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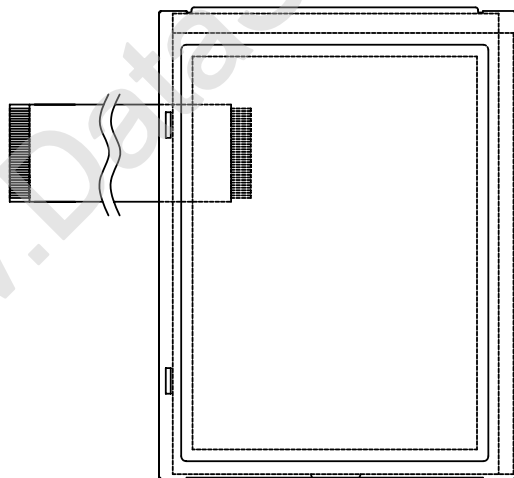
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HANTRONIX

PRODUCT SPECIFICATION

HDM3224-T

240 x320 MONOCHROME GRAPHICS
LCD DISPLAY MODULE



HANTRONIX, INC.
10080 BUBB RD.
CUPERTINO, CA 95014

Q.A.:

ZW

REV:

1.0

HDM3224-T

SHEET 1 OF 14

DATE:

11/30/04

1. MECHANICAL DATA

(1) Product No.	HDM3224-T
(2) Module Size	73.28 (W)mm X 92.18 (H)mm X 6.5 (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	1/240
(7) LCD Display Mode	FSTN: Black and White(Normally White,Paper White /Positive Image) Rear Polarizer: Transflective
(8) Viewing Direction	6 O'clock
(9) Backlight	EL B/L
(10) Weight	63.6g(Aprox.)
(11) Controller	Excluded
(12) DC/DC Converter	Included
(13) EL B/L inverter Ckt	Included
(14) Touch Panel	Excluded

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	
Input Voltage	VEE	1.2	2.0	V	
Static Electricity	-	-	-	-	Note 1

(2) ENVIRONMENTAL ABSOLUTE MAXIMUM RATINGS

ITEM	OPERATING		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 $T_a \leq 70^{\circ}\text{C}$: 75%RH max

$T_a > 70^{\circ}\text{C}$: Absolute humidity must be lower
than the humidity of 75%RH at 70°C

Note 3 T_a at -30°C will be < 48hrs, at 80°C will be < 120hrs

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
		VIL	L level	0	—	0.2VDD	V
Recommended LC Driving Voltage		Vadj	−20°C	1.15	—	—	V
			25°C	—	1.55	—	
			70°C	—	—	1.85	
Power Supply Current		IDD	VDD= 3.3V VSS= 0V Vadj= 1.55V VOP(*)=18.7V FLM=70Hz PATTERN : □ ■ □ ■ □ ■ ■ □ ■ □ ■ □	—	4.4	6.6	mA
EL Power Supply Current		IEL	VEL =3.3VDC	—	16	24	mA
LCM Surface Luminance	M298L	L	(Dots All On) PATTERN: ■ ■ ■ ■ ■ ■ ■ ■	—	0.15	—	cd/m ²
			(Dots All Off) PATTERN: □ □ □ □ □ □ □ □	—	0.47	—	

4.OPTICAL CHARACTERISTICS

ITEM MODE		Cr(Contrast Ratio)										θ (Viewing Angle)		ϕ (Viewing Angle)	
		-20℃		0℃		25℃		50℃		70℃		25℃		25℃	
		MIN.	TYP.	MIN.	TYP.	MIN.	TYP.	MIN.	TYP.	MIN.	TYP.	MIN.	TYP.	MIN.	TYP.
M	L	-	5.5	-	7.0	-	7.0	-	4.0	-	2.0	-	79	-	40-38
Note		NOTE 6										NOTE 5			

NOTE :

M : Transflective (3M)

