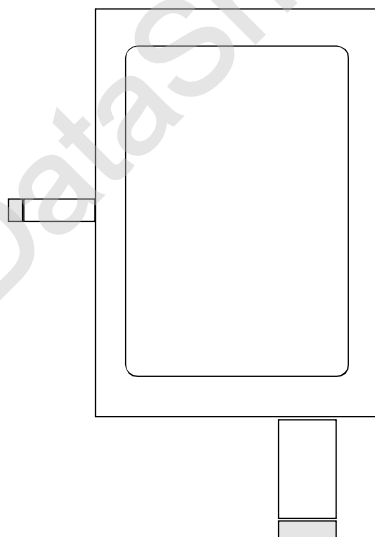


HANTRONIX

PRODUCT SPECIFICATION

HDM2432TSL-T

240x320 GRAPHICS
LCD DISPLAY MODULE



HANTRONIX, INC. 10080 BUBB RD. CUPERTINO, CA 95014	Q.A.: JK	REV.: 1.1	HDM2432TSL-T	SHEET 1 OF 16
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1.MECHANICAL DATA

(1) Product No.	HDM2432TSL-T
(2) Module Size	75.1 (W)mm X 93.8 (H)mm X 9.5 (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) X 320 (H) Dots
(6) Duty	1/320
(7) LCD Display Mode	FSTN: Normally White
	Rear Polarizer: Transflective
(8) Viewing Direction	9 O'clock
(9) Backlight	LED B/L
(10) Weight	73.4g(Approx.)
(11) Controller	Excluded
(12) DC/DC Converter	Excluded

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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 LC Drive	VLCD-VSS	-0.3	30.0	V	
Input Voltage	VI	-0.3	VDD	V	
Static Electricity	-	-	-	-	Note 1

Note 1 LCM should be grounded during handling LCM.

(2) ENVIRONMENTAL ABSOLUTE MAXIMUM RATINGS

ITEM	OPERATION		STORAGE	
	MIN.	MAX.	MIN.	MAX.
Ambient Temperature	-20	70	-30	80
Humidity (Without Condensation)	Note 2,4		Note 3,4	

Note 1 LCM should be grounded during handling LCM.

Note 2 Ta ≤ 70°C : 75%RH max
Ta > 70°C : Absolute humidity must be lower
than the humidity of 75%RH at 70°C

Note 3 Ta at -30°C will be < 48 hrs, at 80°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 ± 10%)

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 1/16.3 Bias	-20°C	28.6	28.9	V
				0°C	27.2	27.5	
				25°C	26.4	26.7	
				50°C	25.4	25.7	
				70°C	24.8	25.1	
Power Supply Current		IDD	VDD= 3.3V VSS= 0V VLCD-VSS=26.7V FLM=70Hz PATTERN : □ ■ □ ■ □ ■ ■ □ ■ □ ■ □	—	0.1	0.2	mA
		IEE		—	2.9	4.4	
Power Supply Current For LED		ILED	VBL=5V RBL=33Ω	—	55	82	mA
LCM	Surface Luminance	L	VDD=3.3V VLCD-VSS =26.7V ILED=55mA	PATTERN: (Dots All On)	—	1.3	cd/m ²
				PATTERN: (Dots All Off)	—	4.6	

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4.OPTICAL CHARACTERISTICS

AT Vop

ITEM MODE		Cr(Contrast Ratio)										θ (Viewing Angle)		ϕ (Viewing Angle)	
		-20℃		0℃		25℃		50℃		75℃		25℃		25℃	
		MIN.	TYP.	MIN.	TYP.	MIN.	TYP.	MIN.	TYP.	MIN.	TYP.	MIN.	TYP.	MIN.	TYP.
S	P	-	6.0	-	7.5	-	7.0	-	6.0	-	4.5	-	59	-	(L) 26 (R) 40
Note		NOTE 6										NOTE 5			

NOTE :

S: TRANSFLCTIVE(NORMAL)
P: NORMALLY WHITE,9 O'clock

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

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Response Time (rise)	Tr	-20℃	4000	5000	6000	ms	NOTE 2
		0℃	900	1100	1300		
		25℃	240	300	360		
		50℃	120	150	180		
		70℃	100	130	160		
Response Time (fall)	Tf	-20℃	1600	2000	2400	ms	NOTE 2
		0℃	300	370	440		
		25℃	100	130	160		
		50℃	50	65	80		
		70℃	40	50	60		

