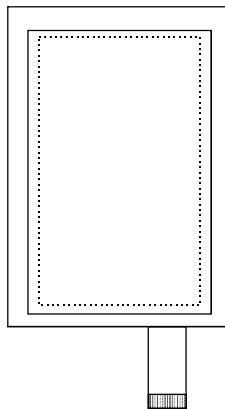




# PRODUCT SPECIFICATION

## HDM2432L-T

240 x 320 GRAPHICS  
LCD DISPLAY MODULE



<b>HANTRONIX, INC.</b> 10080 BUBB RD. CUPERTINO, CA 95014	<b>Q.A.:</b>	<b>REV.:</b>	<b>HDM2432L-T</b>	<b>SHEET 1 OF 17</b>
	JK	1.1		<b>DATE:</b> 7/31/02

# 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<sub>ss</sub>=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 <sub>I</sub>	-0.3	V <sub>DD</sub> +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<sub>a</sub> ≤ 50°C : 85%RH max

T<sub>a</sub> > 50°C : Absolute humidity must be lower

than the humidity of 85%RH at 50°C

Note 3 : T<sub>a</sub> 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	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	-
				PATTERN: (Dots All Off) □ □ □ □ □ □ □ □ □ □		-	5.6	-

## 4. OPTICAL CHARACTERISTICS

AT  $V_{OP}$

ITEM MODE		Cr(Contrast Ratio)						$\theta$ (Viewing Angle)		$\phi$ (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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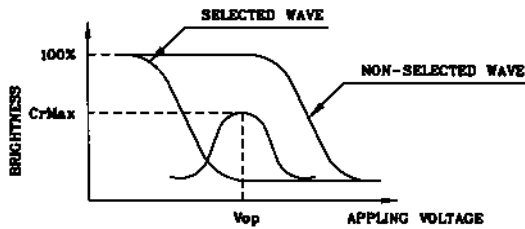
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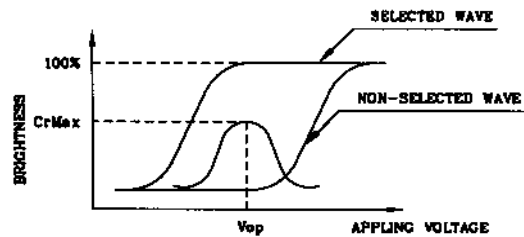
DATE:  
7/31/02

(NOTE 1)

Definition of Operation Voltage(Vop)



(positive type)



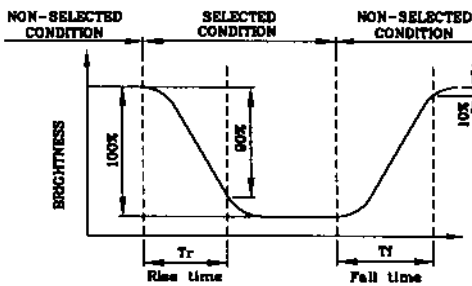
(negative type)

\*Conditions

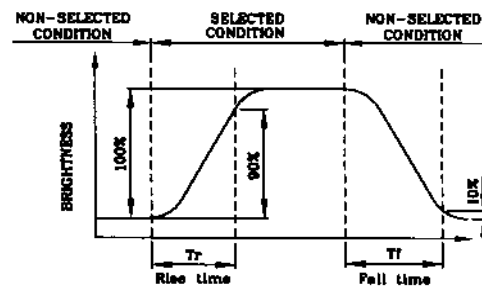
Viewing Angle : 0  
 Frame Frequency : 70Hz  
 Applying Waveform : 1/N duty 1/a bias

(NOTE 2)

Definition of Response Time(Tr,Tf)



(positive type)



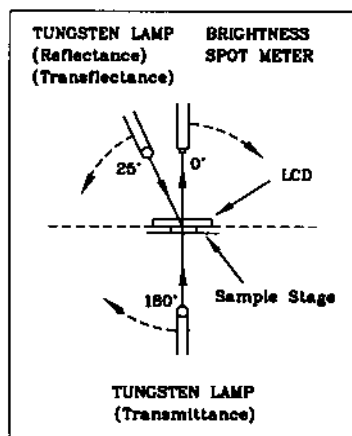
(negative type)