L: Normally White , 6 O'clock ,
special lighter background color

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

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Response Time (rise)	Tr	-20℃	-	7000	-	ms	NOTE 2
		0℃	-	1000	-		
		25℃	-	350	-		
		50℃	-	100	-		
		70℃	-	40	-		
Response Time (fall)	Tf	-20℃	-	4000	-	ms	NOTE 2
		0℃	-	600	-		
		25℃	-	160	-		
		50℃	-	60	-		
		70℃	-	40	-		

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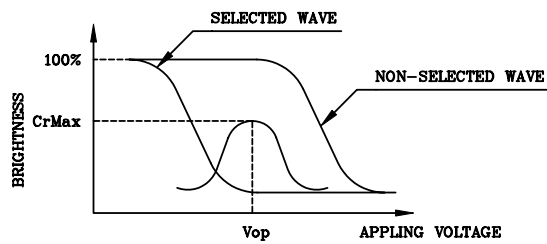
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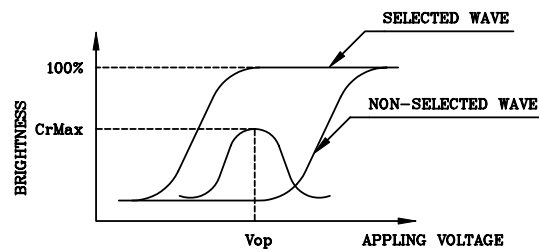
DATE:
11/30/04

(NOTE 1)

Definition of Operation Voltage(Vop)



(positive type)



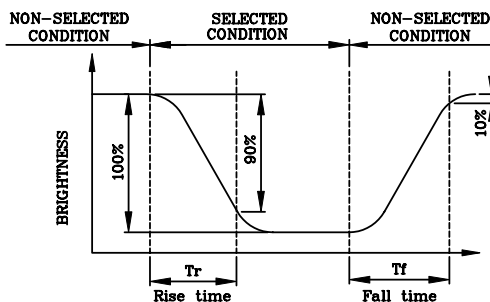
(negative type)

*Conditions

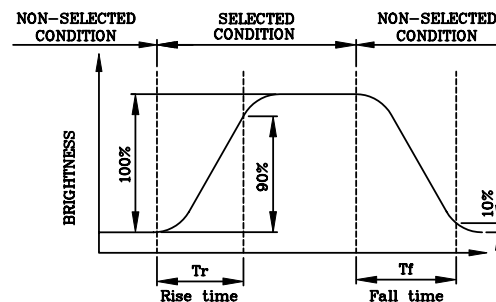
Viewing Angle : 0
Frame Frequency : 70Hz
Applying Waveform : 1/N duty 1/a bias

(NOTE 2)

Definition of Response Time(Tr,Tf)



(positive type)



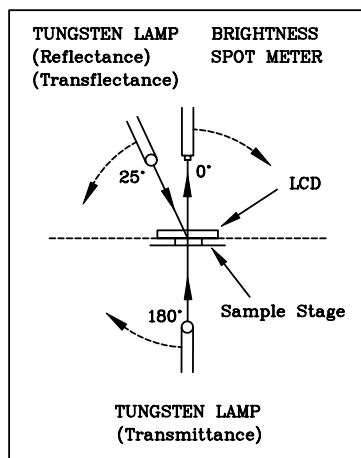
(negative type)

*Conditions

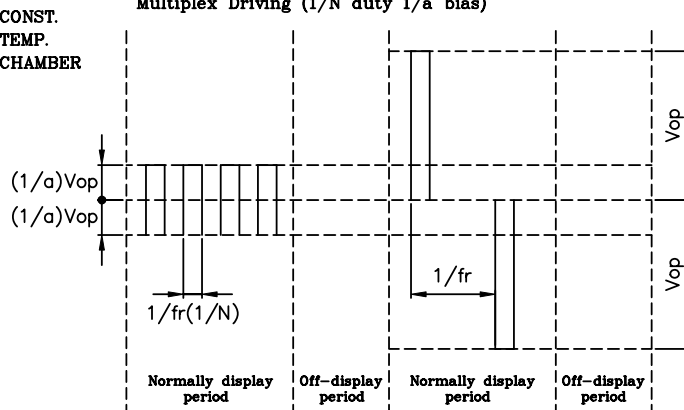
Operating Voltage : Vop
Viewing Angle (θ, ϕ) : (0,0)
Frame Frequency : 70Hz
Applying Waveform : 1/N duty 1/a bias

