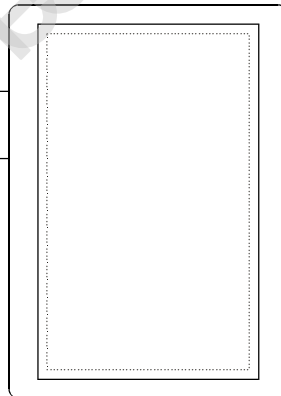


**HANTRONIX**

**PRODUCT SPECIFICATION**

**HDM2432TS-T**

240x320 GRAPHICS  
LCD DISPLAY MODULE



<b>HANTRONIX, INC.</b> 10080 BUBB RD. CUPERTINO, CA 95014	Q.A.:	REV.:	<b>HDM2432TS-T</b>	SHEET 1 OF 15
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# 1. MECHANICAL DATA

- (1) Product No.
- (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/Positive Image)  
 Black and White(Normally White,Paper White /Positive Image)  
Rear Polarizer:  Transflective(Normal)  
 Transflective(High Transparency)
- (8) Viewing Direction 6 O'clock
- (9) Backlight EL B/L
- (10) Weight 52g(Included the EL B/L)
- (11) Controller Excluded
- (12) DC/DC Converter Excluded
- (13) EL B/L inverter Ckt Built-in

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# 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	VEE-VSS	-0.3	30.0	V	
Input Voltage	VI	-0.3	VDD	V	
Static Electricity	-	-	-	-	Note 1

## (2) ENVIRONMENTAL ABSOLUTE MAXIMUM RATINGS

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

Note 1 LCM should be grounded during handling LCM.

Note 2 Background color changes slightly depending on ambient temperature.

This phenomenon is reversible.

Note 3 Ta ≤ 70°C : 75%RH max

Ta > 70°C : Absolute humidity must be lower

than the humidity of 75%RH at 70°C

Note 4 Ta at -30°C will be < 48hrs, at 80°C will be < 120hrs

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# 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 (WIDE TEMP. LCM)	VEE-VSS (Vop) (NOTE1)	1/240 Duty 1/13 Bias	-20°C	24.2	24.6	25.0	V
			0°C	22.9	23.0	23.4	
			25°C	22.3	22.7	23.1	
			50°C	21.1	21.5	21.9	
			70°C	20.3	20.7	21.1	
Power Supply Current	IDD	VDD = 3.3V VSS = 0V VEE-VSS = 22.7V FLM = 70Hz PATTERN : □ ■ □ ■ □ ■ ■ □ ■ □ ■ □	-	0.2	0.5	mA	
	IEE		-	6.3	10.0		
EL Power Supply Current	IEL	VEL = 3.3V VELG = 0V BLE = 3.3V	-	30	40	mA	

# OPTICAL CHARACTERISTICS

AT V<sub>OP</sub>

ITEM  MODE		Cr(Contrast Ratio)						$\theta$ (Viewing Angle)		$\phi$ (Viewing Angle)	
		0°C		25°C		50°C		25°C		25°C	
		MIN.	TYP.	MIN.	TYP.	MIN.	TYP.	MIN.	TYP.	MIN.	TYP.
S	J	-	9.0	-	9.0	-	6.0	-	66	-	83
H	L	-	9.0	-	10.0	-	7.0	-	84	-	79
NOTE		NOTE 6						NOTE 5			

NOTE :

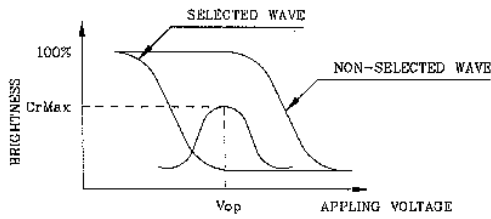
- S: TRANSFLECTIVE(NORMAL)
- H: TRANSFLECTIVE(HIGH TRANSPARENCY)
- J: NORMALLY WHITE
- L: NORMALLY WHITE(PAPER WHITE)

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

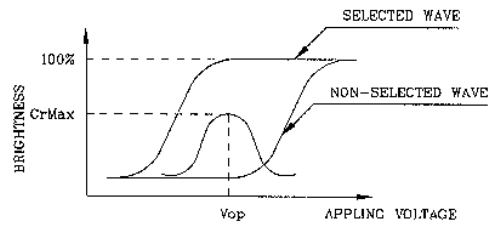
ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Response Time (rise)	Tr	-20°C	-	3000	4500	ms	NOTE 2
		0°C	-	1100	1650		
		25°C	-	300	450		
		50°C	-	150	225		
		70°C	-	100	150		
Response Time (fall)	Tf	-20°C	-	2800	4200	ms	NOTE 2
		0°C	-	500	800		
		25°C	-	200	300		
		50°C	-	100	150		
		70°C	-	80	120		

