } Cr = A/B$$

*Conditions

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

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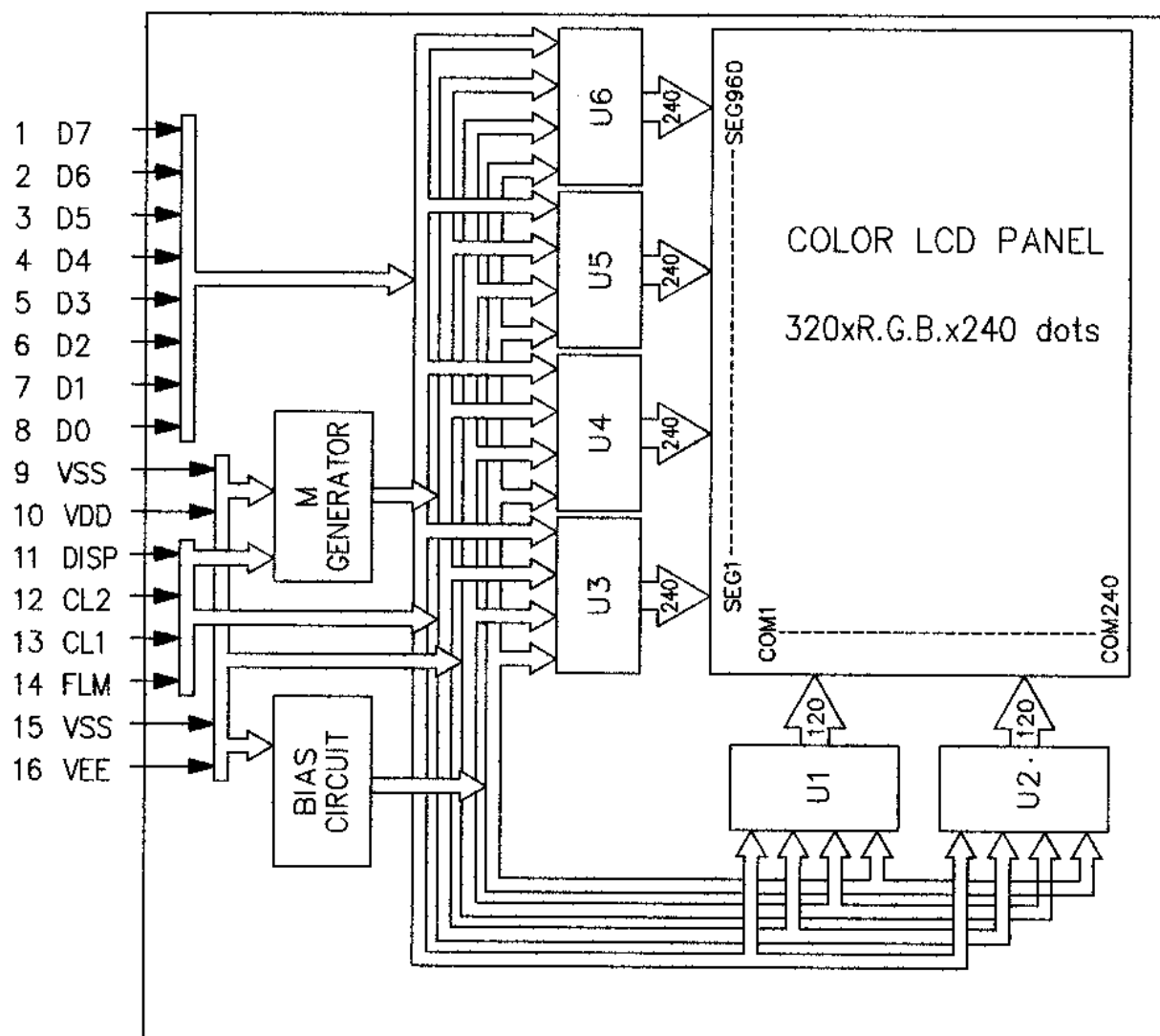
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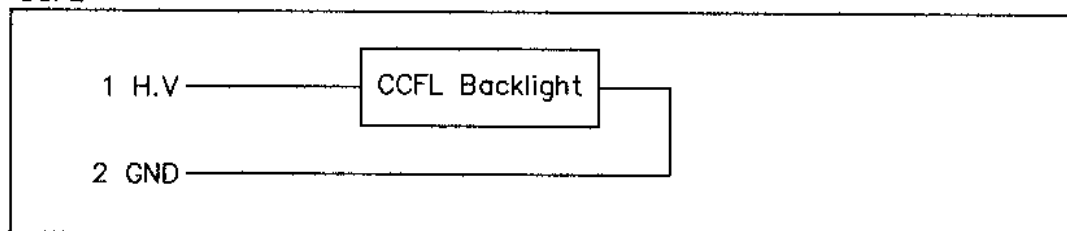
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5. BLOCK DIAGRAM