(NOTE 3)

Description of Measuring Equipment and Driving Waveforms

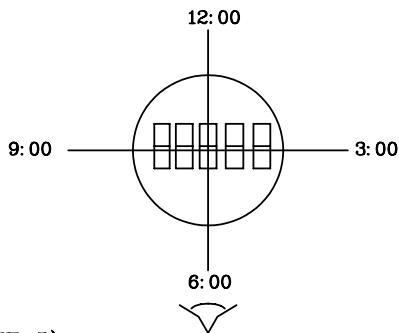


The voltage relationship of each signal is as follow
Multiplex Driving (1/N duty 1/a bias)



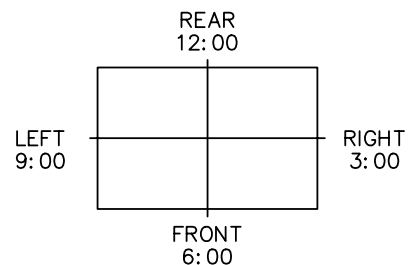
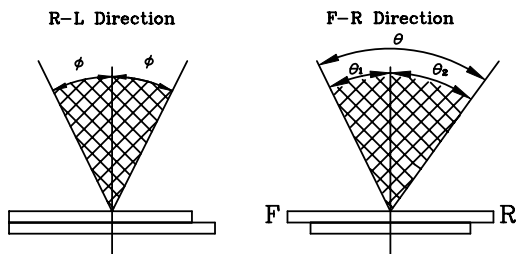
(NOTE 4)

Definition of Viewing Direction



(NOTE 5)

Definition of Viewing Angle



*For This Product

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

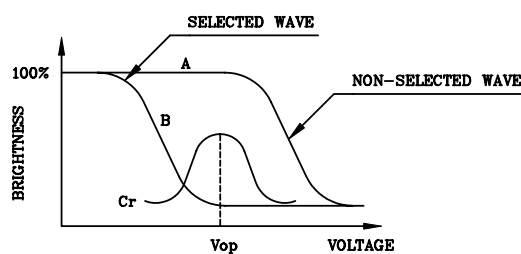
$$\theta = \theta_1 + \theta_2$$

*Conditions

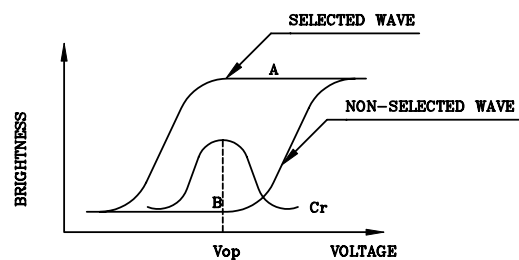
Operating Voltage : V_{op}
Frame Frequency : 70Hz
Applying Waveform : 1/N duty 1/a bias
Contrast Ratio : larger than 2

(NOTE 6)

Definition of Contrast Ratio (Cr)



