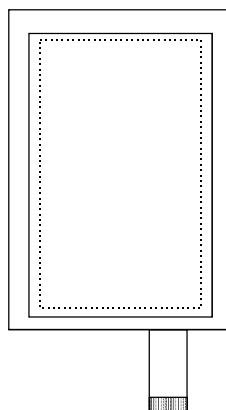




PRODUCT SPECIFICATION

HDM2432L-T

240 x 320 GRAPHICS
LCD DISPLAY MODULE



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1. MECHANICAL DATA

(1) Product No.	HDM2432L-T
(2) Module Size	71.5 (W)mm X 94.1 (H)mm X 7.9 (D)mm
(3) Dot Size	0.225 (W)mm X 0.225 (H)mm
(4) Dot Pitch	0.24 (W)mm X 0.24 (H)mm
(5) Number of Dots	240 (W)Dots X 320 (H) Dots
(6) Duty	1/320
(7) LCD Display Mode	FSTN: Normally White Rear Polarizer: Transflective (Normal)
(8) Viewing Direction	12 O'clock
(9) Backlight	LED B/L
(10) Weight	58.8 g (Approx.)
(11) Controller	Excluded
(12) DC/DC Converter	Excluded

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2. ABSOLUTE MAXIMUM RATINGS

(1) ELECTRICAL ABSOLUTE RATINGS

V_{SS}=0V Standard

ITEM	SYMBOL	MIN	MAX	UNIT	COMMENT
Power Supply for Logic	VDD-VSS	-0.3	7.0	V	
Power Supply For LC Drive	VEE-VSS	-0.3	30	V	
Input Voltage	V _I	-0.3	V _{DD} +0.3	V	
Static Electricity	-	-	-	-	Note 1

Note 1 : LCM should be grounded during handling LCM.

(2) ENVIRONMENTAL ABSOLUTE MAXIMUM RATINGS

ITEM	OPERATING		STORAGE	
	MIN.	MAX.	MIN.	MAX.
Ambient Temperature	0	50	-20	70
Humidity (Without Condensation)	Note 2,4		Note 3,4	

Note 2 : T_a ≤ 50°C : 85%RH max

T_a > 50°C : Absolute humidity must be lower

than the humidity of 85%RH at 50°C

Note 3 : T_a at -20°C will be < 48hrs, at 70°C will be < 120 hrs

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

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3. ELECTRICAL CHARACTERISTICS

(VDD= 3.3V ± 5%)

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT		
Input Voltage	VIH	H level	0.8VDD	-	VDD	V		
	VIO	L level	0	-	0.2VDD	V		
Recommended LC Driving Voltage	VLCD-VSS (Vop)	1/320 Duty	0°C	27.6	28.0	28.4	V	
		1/16.3 Bias	25°C	26.4	26.8	27.2		
			50°C	25.6	26.0	26.4		
Power Supply Current	IDD	VDD=3.3V VSS=0V VLCD-VSS=26.8V FLM=70Hz PATTERN: □ ■ □ ■ □ ■ ■ □ ■ □ ■ □	-	0.2	0.5	mA		
	IEE		-	2.9	4.5			
Power Supply Current For LED	ILED	VBL=5.0V RBL=33Ω	-	55	82	mA		
LCM	Surface Luminance	L	VDD= 3.3V VSS= 0V VLCD-VSS=26.8V ILED=55mA	PATTERN: (Dots All On) ■ ■ ■ ■ ■ ■ ■ ■	-	1.7	-	cd/m ²
				PATTERN: (Dots All Off) □ □ □ □ □ □ □ □	-	5.6	-	

4. OPTICAL CHARACTERISTICS

AT V_{OP}

ITEM MODE		Cr(Contrast Ratio)						θ (Viewing Angle)		ϕ (Viewing Angle)	
		0°C		25°C		50°C		25°		25°	
		MIN.	TYP.	MIN.	TYP.	MIN.	TYP.	MIN.	TYP.	MIN.	TYP.
S	K	-	7.5	-	7.0	-	6.0	-	66	-	(L)33 (R)26
NOTE		NOTE 6						NOTE 5			

NOTE :

S: TRANSFLECTIVE

K: NORMALLY WHITE, 12 O'clock

AT $\theta=0^\circ$ $\theta=0^\circ$

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Response Time (rise)	Tr	0°C	900	1100	1300	ms	NOTE 2
		25°C	240	300	360		
		50°C	120	150	180		
Response Time (fall)	Tf	0°C	300	370	440	ms	NOTE 2
		25°C	100	130	160		
		50°C	50	65	80		