CCFL



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

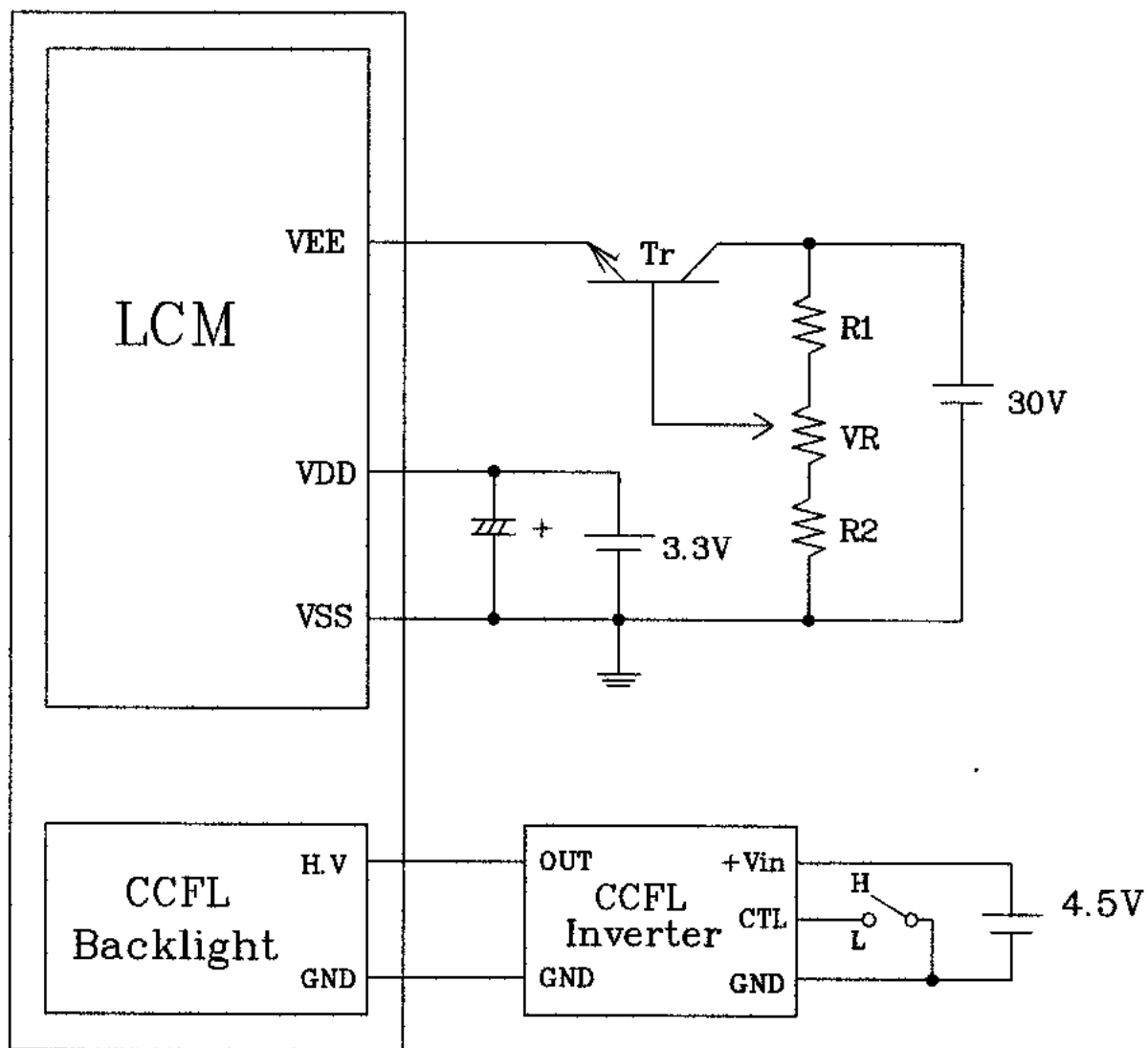
FH12-16S-0.5SV (HIROSE)/Suitable FFC :pitch 0.5mm ,width 8.5mm