(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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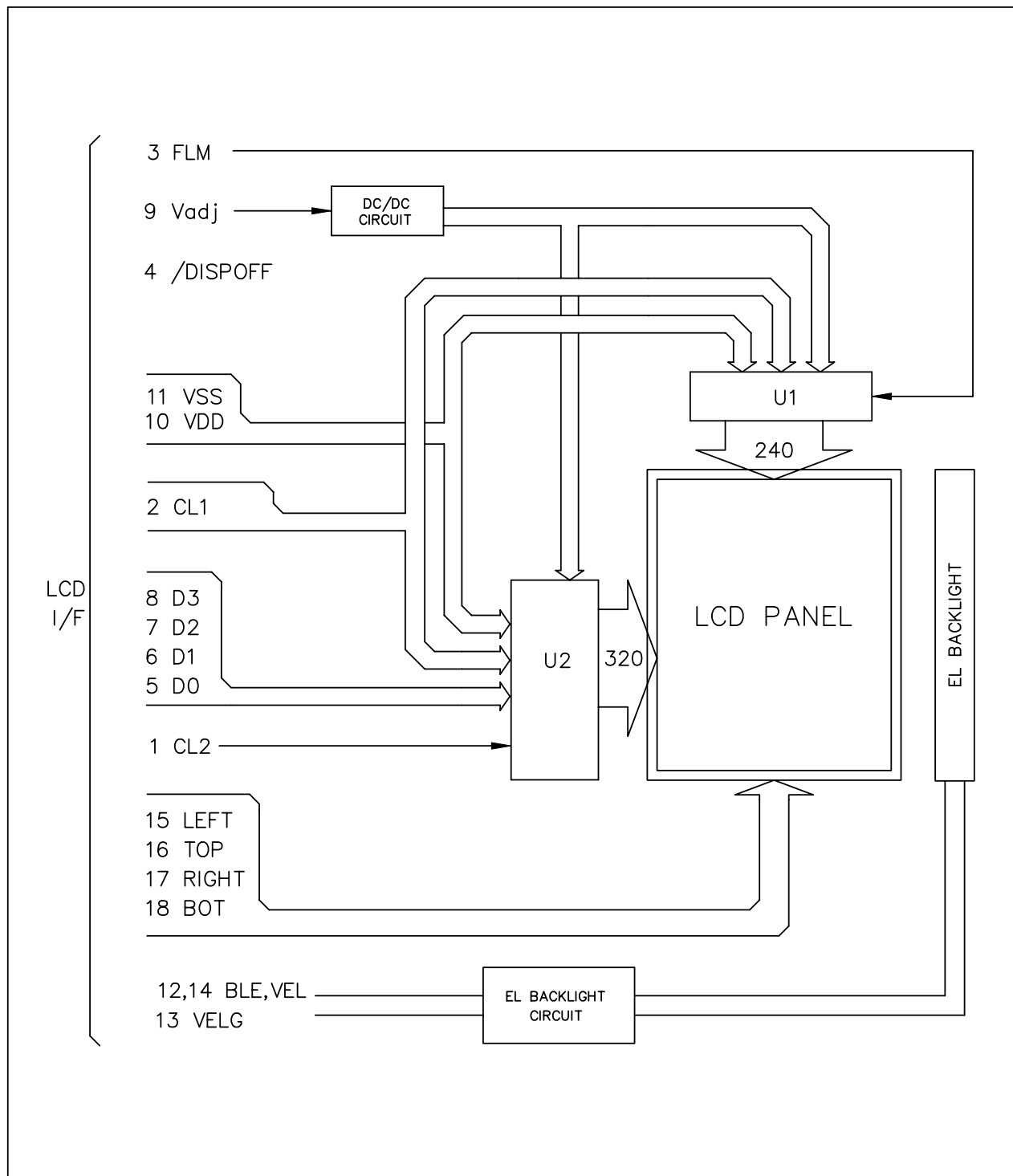
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5. BLOCK DIAGRAM



6.INTERNAL PIN CONNECTION

CN1

Pin No.	Symbol	Level	Function
1	CL2	H/L	Data Shift Clock Signal
2	CL1	H/L	Data Latch Clock Signal
3	FLM	H/L	Frame Signal
4	/DISPOFF	H/L	H: Display ON ; L: Display OFF
5	D0	H/L	Display Data
6	D1	H/L	
7	D2	H/L	
8	D3	H/L	
9	Vadj	—	Contrast adjust voltage
10	VDD	—	Power Supply for Logic
11	VSS	—	Power Supply (0V)
12	BLE	H/L	H: EL Enable ; L: EL Disable
13	VELG	—	Power Supply for EL (GND,0V)
14	VEL	—	Power Supply for EL (+)
15	N.C.	—	None Connection
16	N.C.	—	
17	N.C.	—	
18	N.C.	—	

USED CABLE(CN1) :