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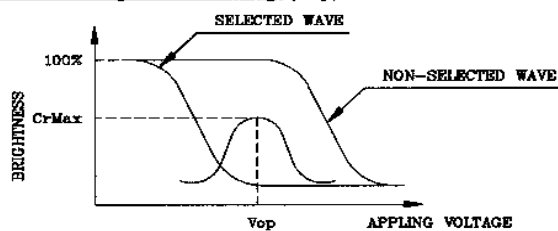
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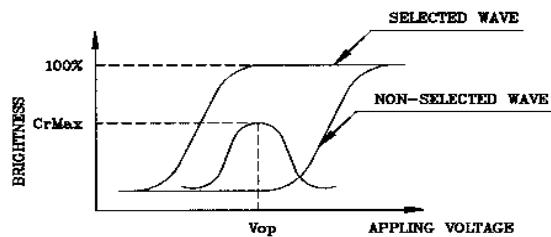
DATE: 4/15/02

(NOTE 1)

Definition of Operation Voltage(Vop)



(positive type)



(negative type)

*Conditions

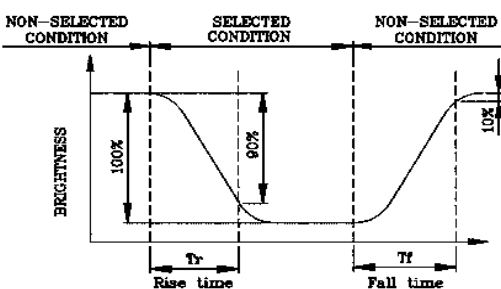
Viewing Angle : 0

Frame Frequency : 70Hz

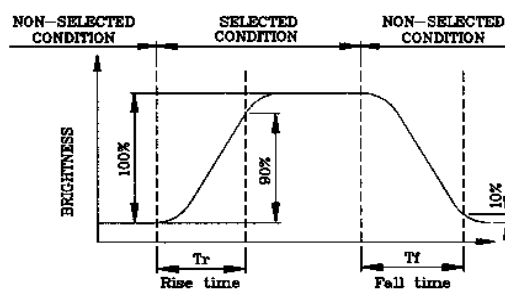
Applying Waveform : 1/N duty 1/a bias

(NOTE 2)

Definition of Response Time(Tr,Tf)



(positive type)



(negative type)

*Conditions

Operating Voltage : Vop

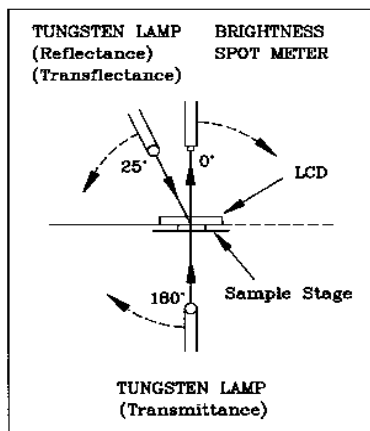
Viewing Angle (θ,φ) : (0,0)

Frame Frequency : 70Hz

Applying Waveform : 1/N duty 1/a bias

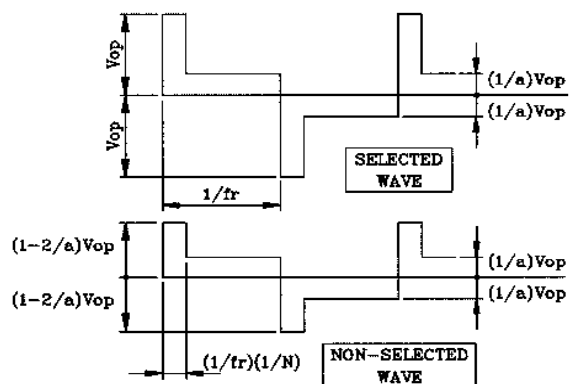
(NOTE 3)

