

# AZ DISPLAYS, INC.

## 1. MECHANICAL DATA

(1) Product No.	<b>AGM3224V</b>				
(2) Module Size	70.7 (W)mm X	90.2 (H)mm X	7.6 (D)mm		
(3) Dot Size	0.061 (W)mm X	0.215 (H)mm			
(4) Dot Pitch	0.076 (W)mm X	0.23 (H)mm			
(5) Number of Dots	240RGB(W) X	320 (H) Dots			
(6) Duty	1/320				
(7) LCD Display Mode	FSTN: Color STN Module				
	Rear Polarizer: Color Transmissive Type				
(8) Viewing Direction	6 O'clock				
(9) Backlight	CCFL				
(10) Touch Panel	Included				
(11) Weight	70.3g (Approx.)				

Date: June 22,2002

## 2. ABSOLUTE MAXIMUM RATINGS

### (1) ELECTRICAL ABSOLUTE RATINGS

GND=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	36.0	V	
Input Voltage	VI	-0.3	VDD+0.3	V	
Static Electricity	-	-	-	-	Note 1

### (2) ENVIRONMENTAL ABSOLUTE MAXIMUM RATINGS

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

Note 1 LCM should be grounded during handling

Note 2 Background color will change slightly depending on ambient temperature.  
This phenomenon is reversible.

Note 3 Ta ≤ 50°C : 85%RH max  
Ta > 50°C : Absolute humidity must be lower  
than the humidity of 85%RH at 50°C

Note 4 Ta at -20°C will be < 48hrs, at 70°C will be < 120hrs

## 3-1. ELECTRICAL CHARACTERISTICS

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT		
Logic Circuit Power Supply	VDD-VSS	Ta= 25°C	3.0	3.3	3.6	V		
Input Voltage	VIH	H level	0.8VDD	—	VDD	V		
	VIL	L level	0	—	0.2VDD			
Recommended LCD Driving Voltage	VEE-VSS (Vop)	Duty=1/320 Bias=1/17	0°C	30.3	30.6	30.9	V	
			25°C	30.1	30.4	30.7		
			50°C	29.7	30.0	30.3		
Power Supply Current	IDD	VDD-VSS = 3.3V VEE-VSS = 30.4V Ta= 25°C	—	0.56	1.0	mA		
	IEE	PATTERN: <div style="display: flex; justify-content: space-around; font-size: 0.8em;"> <span>□ ■ □ ■ □ ■ □ ■</span> <span>■ □ ■ □ ■ □ ■ □</span> </div>	—	0.53	1.0			
LCM	Surface Luminance	L	INVERTER INV-081 Vin=10.3V IL=1.5mArms	PATTERN: (Dots All On of White Color) <div style="display: flex; justify-content: space-around; font-size: 0.8em;"> <span>□ □ □ □</span> <span>□ □ □ □</span> </div>	—	80.5	—	cd/m <sup>2</sup>
				PATTERN: (Dots All Off) <div style="display: flex; justify-content: space-around; font-size: 0.8em;"> <span>■ ■ ■ ■</span> <span>■ ■ ■ ■</span> </div>	—	5.0	—	
			INVERTER INV-081 Vin=8.6V IL=1.0mArms	PATTERN: (Dots All On of White Color) <div style="display: flex; justify-content: space-around; font-size: 0.8em;"> <span>□ □ □ □</span> <span>□ □ □ □</span> </div>	—	45.2	—	
				PATTERN: (Dots All Off) <div style="display: flex; justify-content: space-around; font-size: 0.8em;"> <span>■ ■ ■ ■</span> <span>■ ■ ■ ■</span> </div>	—	2.9	—	

## 3-2.ELECTRICAL CHARACTERISTICS OF BACKLIGHT

CCFL Rating

Temp.=25°C

ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT	REMARK
Lamp voltage	V <sub>L</sub>	-	280	-	Vrms	-
Lamp current	I <sub>L</sub>	-	1.5	-	mArms	-
Lamp power consumption	P <sub>L</sub>	-	0.42	-	W	(*1)
Starting voltage	V <sub>s</sub>	-	-	620	Vrms	-
Lamp frequency	F <sub>L</sub>	-	45-50	-	KHz	-
Lamp life time	L <sub>L</sub>	10000	-	-	hrs	IL = 1.5 mArms (*2)

(\*1) Power consumption excluded inverter loss .

(\*2) LED life time is defined as the time taken for the brightness to be reduced to 50% of its original value.