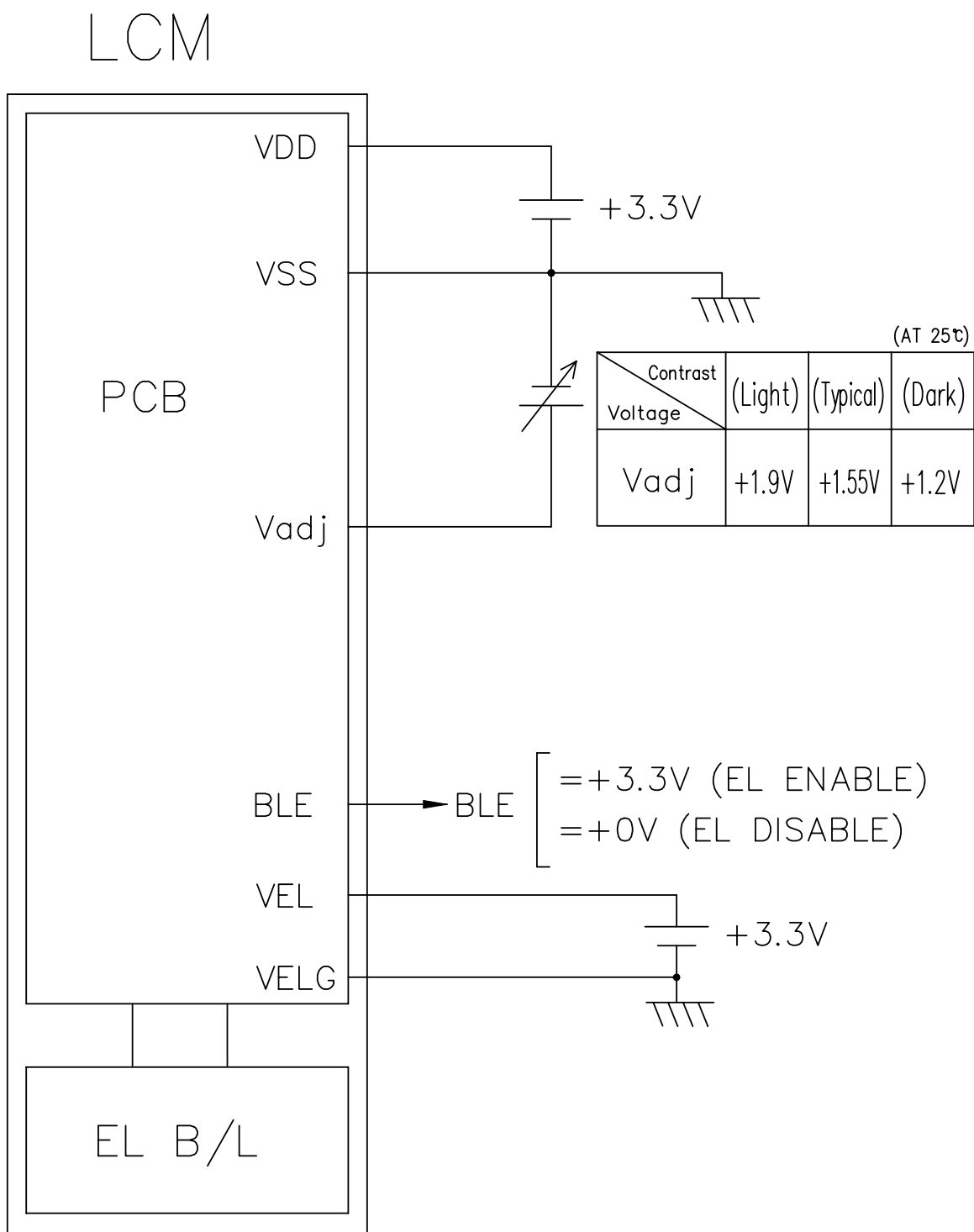
FFC,N18,PITCH=1.0mm,THICKNESS=0.3mm

MATING CONNECTOR :