\*Conditions

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

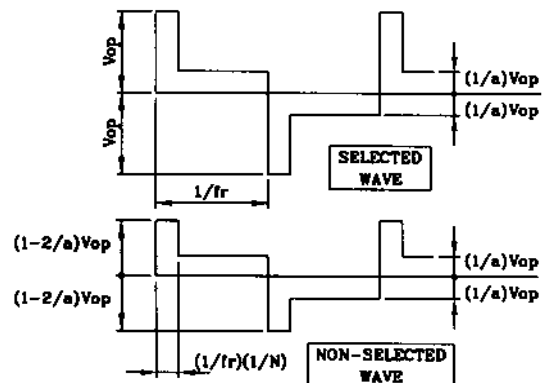
(NOTE 3)

Description of Measuring Equipment and Driving Waveforms



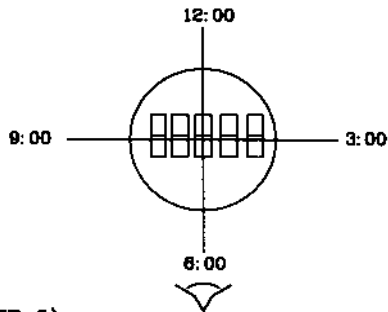
CONST.  
TEMP.  
CHAMBER

Multiplex Driving ( 1/N duty 1/a bias )



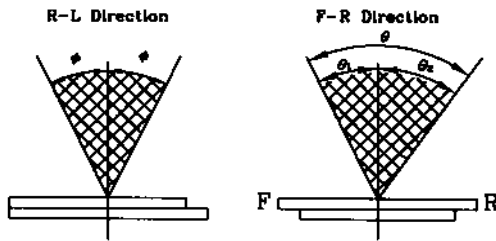
(NOTE 4)

Definition of Viewing Direction



(NOTE 5)

Definition of Viewing Angle



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

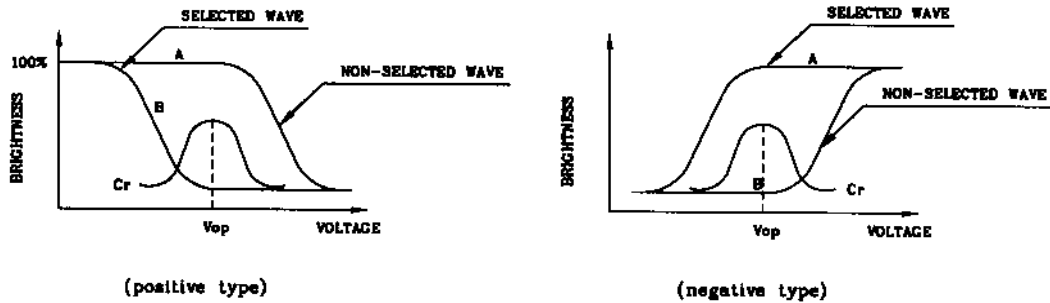
$$\theta = \theta_1 + \theta_2$$

\*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)