(NOTE 1)

Definition of Operation Voltage(Vop)



(positive type)



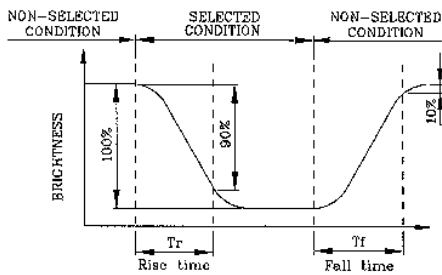
(negative type)

\*Conditions

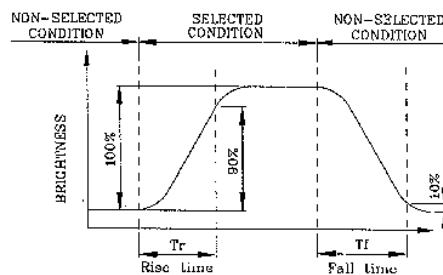
Viewing Angle : 0  
 Frame Frequency : 70Hz  
 Applying Waveform : 1/N duty 1/a bias

(NOTE 2)

Definition of Response Time(Tr,Tf)



(positive type)



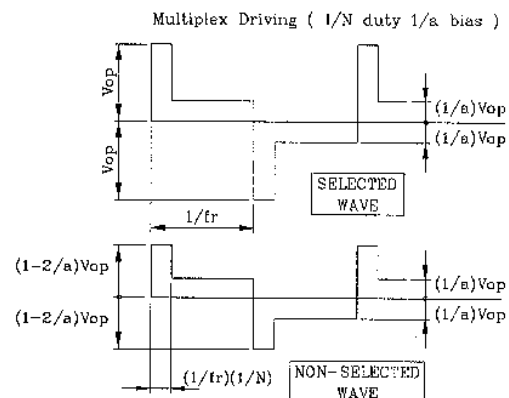
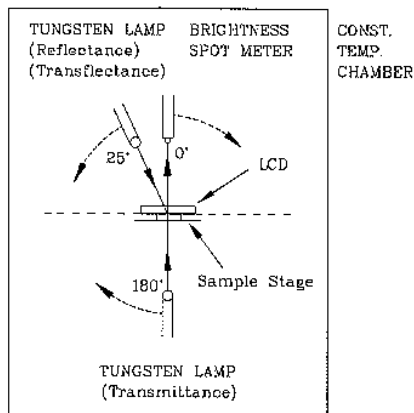
(negative type)

\*Conditions

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

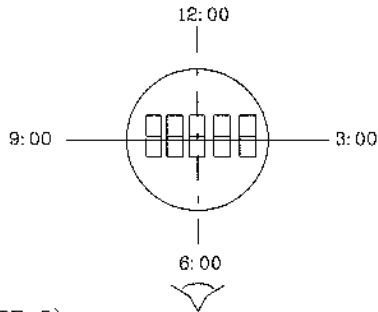
(NOTE 3)

Description of Measuring Equipment and Driving Waveforms



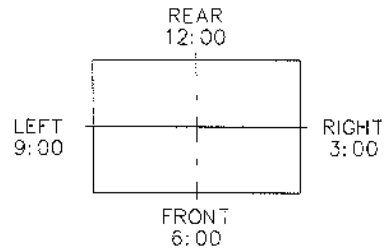
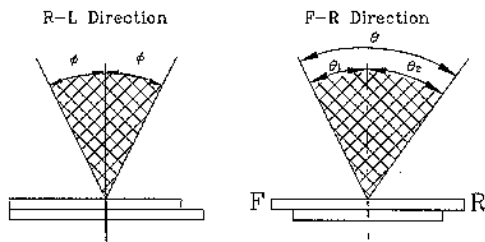
(NOTE 4)

Definition of Viewing Direction



(NOTE 5)