MOLEX 52207-1890 or COMPATIBLE

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7. POWER SUPPLY



8. TIMING CHARACTERISTICS

8-1 INTERFACE TIMING

@ VDD=3.3V±10%, 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

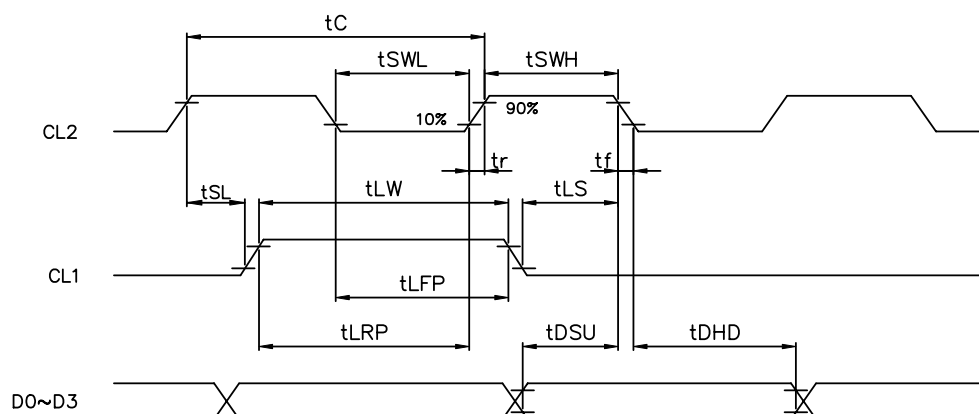


Fig . a Interface timing (SEGMENT)

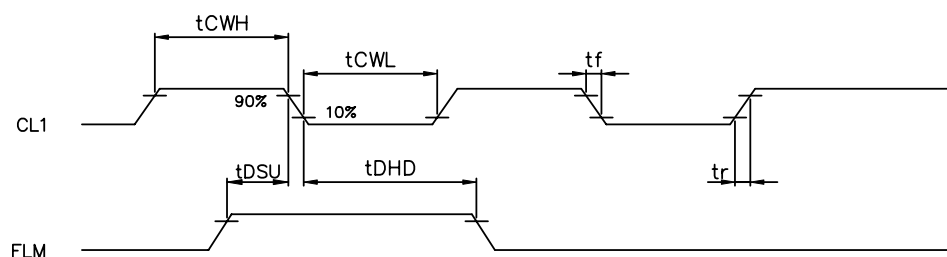
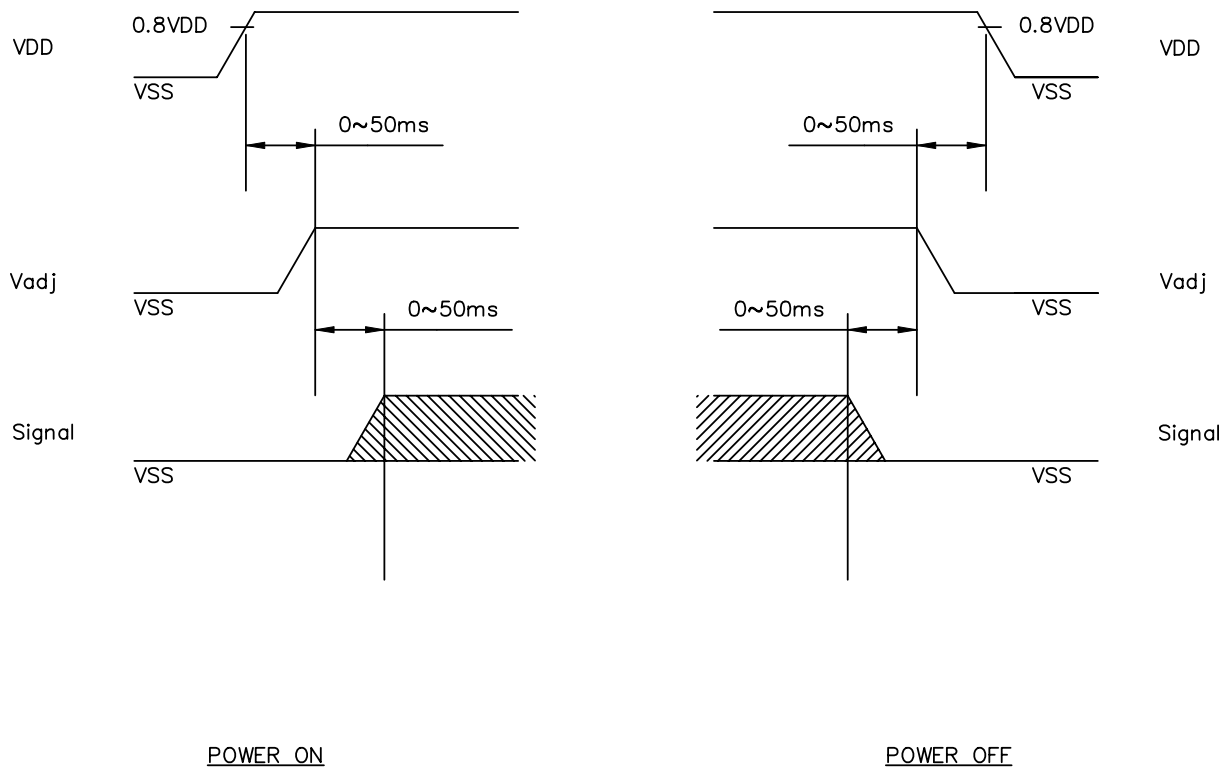