Description of Measuring Equipment and Driving Waveforms



CONST.
TEMP.
CHAMBER

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



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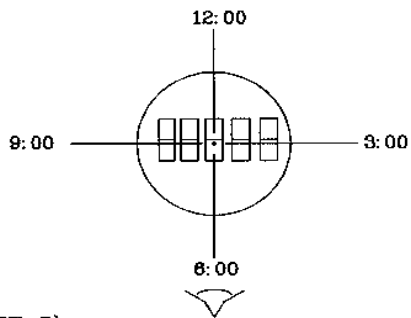
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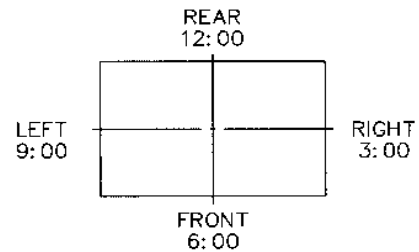
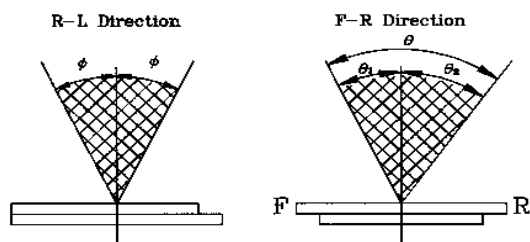
(NOTE 4)

Definition of Viewing Direction



(NOTE 5)

Definition of Viewing Angle



*For This Product

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

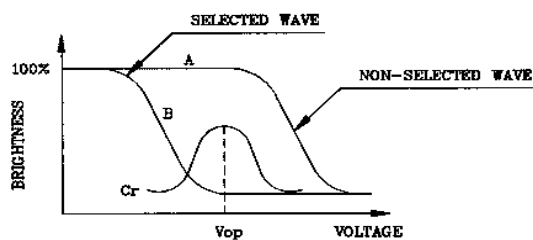
$$\theta = \theta_1 + \theta_2$$

*Conditions

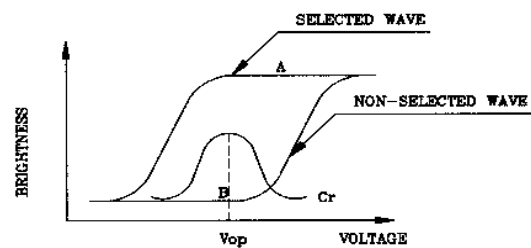
Operating Voltage : V_{op}
Frame Frequency : 70Hz
Applying Waveform : 1/N duty 1/a bias
Contrast Ratio : larger than 2

(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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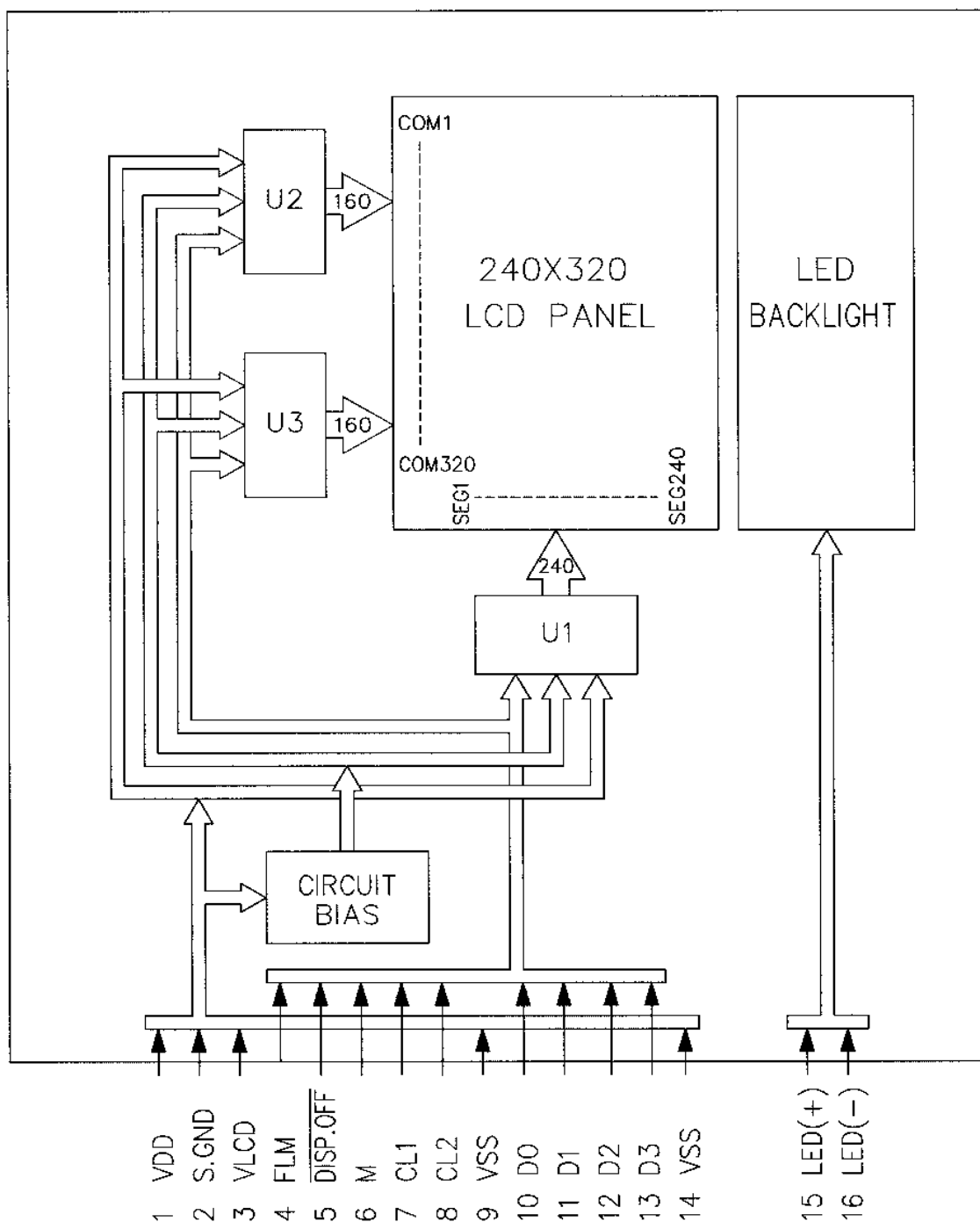
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5. BLOCK DIAGRAM