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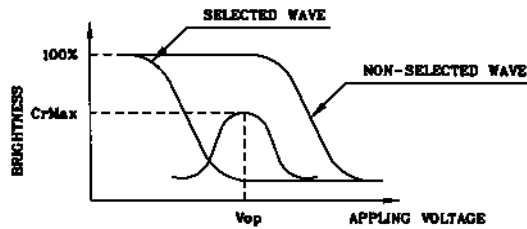
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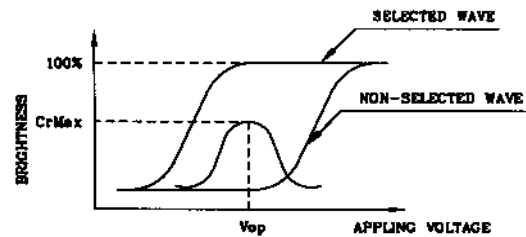
DATE:
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(NOTE 1)

Definition of Operation Voltage(Vop)



(positive type)



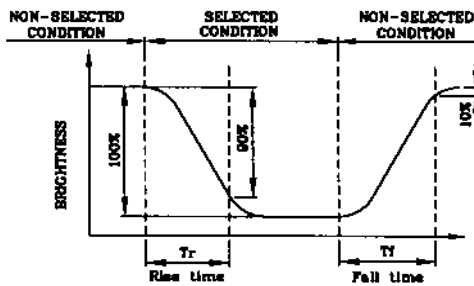
(negative type)

*Conditions

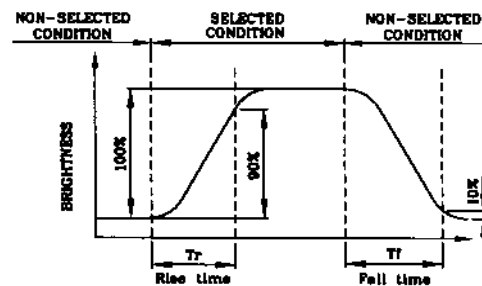
Viewing Angle : 0
 Frame Frequency : 70Hz
 Applying Waveform : 1/N duty 1/a bias

(NOTE 2)

Definition of Response Time(Tr,Tf)



(positive type)



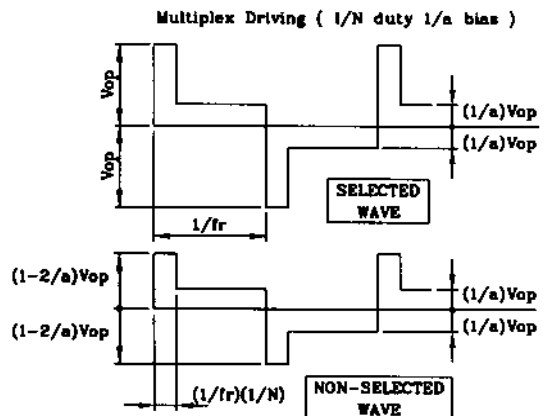
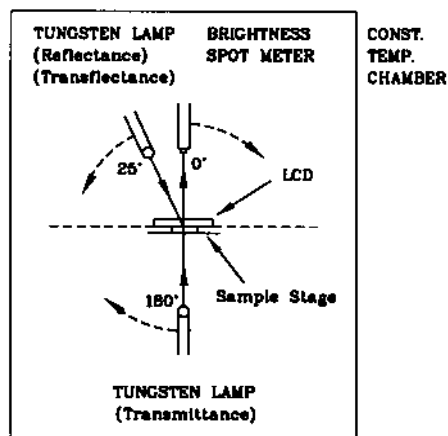
(negative type)

*Conditions

Operating Voltage : Vop
 Viewing Angle (θ) : (0,0)
 Frame Frequency : 70Hz
 Applying Waveform : 1/N duty 1/a bias

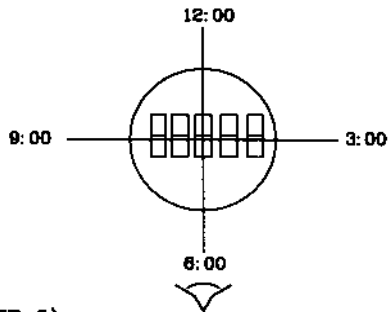
(NOTE 3)