Contrast Ratio :  $Cr = A/B$

\*Conditions

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

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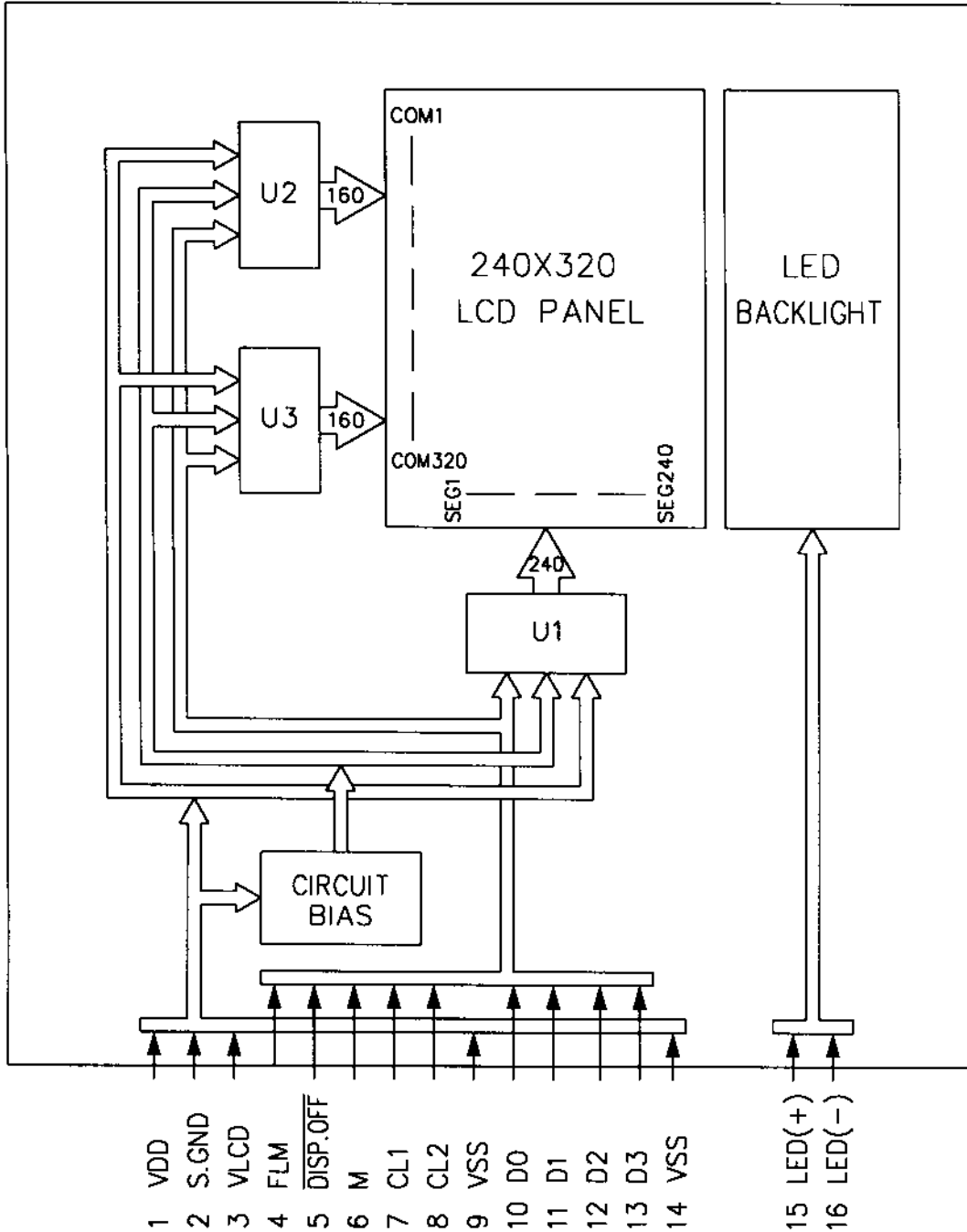
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# 5. BLOCK DIAGRAM



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## 6.INTERNAL PIN CONNECTION