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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

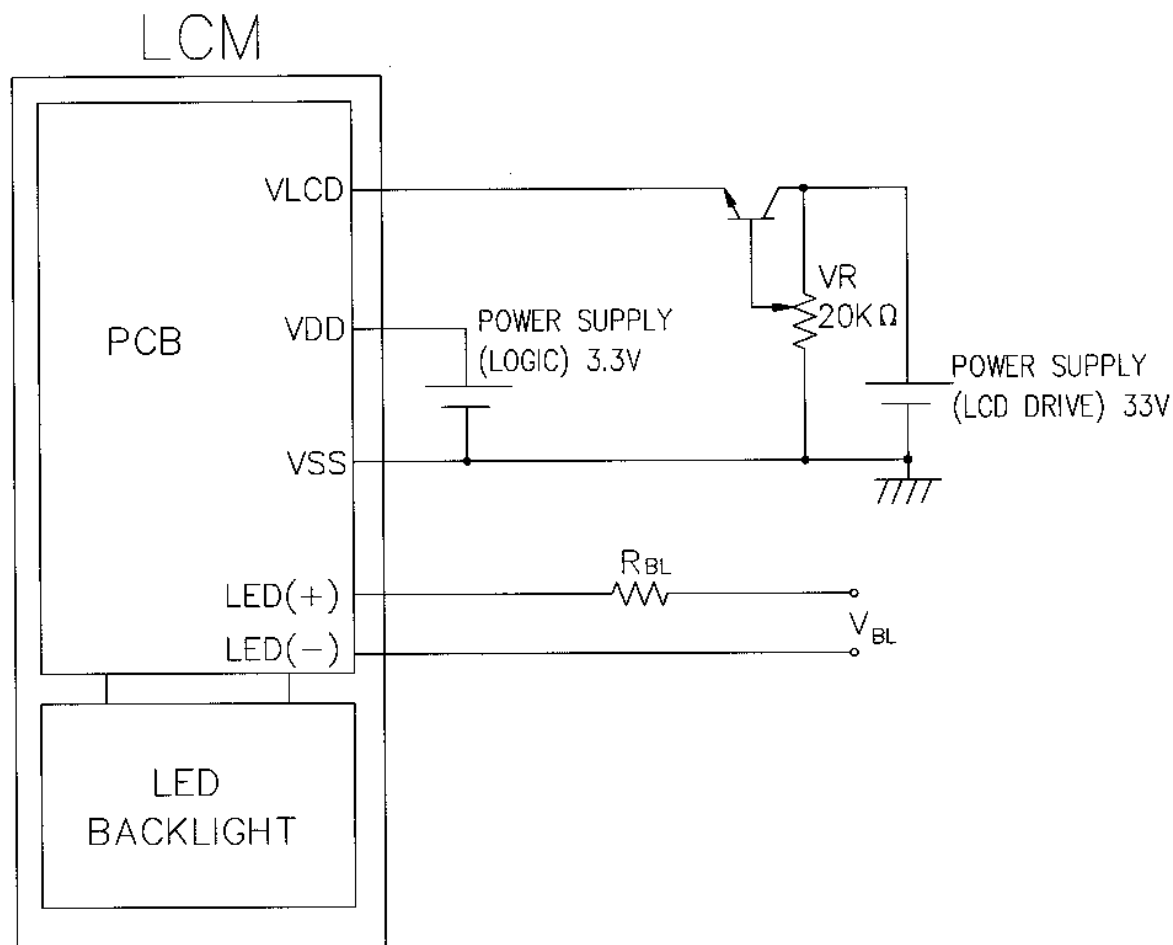
TOUCH PANEL

Pin No.	Symbol
1	Y2
2	X2
3	Y1
4	X1

Mating Connector : ELCO 6200-087-032-800

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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=2.7~4.5V, Ta=-20~70 ℃

Item	Symbol	Test condition	Min.	Typ.	Max.	Unit
Clock Cycle	tC	Fig.a	500	—	—	ns
SCP Pulse Width	tSWH,tSWL	Fig.a	240	—	—	ns
Data Set Up Time	tDSU	Fig.a , Fig.b	240	—	—	ns