Definition of Viewing Angle



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

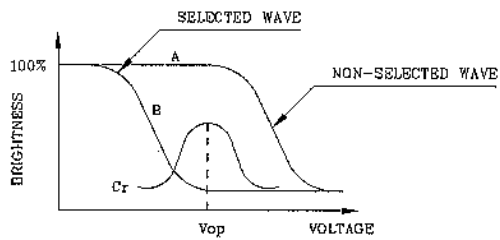
$$\theta = \theta_1 + \theta_2$$

\*Conditions

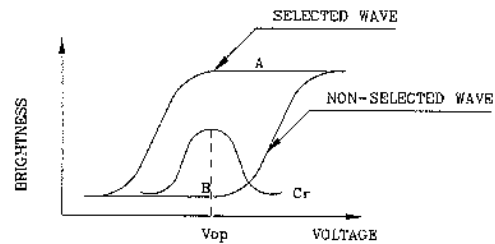
Operating Voltage :  $V_{op}$   
Frame Frequency : 70Hz  
Applying Waveform : 1/N duty 1/a bias  
Contrast Ratio : larger than 2

(NOTE 6)

Definition of Contrast Ratio (Cr)



(positive type)



(negative type)

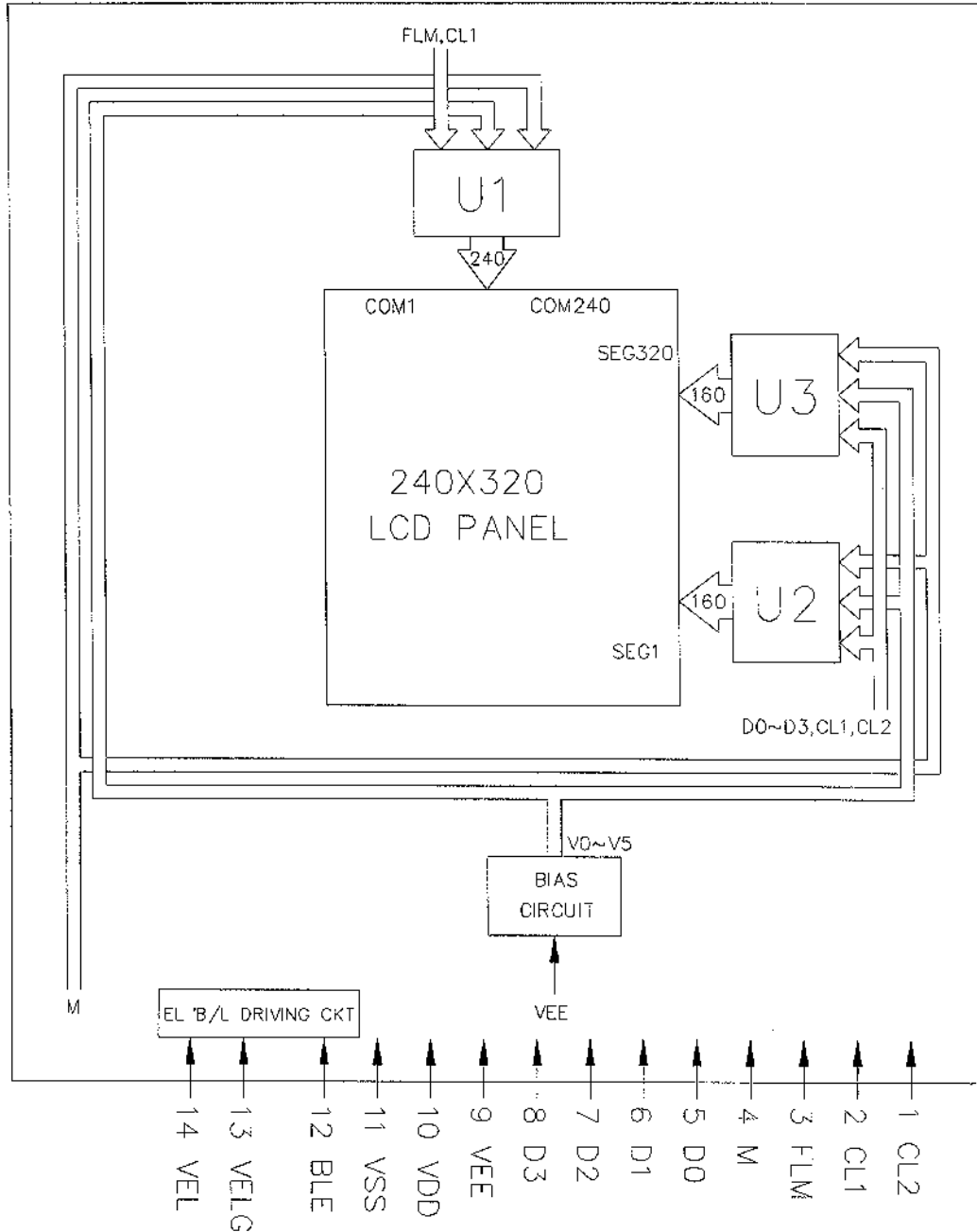
$$\text{Contrast Ratio : } Cr = A/B$$

\*Conditions

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

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# BLOCK DIAGRAM



\* M SIGNAL SHOULD BE SUPPLIED BY USERS

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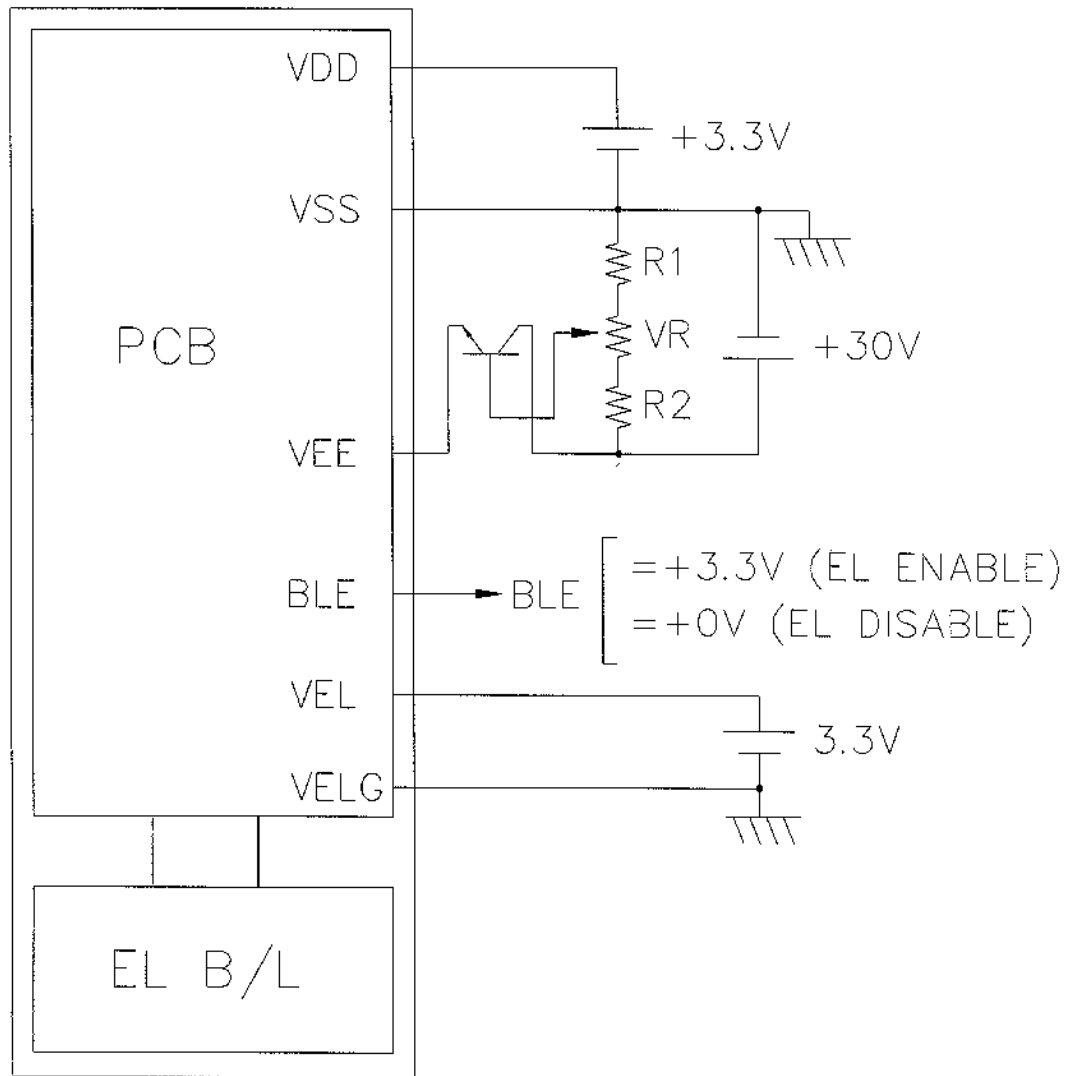
## INTERNAL PIN CONNECTION