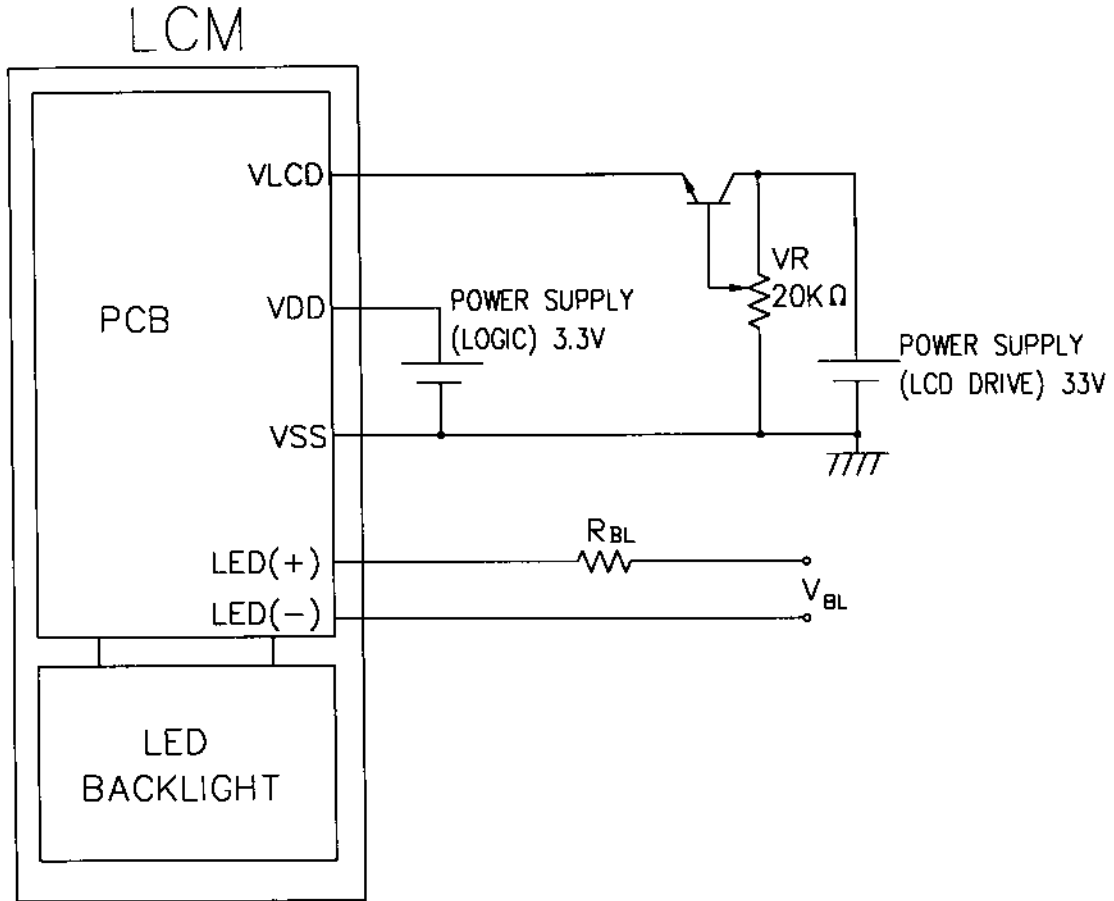
FPC ,20 pins,pitch 0.5mm

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 <sub>C</sub>	Fig.a	125	-	-	ns
CL2 Pulse Width	t <sub>SWH</sub> ,t <sub>SWL</sub>	Fig.a	51	-	-	ns
CL2 Rise/Fall Time	t <sub>CR</sub> ,t <sub>CF</sub>	Fig.a	-	-	50	ns
Data Set Up Time	t <sub>DSU</sub>	Fig.a	30	-	-	ns
Data Hold Time	t <sub>DHD</sub>	Fig.a	40	-	-	ns
CL1 Cycle Time	t <sub>L</sub>	Fig.b	250	-	-	ns
CL1 "H" Pulse Width	t <sub>LWH</sub>	Fig.a , Fig.b	51	-	-	ns
CL1 Rise/Fall Time	t <sub>LR</sub> ,t <sub>LF</sub>	Fig.b	-	-	50	ns
CL2 To CL1 Delay Time	t <sub>CL</sub>	Fig.a	51	-	-	ns
CL1 To CL2 Delay Time	t <sub>LC</sub>	Fig.a	51	-	-	ns
FLM TO CL1 SETUP TIME	t <sub>FLS</sub>	Fig.b	30	-	-	ns
FLM TO CL1 HOLD TIME	t <sub>FLH</sub>	Fig.b	50	-	-	ns

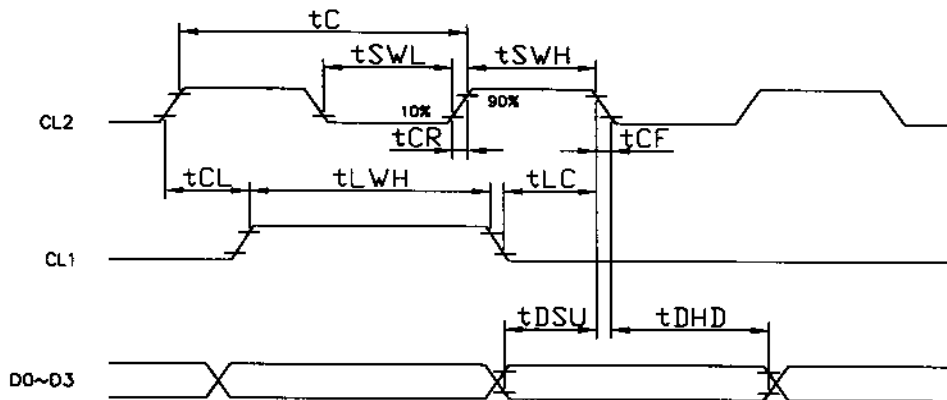


Fig . a Interface timing (SEGMENT)