## 3-3.CHARACTERISTICS OF TOUCH SCREEN

Touch screen Rating

Temp.=25°C

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Applied Rating Voltage	$V_R$	—	—	—	7.0	V
Operating Temperature	$T_{OPR}$	20%~85% R.H. Max. Avoid Dew Condensation at Any Time	0	—	50	°C
Storage Temperature	$T_{STO}$		-20	—	70	
Resistance of Terminal Electrodes	$R_{ETD}$	X Electrode	200	—	800	Ω
		Y Electrode	200	—	800	
Linearity	L	—	—	—	1.5	%
Insulation Resistance	$R_{OFF}$	$V_{DC} = 25V$	20	—	—	MΩ
Transparency	T	According to JIS-K7015	82	85	—	%
Surface Hardness	$S_H$	According to JIS-K5400	3	—	—	H

## 4. OPTICAL CHARACTERISTICS

### 4-1 Optical Characteristics of LCD

AT Vop

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.
T	M	10.5	13.5	16	20	7.0	10	-	90	-	±54
note		NOTE 6						NOTE 5			

NOTE :

T: TRANSMISSION

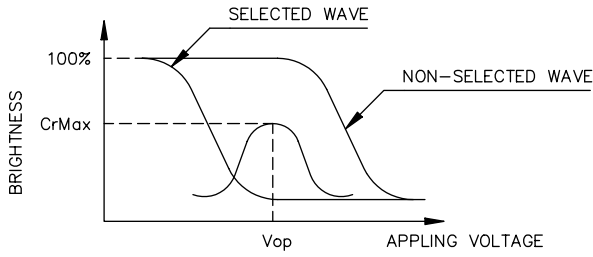
M: COLOR STN MODULE,  
6 O'CLOCK **Viewing Direction** (NOTE 5)

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

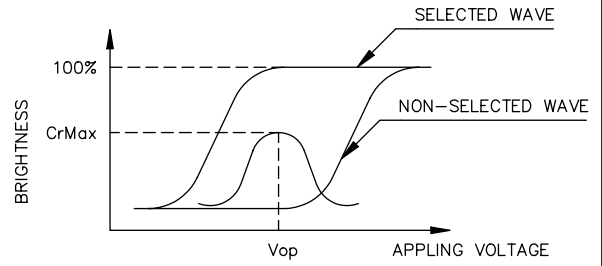
ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Response Time (rise)	Tr	0°C	800	1000	1200	ms	NOTE 2
		25°C	340	420	500		
		50°C	270	340	410		
Response Time (fall)	Tf	0°C	360	450	540	ms	NOTE 2
		25°C	130	160	190		
		50°C	70	90	110		

(NOTE 1)

Definition of Operation Voltage( $V_{op}$ )



(positive type)



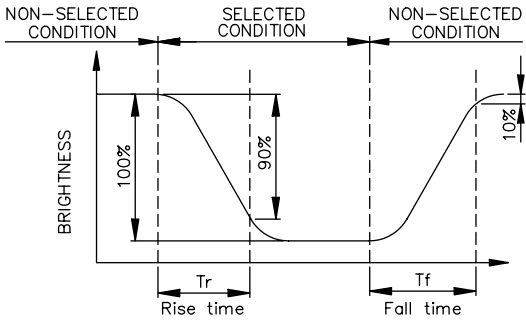
(negative type)

\*Conditions

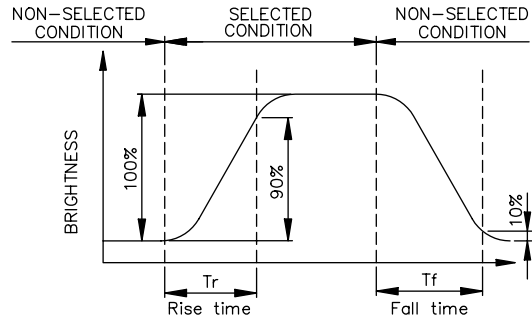
- Viewing Angle : 0
- Frame Frequency : 70Hz
- Applying Waveform : 1/N duty 1/a bias

(NOTE 2)

Definition of Response Time( $T_r, T_f$ )



(positive type)