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	M	H/L	Alternate Signal
5	D0	H/L	Display Data
6	D1	H/L	
7	D2	H/L	
8	D3	H/L	
9	VEE	—	Power Supply for LCD (+V)
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	Xp	—	Touch Panel Connection
16	Ym	—	
17	Xm	—	
18	Yp	—	

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# POWER SUPPLY

LCM



$$R1 + VR + R2 = 10 \sim 20K \Omega$$

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CUPERTINO, CA 95014

Q.A.:  
JB

REV.:  
1.0

**HDM2432TS-T**

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# TIMING CHARACTERISTICS

## 8-1 INTERFACE TIMING

© VDD=3.3V±10%, To=-20~70°C

Item	Symbol	Test condition	Min.	Typ.	Max.	Unit
Clock Cycle	t <sub>C</sub>	Fig.a	500	-	-	ns
SCP Pulse Width	t <sub>SWH</sub> ,t <sub>SWL</sub>	Fig.a	240	-	-	ns
Data Set Up Time	t <sub>DSU</sub>	Fig.a , Fig.b	240	-	-	ns
Data Hold Time	t <sub>DHD</sub>	Fig.a , Fig.b	240	-	-	ns
SCP Rise/Fall Time	t <sub>r</sub> ,t <sub>f</sub>	Fig.a , Fig.b	-	-	50	ns
LP Rise Time	t <sub>LRP</sub>	Fig.a	240	-	-	ns
LP Fall Time	t <sub>LFP</sub>	Fig.a	240	-	-	ns
LP Pulse Width	t <sub>LW</sub>	Fig.a	240	-	-	ns
SCP To LP Delay Time	t <sub>SL</sub>	Fig.a	50	-	-	ns
LP To SCP Delay Time	t <sub>LS</sub>	Fig.a	100	-	-	ns
LP "H" Pulse Width	t <sub>CWH</sub>	Fig.b	40	-	-	ns
LP "L" Pluse Width	t <sub>CWL</sub>	Fig.b	170	-	-	ns

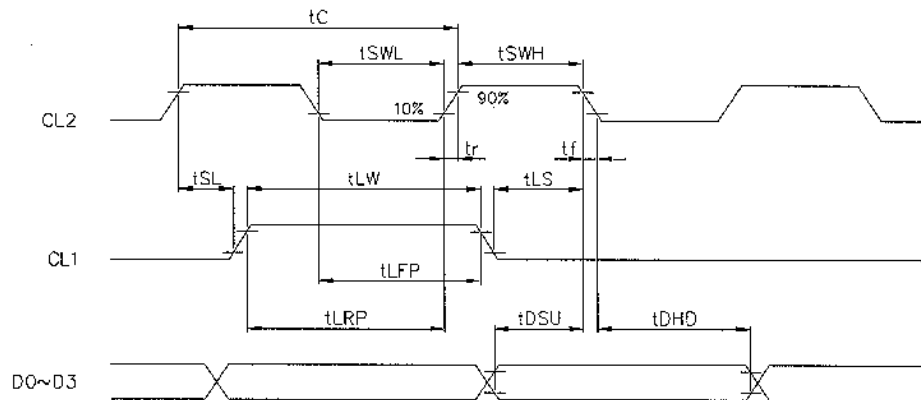


Fig a Interface timing (SEGMENT)

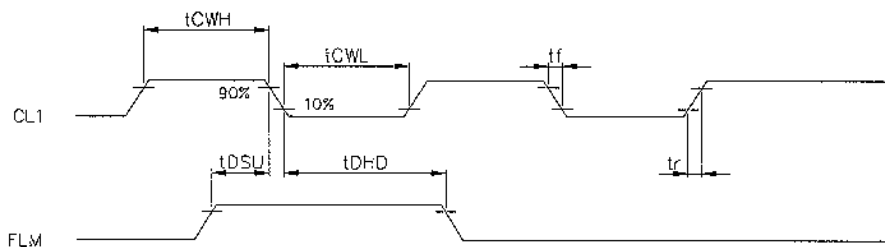


Fig . b Interface timing (COMMON)