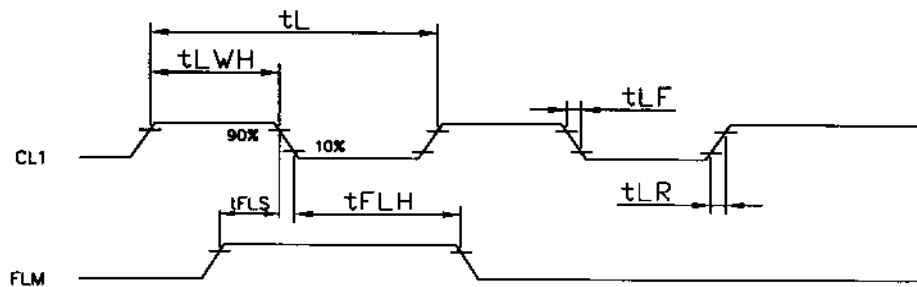


Fig . b Interface timing (COMMON)

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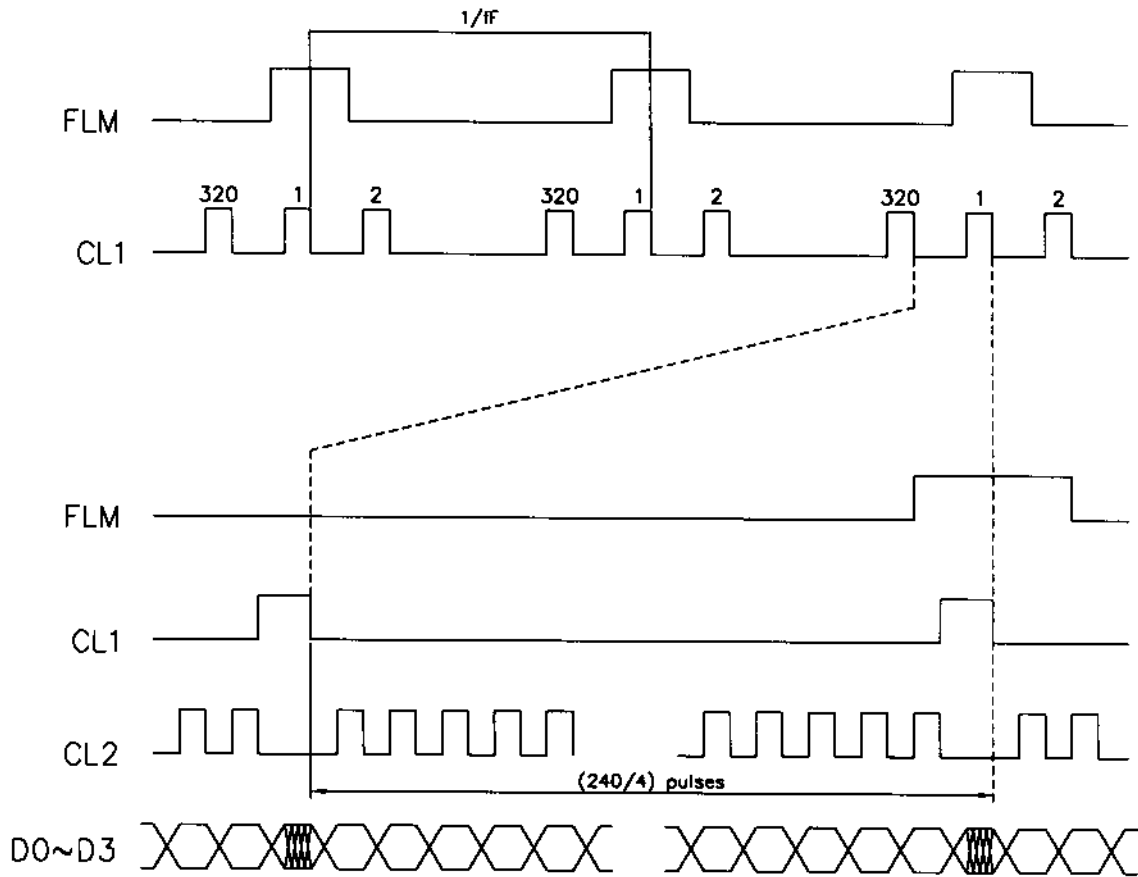
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## 8-2. TIMING CHART OF INPUT SIGNAL