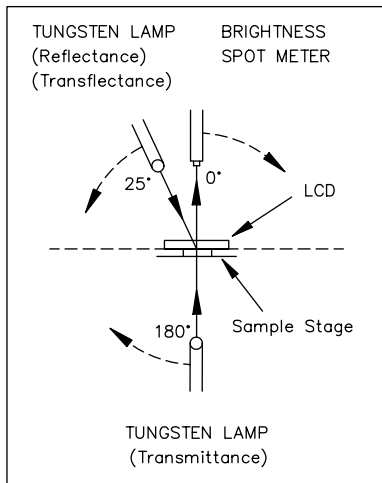
(negative type)

\*Conditions

- Operating Voltage :  $V_{op}$
- Viewing Angle ( $\theta, \theta$ ) : (0,0)
- Frame Frequency : 70Hz
- Applying Waveform : 1/N duty 1/a bias

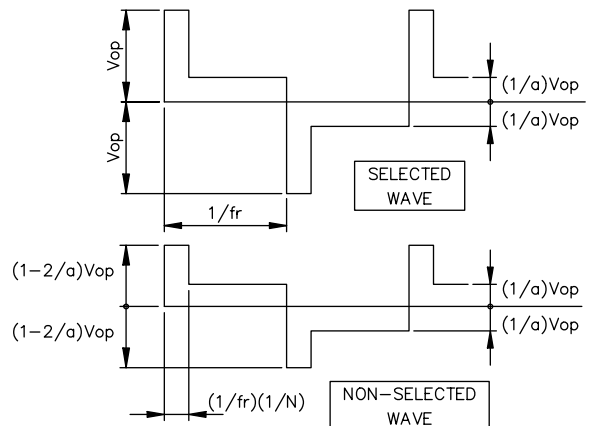
(NOTE 3)

Description of Measuring Equipment and Driving Waveforms



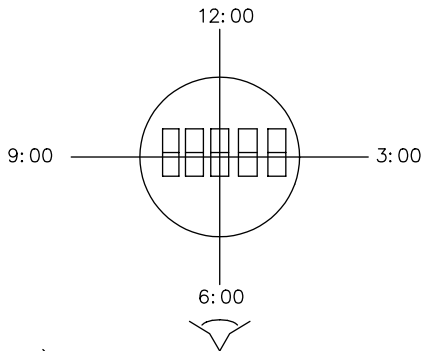
CONST.  
TEMP.  
CHAMBER

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



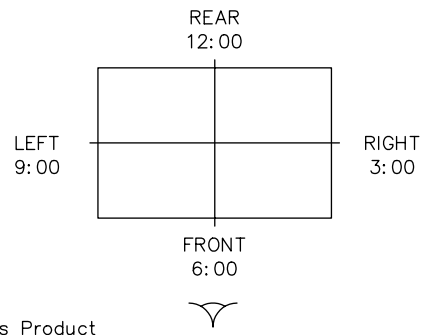
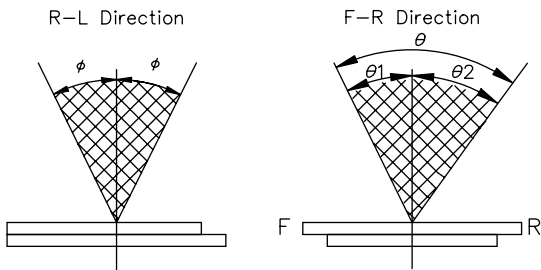
(NOTE 4)

Definition of Viewing Direction



(NOTE 5)

Definition of Viewing Angle



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

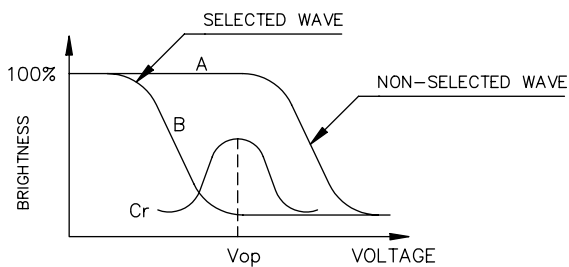
$$\theta = \theta_1 + \theta_2$$

\*Conditions

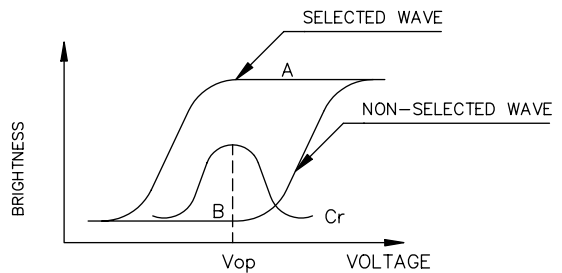
Operating Voltage :  $V_{op}$   
Frame Frequency : 70Hz  
Applying Waveform : 1/N duty 1/a bias  
Contrast Ratio : larger than 2