CCFL CONNECTOR :

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

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7. POWER SUPPLY



1. $R1 + R2 + VR = 10 \sim 20K\Omega$
2. RECOMMENDED CCFL INVERTER :
COTEK INV-087

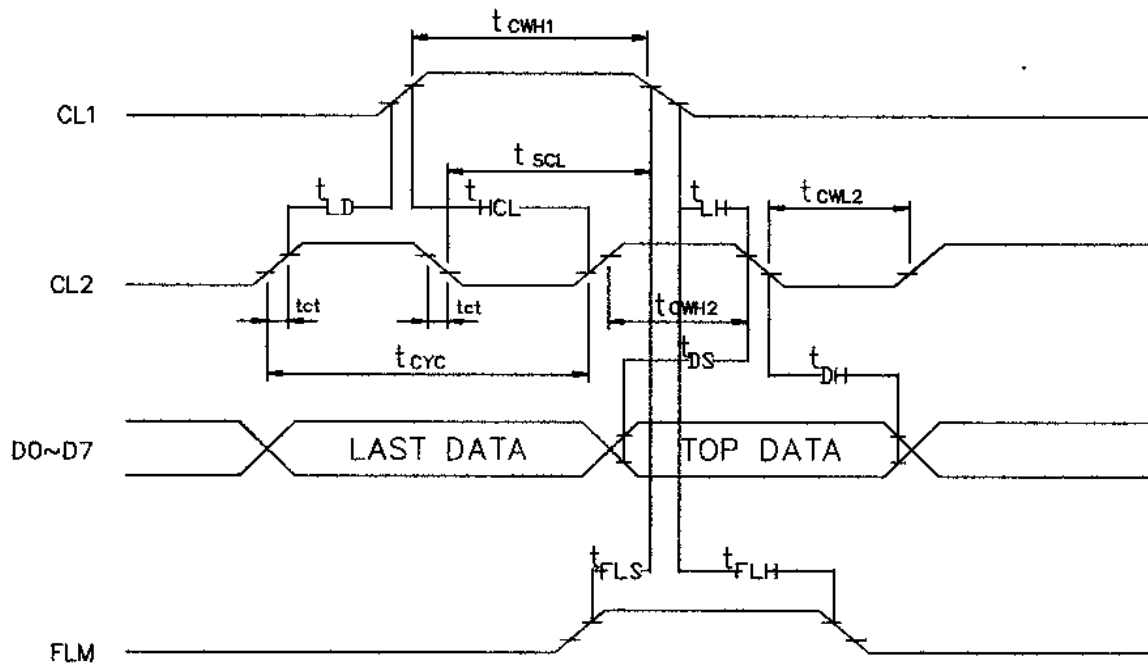
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8. TIMING CHARACTERISTICS

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_{LH}	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