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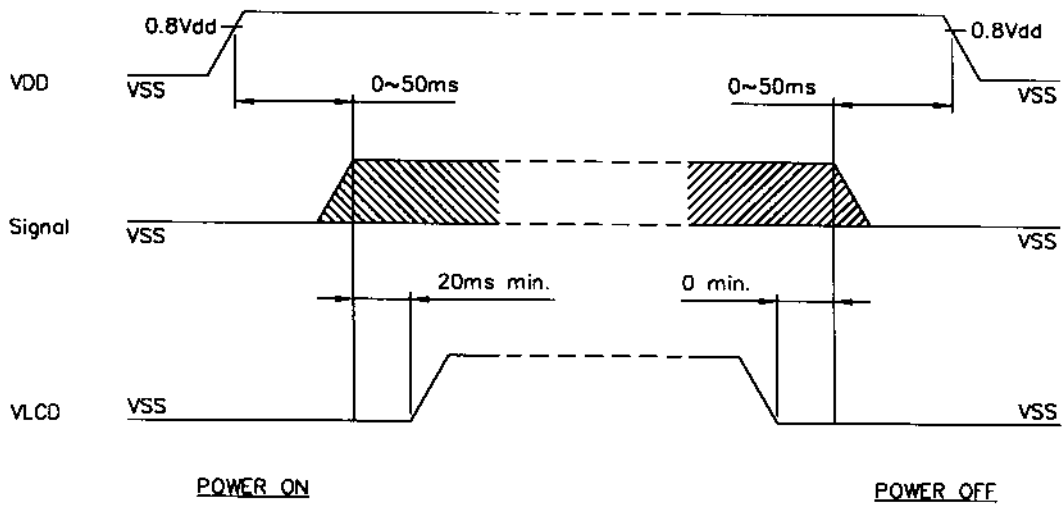
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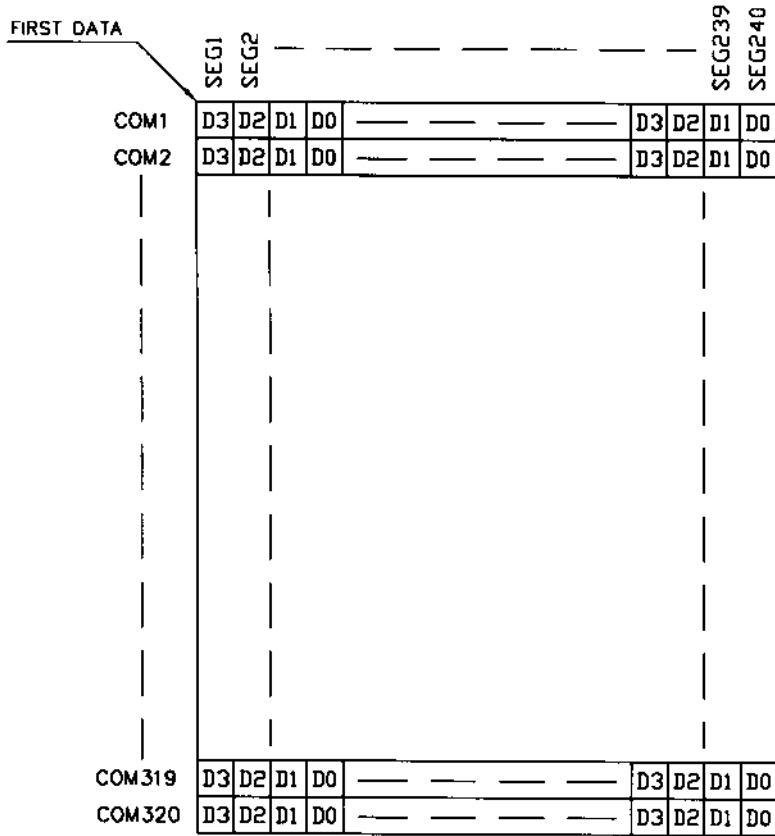
### 8-3. POWER ON/OFF TIMING