Description of Measuring Equipment and Driving Waveforms



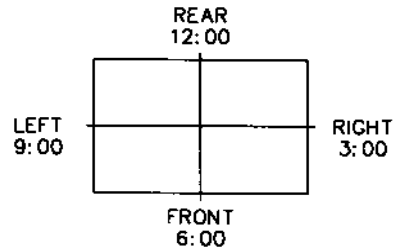
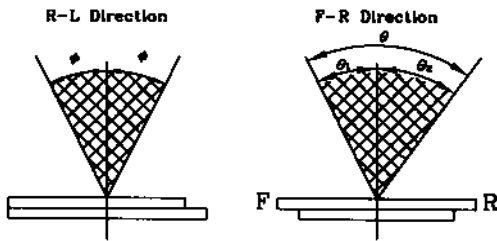
(NOTE 4)

Definition of Viewing Direction



(NOTE 5)

Definition of Viewing Angle



*For This Product
The Viewing Direction is 6 O'clock
So $\theta_1 > \theta_2$

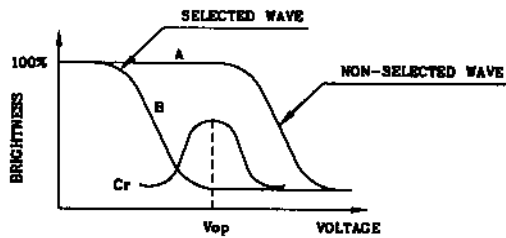
$$\theta = \theta_1 + \theta_2$$

*Conditions

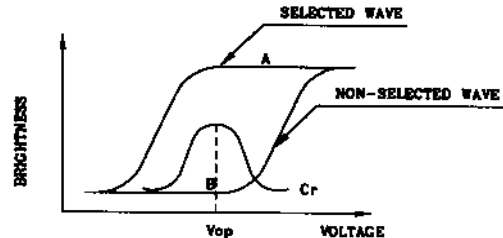
Operating Voltage : V_{op}
Frame Frequency : 70Hz
Applying Waveform : 1/N duty 1/a bias
Contrast Ratio : larger than 2

(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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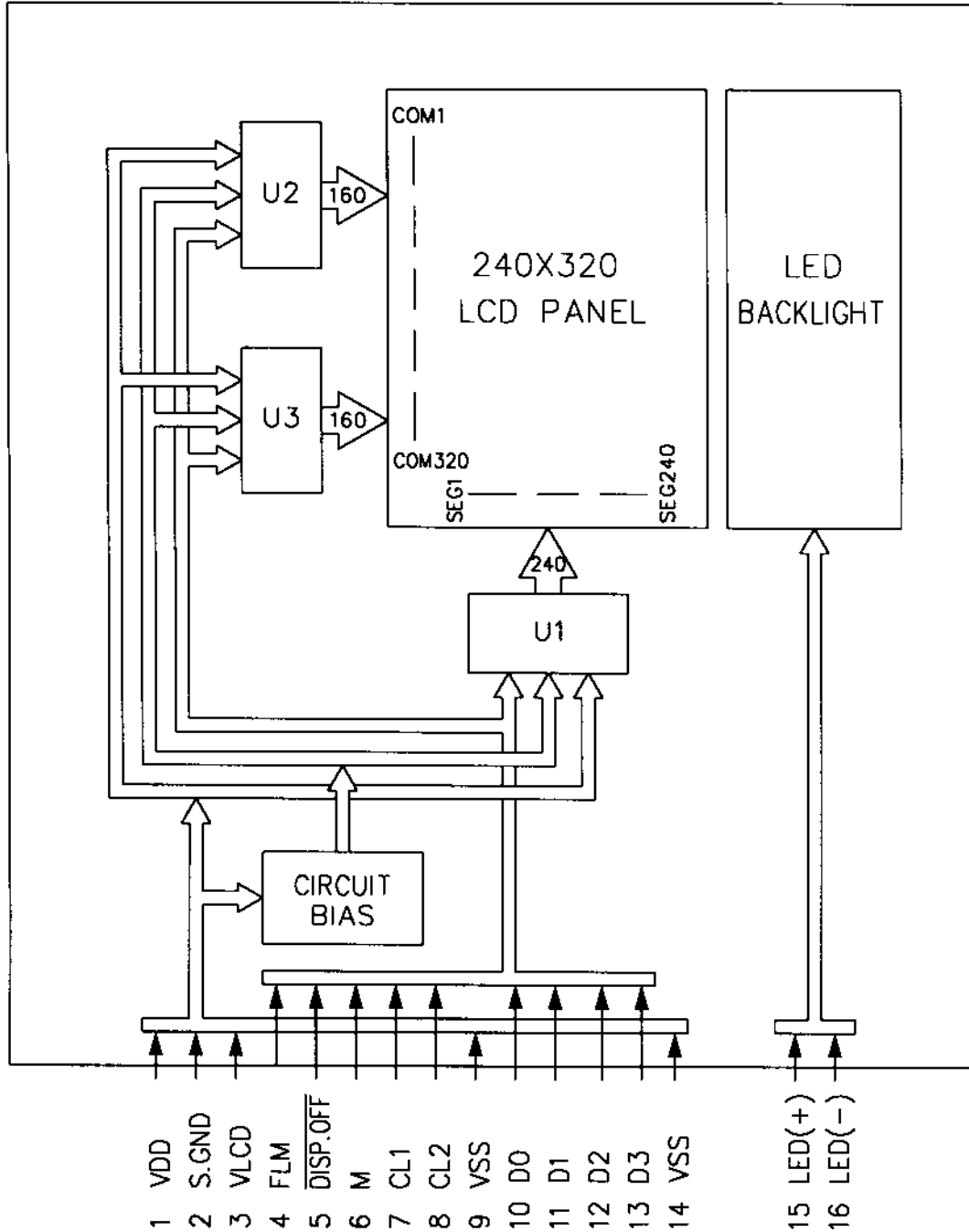
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5. BLOCK DIAGRAM