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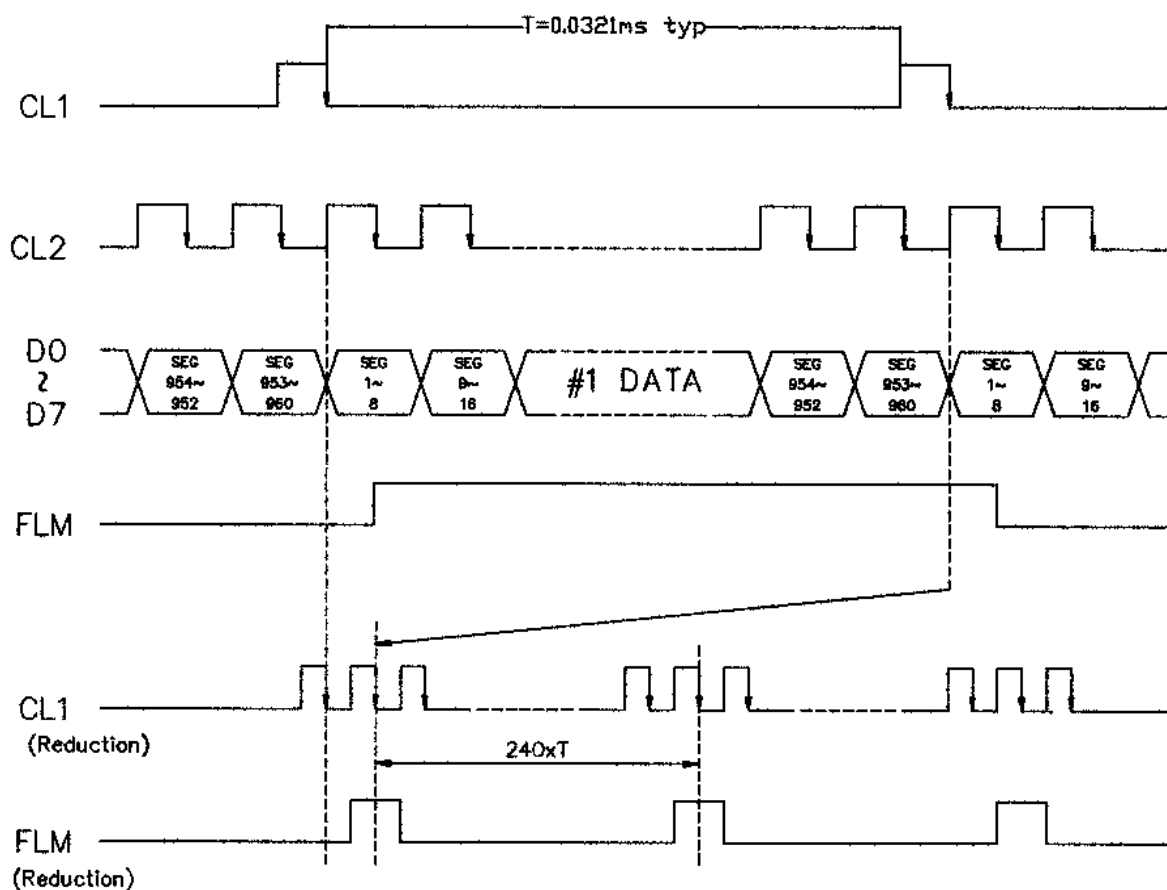
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8-2 TIMING CHART OF INPUT SIGNAL