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

## 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

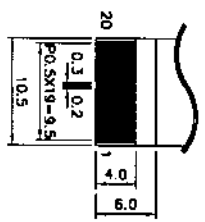
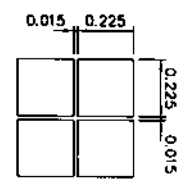
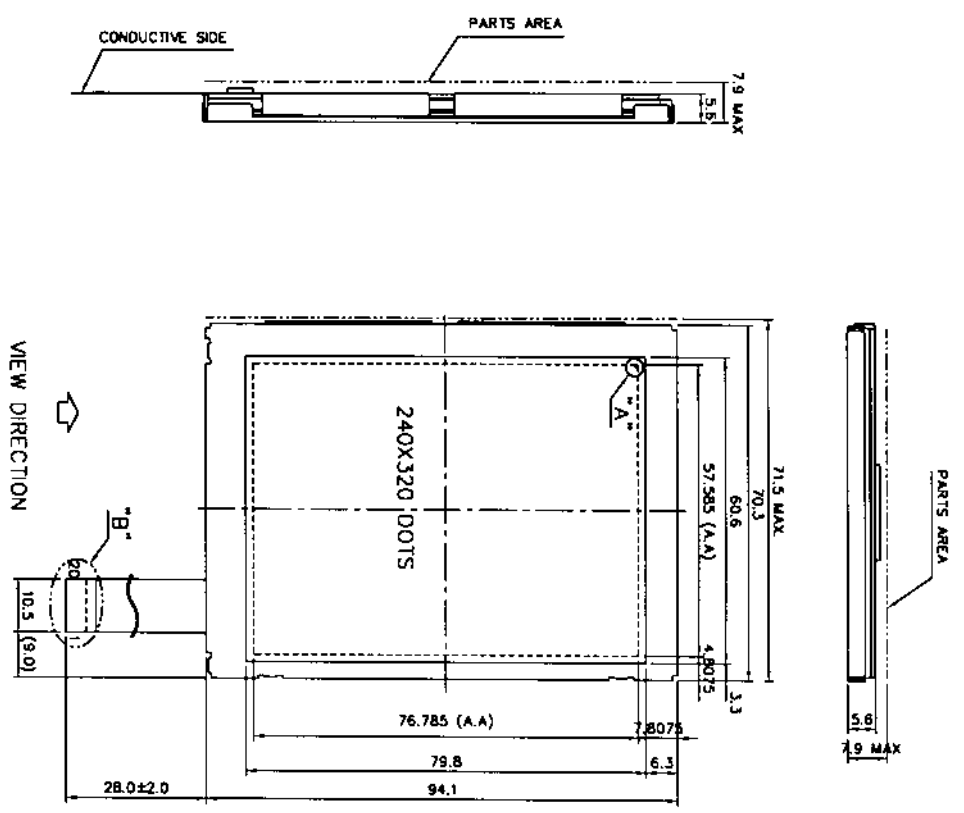
- 1.Acceptance inspection period  
The period is within one month after the arrival of contracted commodity at the buyer's factory site.
- 2.Applicable warranty period  
The period is within twelve months since the date of shipping out under normal using and storage conditions.

• 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	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
Com 1	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.0	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	3.0	3.1	3.2	3.3	3.4	3.5	3.6	3.7	3.8	3.9	4.0	4.1	4.2	4.3	4.4	4.5	4.6	4.7	4.8	4.9	5.0	5.1	5.2	5.3	5.4	5.5	5.6	5.7	5.8	5.9	6.0	6.1	6.2	6.3	6.4	6.5	6.6	6.7	6.8	6.9	7.0	7.1	7.2	7.3	7.4	7.5	7.6	7.7	7.8	7.9	8.0	8.1	8.2	8.3	8.4	8.5	8.6	8.7	8.8	8.9	9.0	9.1	9.2	9.3	9.4	9.5	9.6	9.7	9.8	9.9	10.0										

Com 320 320.1 320.240

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