(NOTE 6)

Definition of Contrast Ratio (Cr)



(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



## 4-2 Color of CIE Coordinate

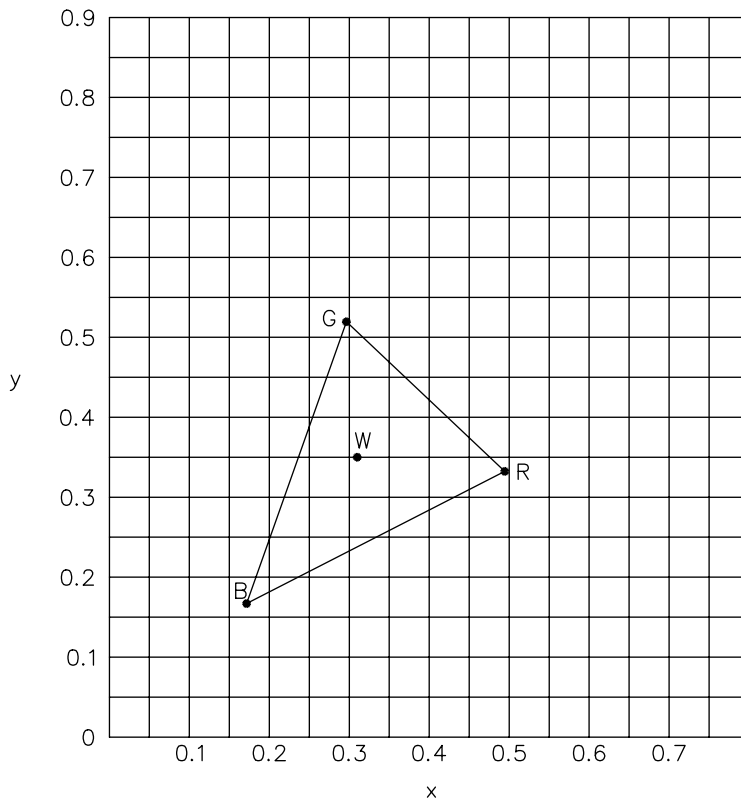
Ta = 25°C

ITEM		SYMBOL	CONDITION	VALUE	BRIGHTNESS (cd/m <sup>2</sup> )	NOTE
Color of CIE Coordinate	Red	X	$\phi=0^\circ, \theta=0^\circ$	0.495	22.4	Fig.1
		y		0.332		
	Green	X		0.296	49.0	
		y		0.519		
	Blue	X		0.172	15.2	
		y		0.167		
	White	X		0.310	80.5	
		y		0.350		