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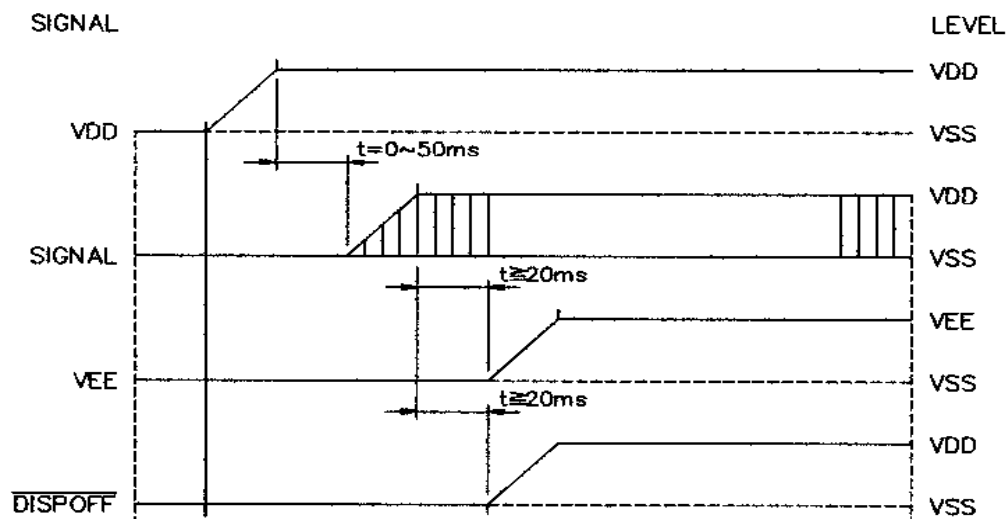
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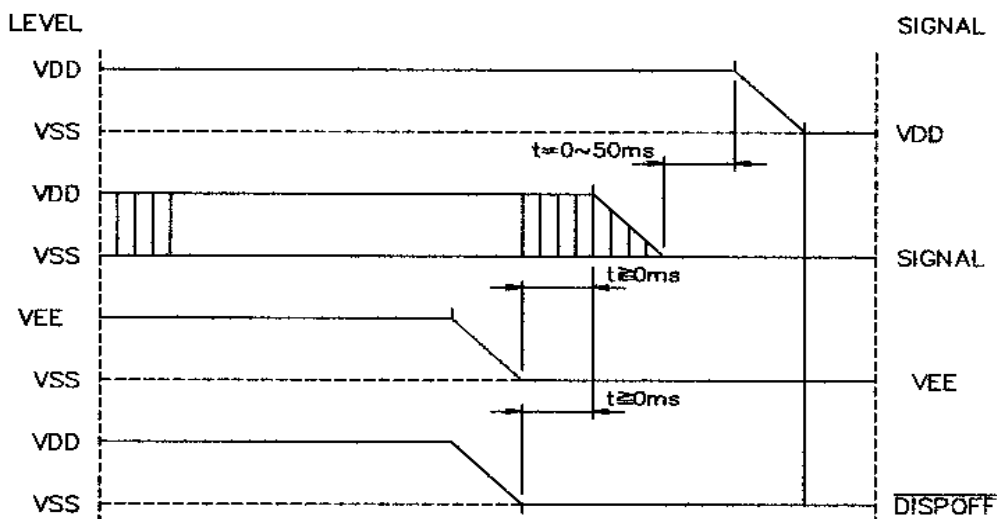
DATE:
5/22/01

8-3. POWER ON/OFF TIMING

ON SEQUENCE



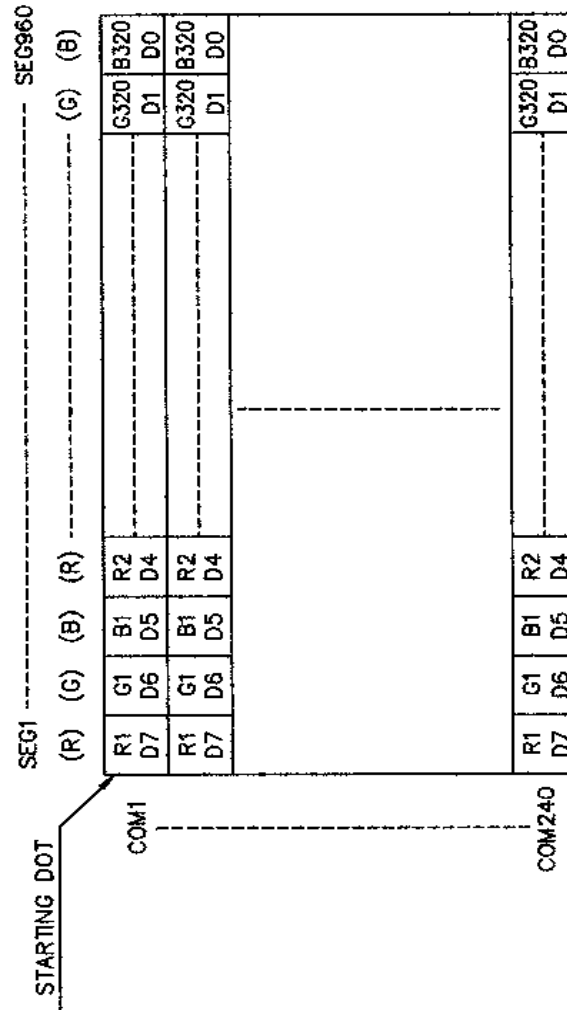
OFF SEQUENCE



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.

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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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