Data Hold Time	tDHD	Fig.a , Fig.b	240	—	—	ns
SCP Rise/Fall Time	tr,tf	Fig.a , Fig.b	—	—	50	ns
LP Rise Time	tLRP	Fig.a	240	—	—	ns
LP Fall Time	tLFP	Fig.a	240	—	—	ns
LP Pulse Width	tLW	Fig.a	240	—	—	ns
SCP To LP Delay Time	tSL	Fig.a	50	—	—	ns
LP To SCP Delay Time	tLS	Fig.a	100	—	—	ns
LP "H" Pulse Width	tCWH	Fig.b	40	—	—	ns
LP "L" Pluse Width	tCWL	Fig.b	170	—	—	ns

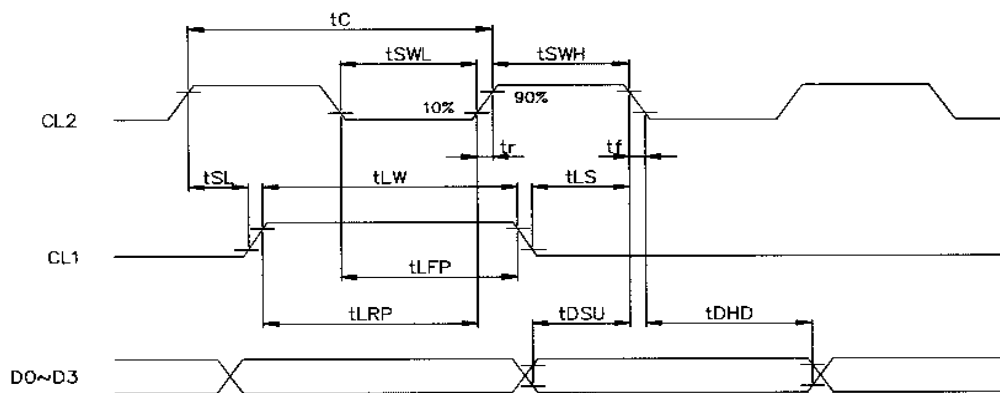


Fig . a Interface timing (SEGMENT)

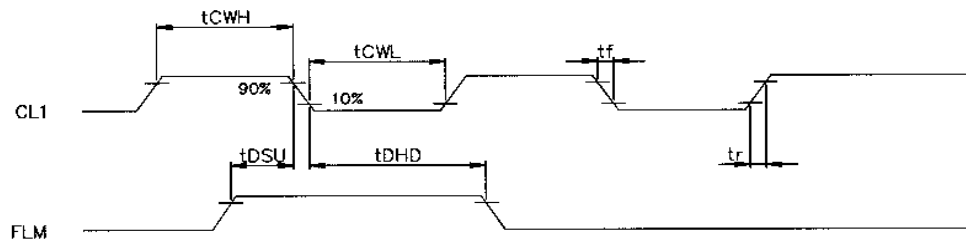


Fig . b Interface timing (COMMON)