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6.INTERNAL PIN CONNECTION

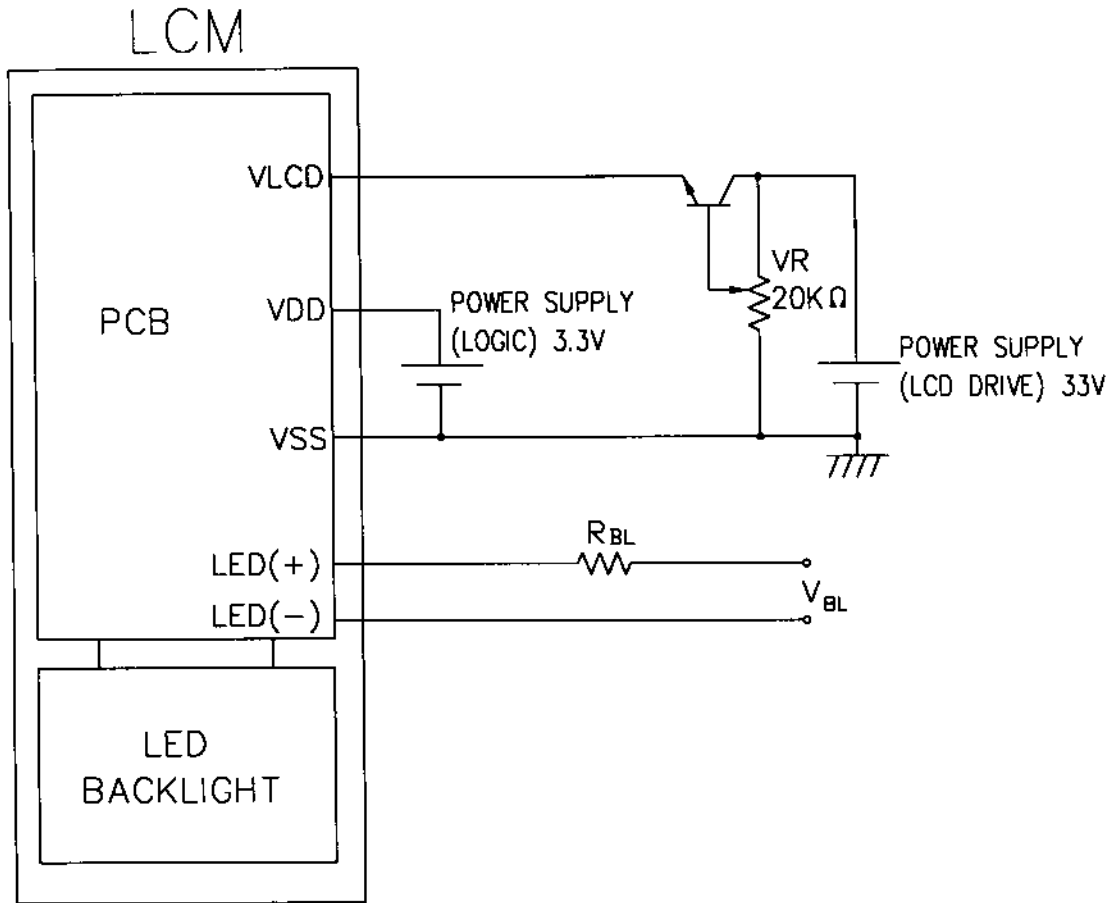
FPC ,20 pins,pitch 0.5mm

Pin No.	Symbol	Function
1	VDD	POWER SUPPLY FOR LOGIC
2	S.GND	SHIELD GROUND
3	VLCD	POWER SUPPLY FOR LCD
4	FLM	FIRST LINE MARKER
5	DISP.OFF	H: ON/L: OFF
6	M	SWITCH SIGNAL TO CONVERT LIQUID CRYSTAL DRIVE WAVEFORM INTO AC
7	CL1	DATA LATCH
8	CL2	SHIFT CLOCK
9	VSS	LOGIC GROUND
10	D0	DISPLAY DATA
11	D1	DISPLAY DATA
12	D2	DISPLAY DATA
13	D3	DISPLAY DATA
14	VSS	LOGIC GROUND
15	LED(+)	POWER SUPPLY FOR LED
16	LED(-)	POWER SUPPLY FOR LED
17	NC	NC
18	NC	NC
19	NC	NC
20	NC	NC

Mating Connector:MOLEX 52746-2090

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7. POWER SUPPLY



Recommended Value for R_{BL} & V_{BL}

item	R_{BL}	V_{BL}
Back Light interface	White LED	White LED