Fig . b Interface timing (COMMON)

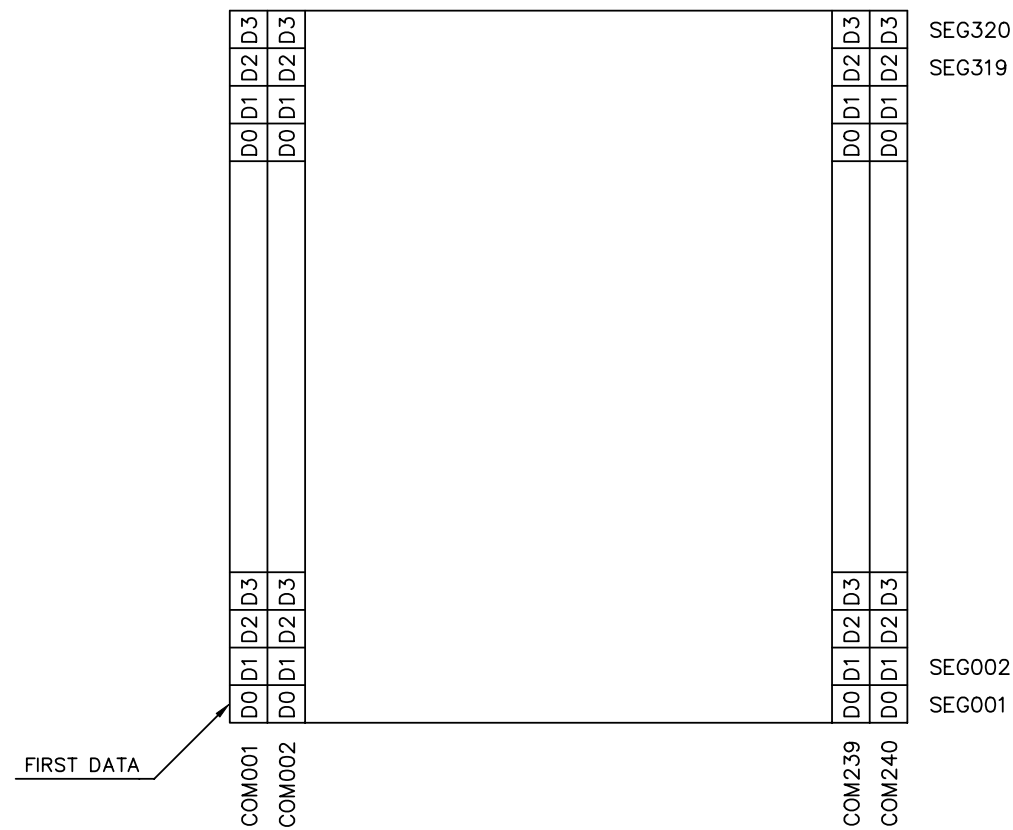
8-2 POWER ON/OFF TIMING



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