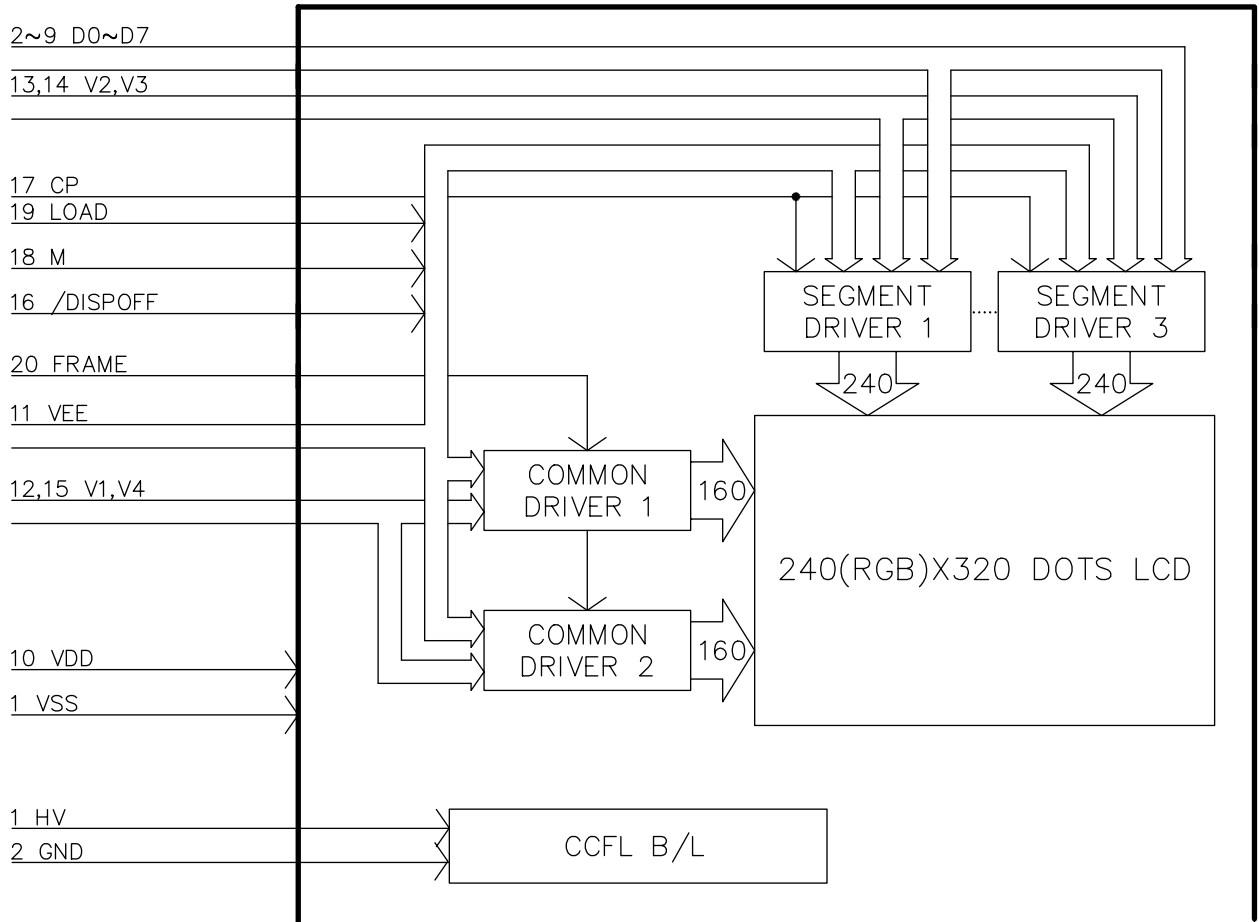
Tolerance : ±0.05

CIE chromaticity diagram

Fig.1



## 5. BLOCK DIAGRAM



Note :

- 1) Controller and bias voltage supply circuit are not included.
- 2) VEE, V1, V2, V3, V4 and VSS are power supply voltages for the LCD.  
(VEE > V1 > V2 > V3 > V4 > VSS)