LED(+),LED(-) PIN	33Ω	5 Vdc

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8. TIMING CHARACTERISTICS

8-1. INTERFACE TIMING

● VDD=3.0V±5%, To=-20~85 °C

Item	Symbol	Test condition	Min.	Typ.	Max.	Unit
CL2 Cycle Time	t _C	Fig.a	125	-	-	ns
CL2 Pulse Width	t _{SWH} , t _{SWL}	Fig.a	51	-	-	ns
CL2 Rise/Fall Time	t _{CR} , t _{CF}	Fig.a	-	-	50	ns
Data Set Up Time	t _{DSU}	Fig.a	30	-	-	ns
Data Hold Time	t _{DHD}	Fig.a	40	-	-	ns
CL1 Cycle Time	t _L	Fig.b	250	-	-	ns
CL1 "H" Pulse Width	t _{LWH}	Fig.a, Fig.b	51	-	-	ns
CL1 Rise/Fall Time	t _{LR} , t _{LF}	Fig.b	-	-	50	ns
CL2 To CL1 Delay Time	t _{CL}	Fig.a	51	-	-	ns
CL1 To CL2 Delay Time	t _{LC}	Fig.a	51	-	-	ns
FLM TO CL1 SETUP TIME	t _{FLS}	Fig.b	30	-	-	ns
FLM TO CL1 HOLD TIME	t _{FLH}	Fig.b	50	-	-	ns

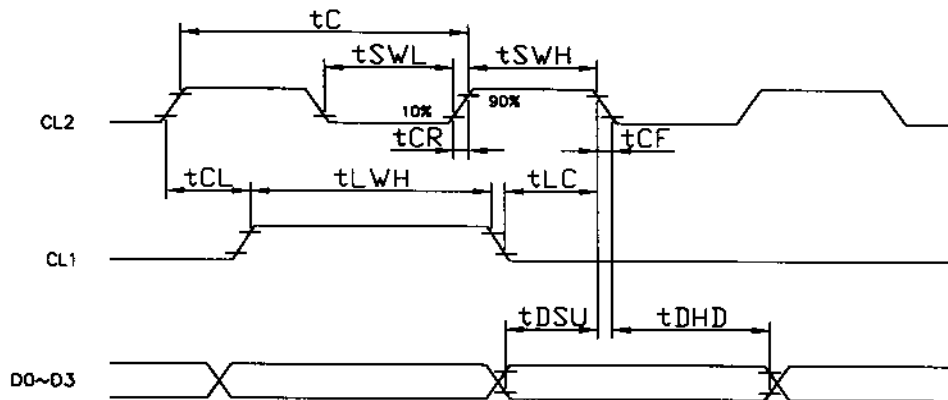


Fig . a Interface timing (SEGMENT)