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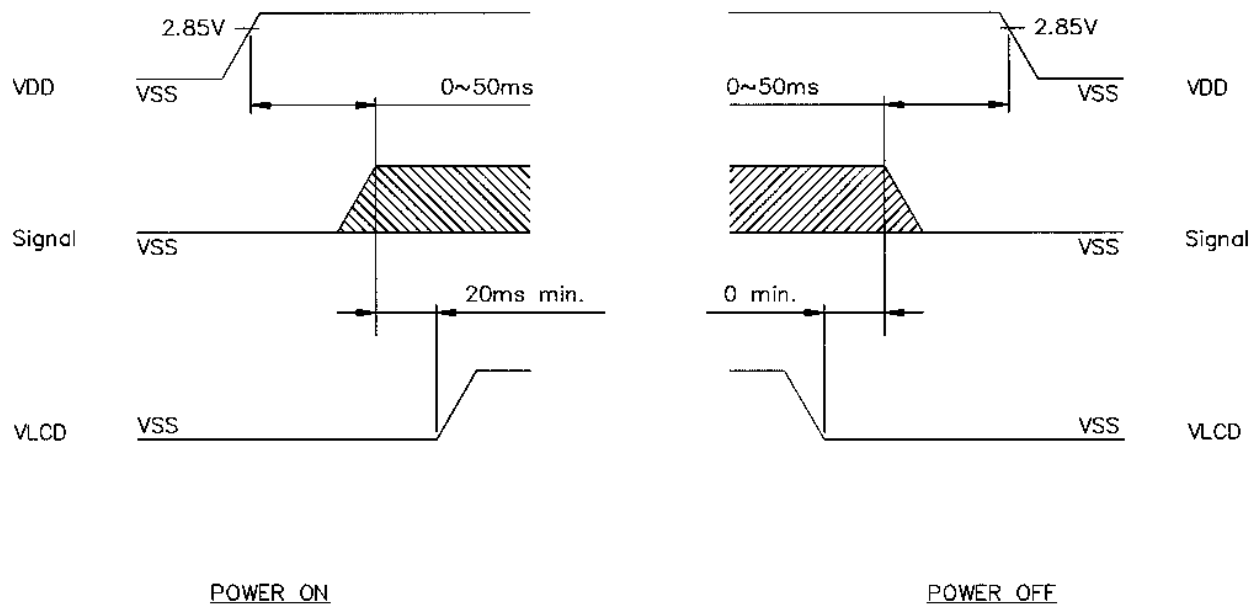
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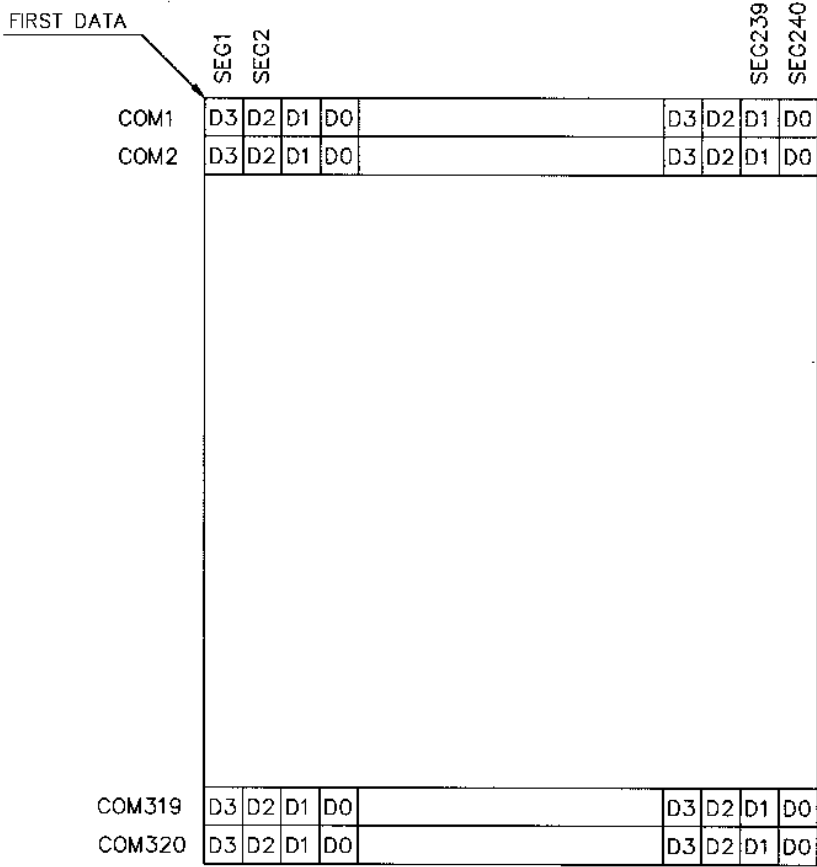
8-2 POWER ON/OFF TIMING



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

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8-3 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

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

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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