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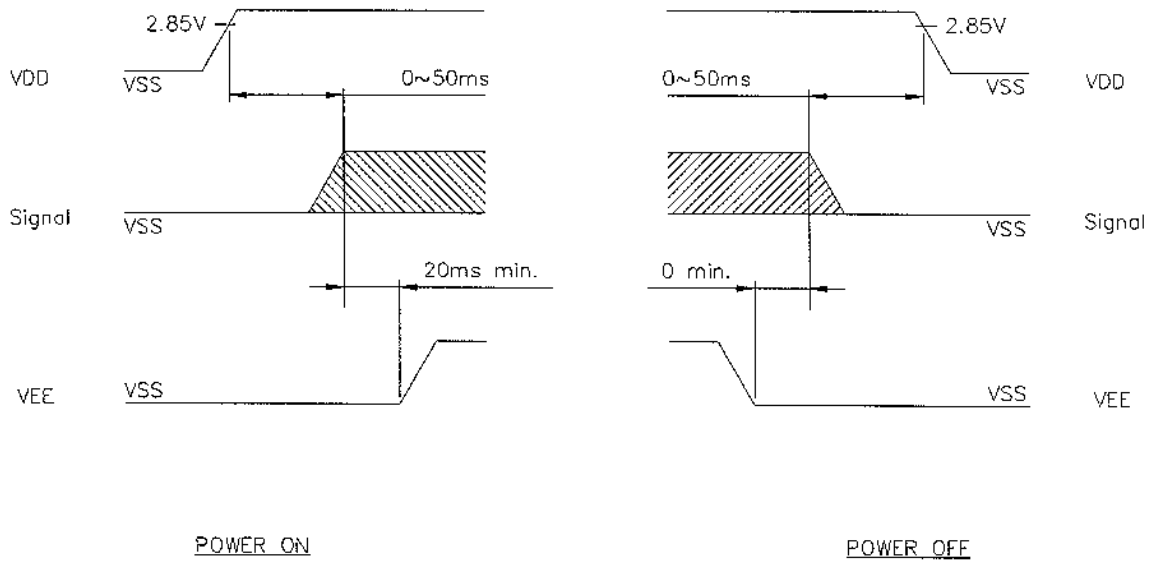
REV.:  
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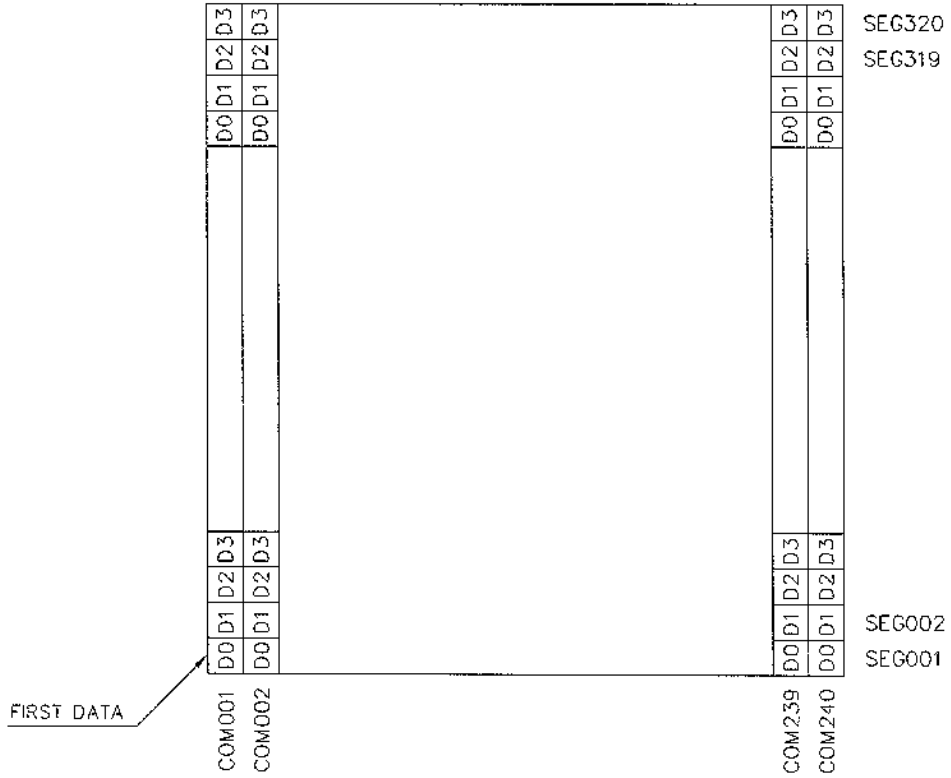
## POWER ON/OFF TIMING



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

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# DISPLAY PATTERN



240 X 320 Dots Matrix

(2) NOTE:

• 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.