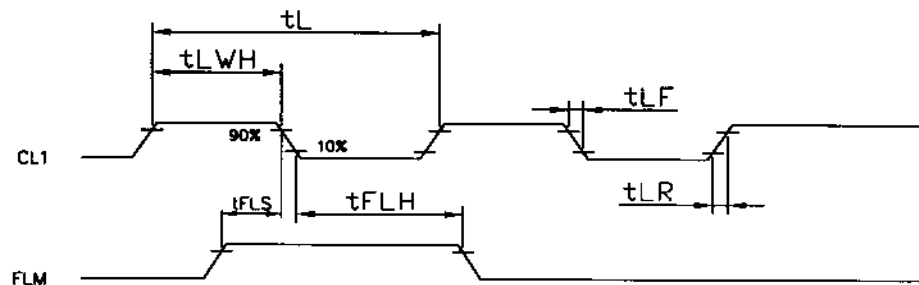


Fig . b Interface timing (COMMON)

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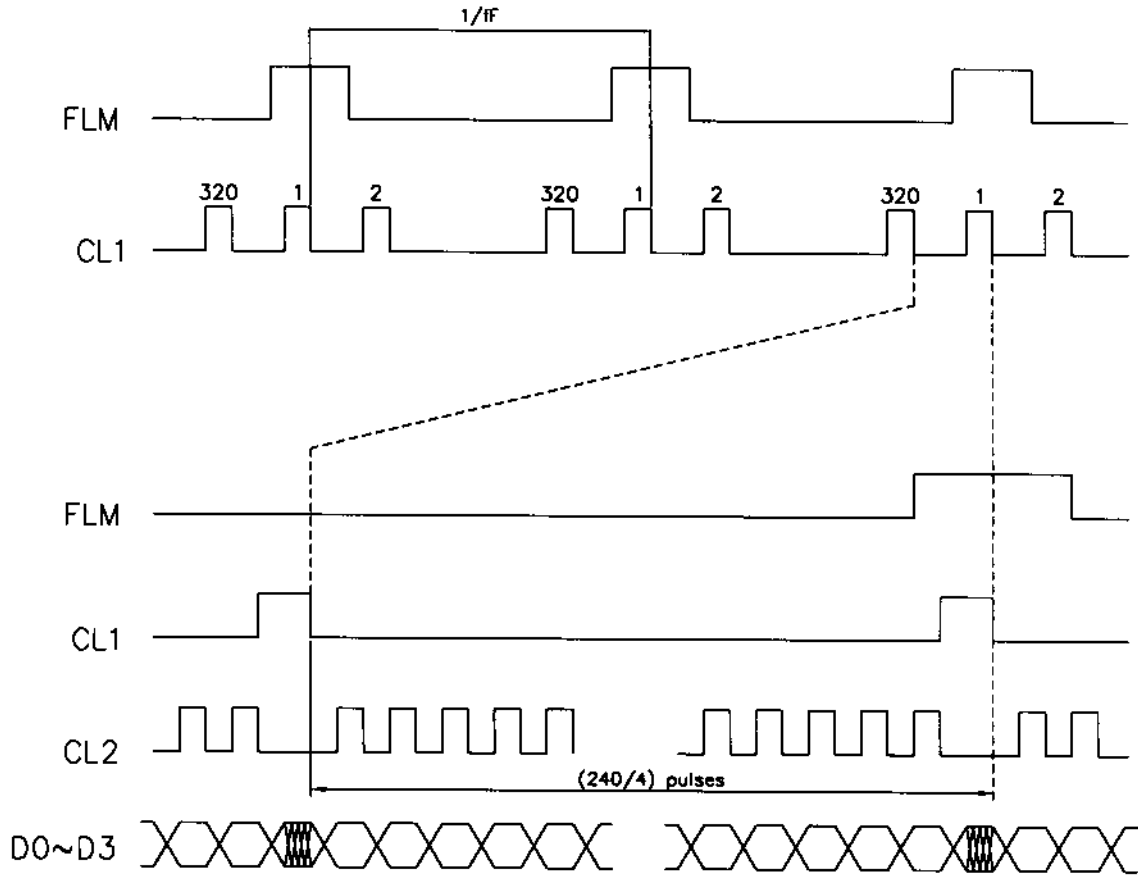
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8-2. TIMING CHART OF INPUT SIGNAL



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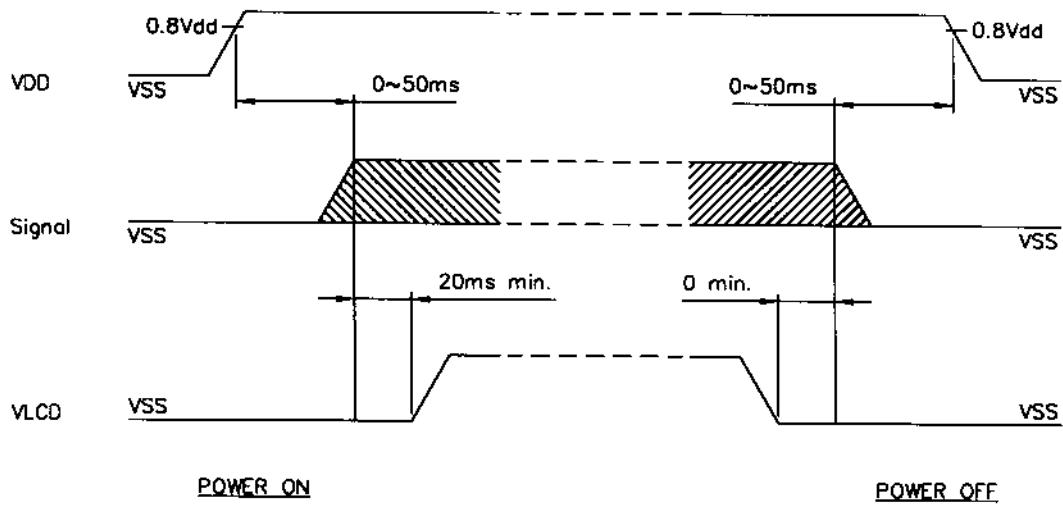
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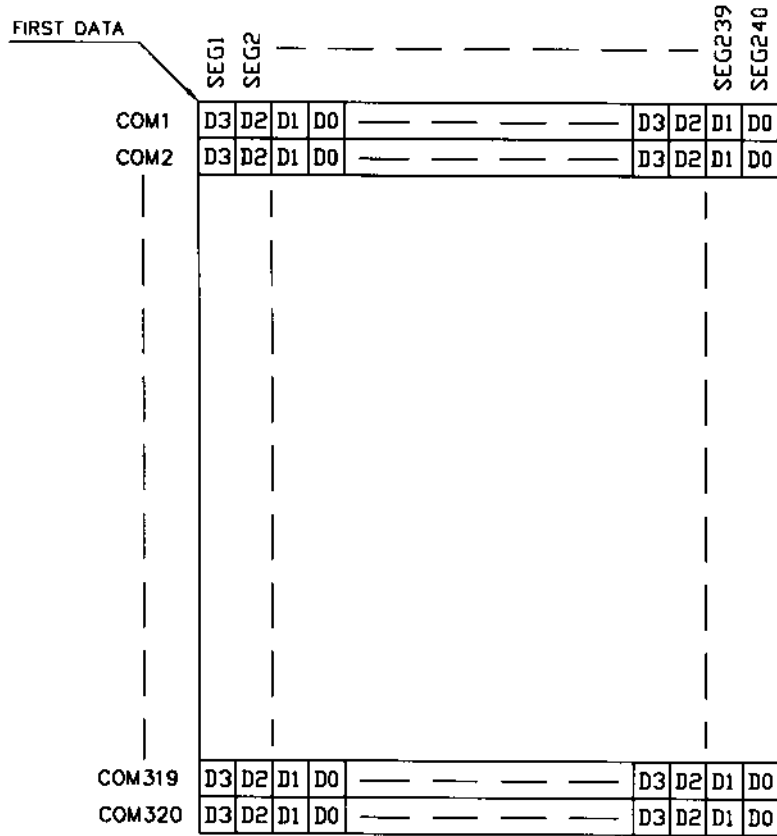
8-3. POWER ON/OFF TIMING



The missing pixels may occur when the LCM is driven beyond above power interface timing sequence.