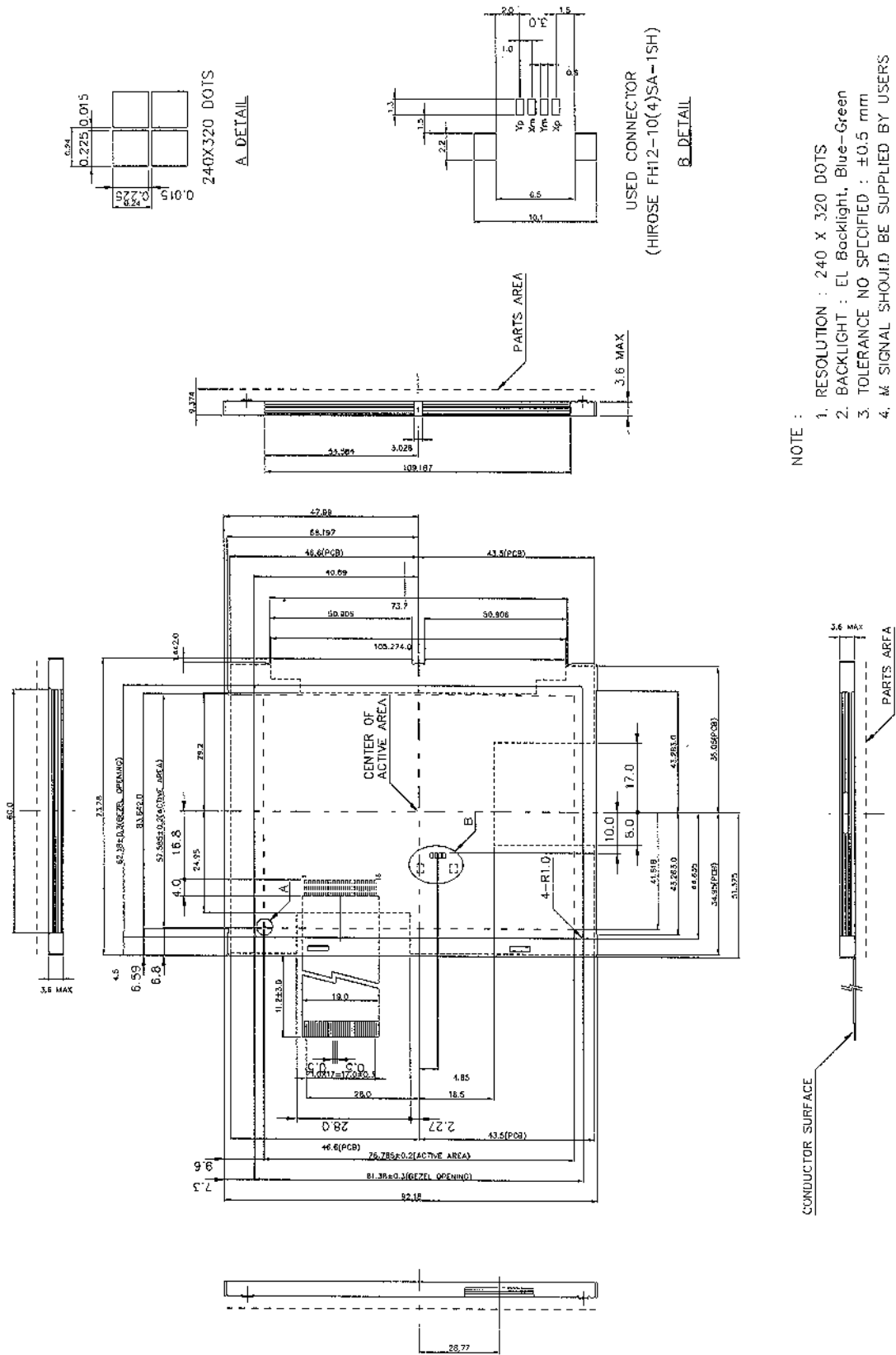
• TERMS OF WARRANT

- 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

EL : 1,700HR FOR AC 100 Vrms 400 Hz 20°C 60% RH

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