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8-4. DISPLAY PATTERN



240 X 320 Dots Matrix

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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

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 $25^{\circ}\text{C}\pm 5^{\circ}\text{C}$ 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.

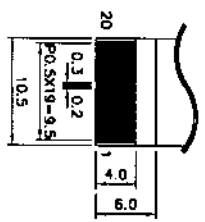
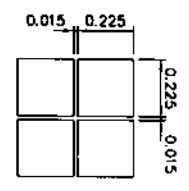
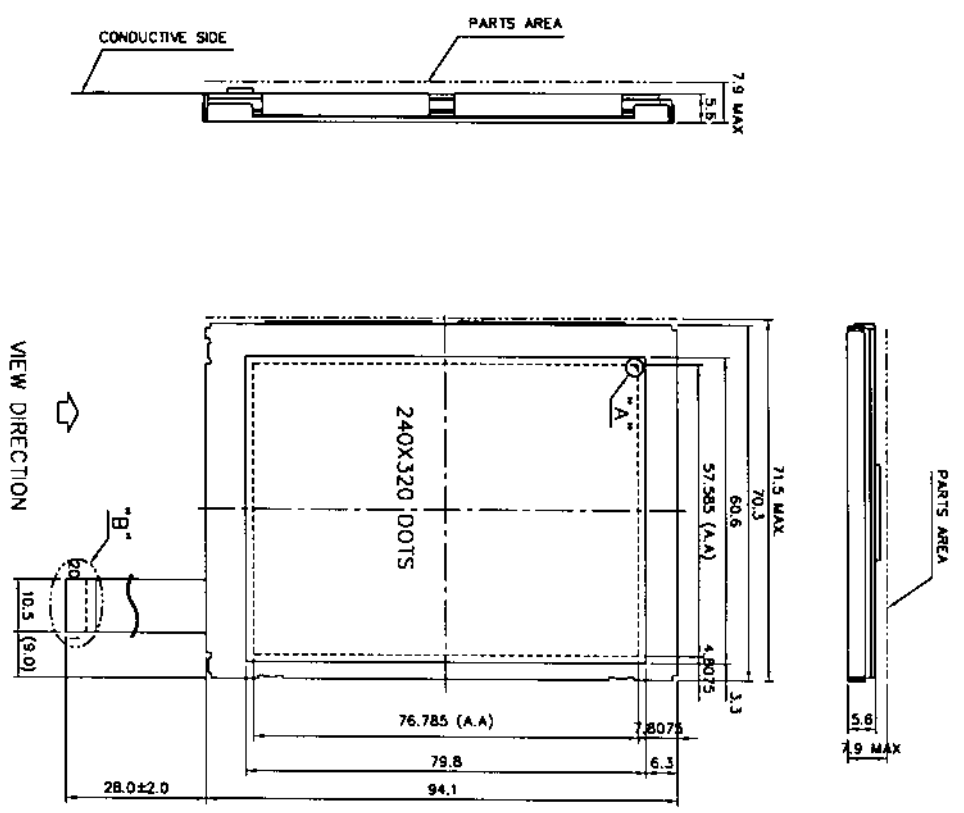
• TERMS OF WARRANTY

- 1.Acceptance inspection period
The period is within one month after the arrival of contracted commodity at the buyer's factory site.
- 2.Applicable warranty 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

- LED : 40,000hrs for ILED=55mA, 25°C
(Operating life time is defined as follows : The final brightness is at 50% of original brightness.)

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FIRST DATA

Com	1	2	3	4	5
Com 1	1.1	1.2	1.3	1.4	
Com 2	2.1	2.2	2.3		
Com 3	3.1	3.2			

Seg 1 Seg 2 Seg 3 Seg 4

1:240

320:240

320:1

320:240

00: (1,4) (1,8) (320,240)
 01: (1,5) (1,7) (320,239)
 02: (1,2) (1,6) (320,238)
 03: (1,1) (1,5) (320,237)

- NOTES:
- 1.RESOLUTION: 240X320 DOTS
 - 2.BACKLIGHT: LED (WHITE)
 - 3.FRAME MATERIAL: SECC
 - 4.GLASS THICKNESS: 0.7 mm