## 6. INTERNAL PIN CONNECTION

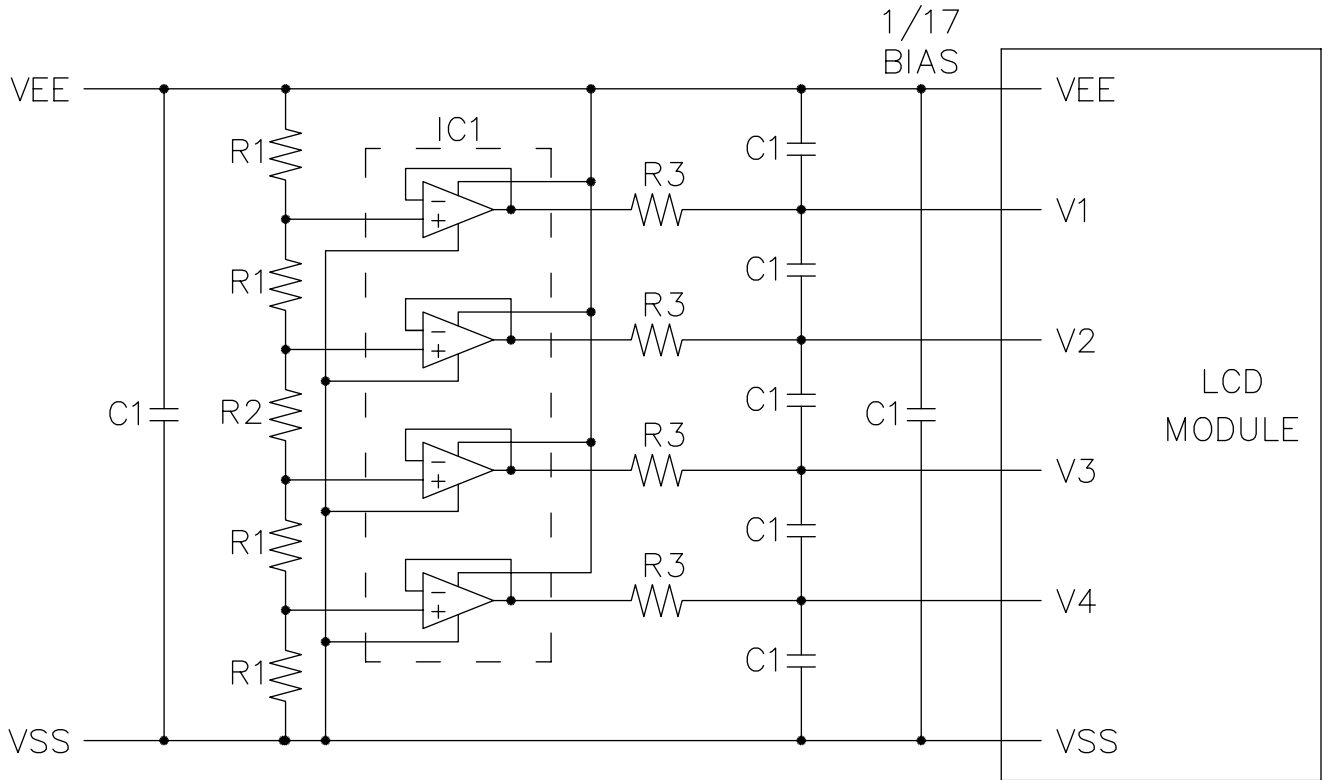
CN1 : (FPC) PITCH 0.5mm WIDTH 10.5mm

PIN NO.	SYMBOL	FUNCTION
1	VSS	Power Supply for Logic (GND) Power Supply for LCD (COM/SEG Selected Level)
2	D0	DISPLAY DATA
3	D1	DISPLAY DATA
4	D2	DISPLAY DATA
5	D3	DISPLAY DATA
6	D4	DISPLAY DATA
7	D5	DISPLAY DATA
8	D6	DISPLAY DATA
9	D7	DISPLAY DATA
10	VDD	Power Supply for Logic (+3.0V)
11	VEE	Power Supply for LCD (COM/SEG Selected Level)
12	V1	Power Supply for LCD (COM Non-Selected Level)
13	V2	Power Supply for LCD (SEG Non-Selected Level)
14	V3	Power Supply for LCD (SEG Non-Selected Level)
15	V4	Power Supply for LCD (COM Non-Selected Level)
16	$\overline{\text{DISPOFF}}$	Display Control L: off H: on
17	CP	Display Data Shift Clock
18	M	AC Signal for LC
19	LOAD	Display Data Latch Clock
20	FRAME	FRAME CLOCK

CN2 : BHSR-02VS-1(JST) (PIN1-HOT;PIN2-GND)

1	H.V.	Power Supply Voltage for CCFL
2	GND	CCFL GND

## 7. POWER SUPPLY



IC1 : LP324M(NATIONAL SEMICONDUCTOR)  
 R1 : 22(KOHM) $\pm$ 0.5%, R2 : 287(KOHM) $\pm$ 2%, R3 : 4.7(OHM) $\pm$ 5%  
 C1 : 2.2–4.7( $\mu$ F)

## 8. TIMING CHARACTERISTICS

### 8-1. INTERFACE TIMING

VDD=3.0V±10%

Item	Symbol	Test condition	Min.	Typ.	Max.	Unit
CP Cycle Time	tC	Fig.a	82	-	-	ns
CP Pulse Width	tSWH,tSWL	Fig.a	28	-	-	ns
CP Rise/Fall Time	tCR,tCF	Fig.a	-	-	50	ns
Data Set Up Time	tDSU	Fig.a , Fig.b	100	-	-	ns
Data Hold Time	tDHD	Fig.a , Fig.b	30	-	-	ns
LOAD Cycle Time	tL	Fig.b	250	-	-	ns
LOAD "H" Pulse Width	tLWH	Fig.a , Fig.b	100	-	-	ns
LOAD Rise/Fall Time	tLR,tLF	Fig.b	-	-	30	ns
CP To LOAD Delay Time	tCL	Fig.a	30	-	-	ns
LOAD To CP Delay Time	tLC	Fig.a	-	-	200	ns
FRAME TO LOAD SETUP TIME	tFLS	Fig.b	30	-	-	ns
FRAME TO LOAD HOLD TIME	tFLH	Fig.b	50	-	-	ns

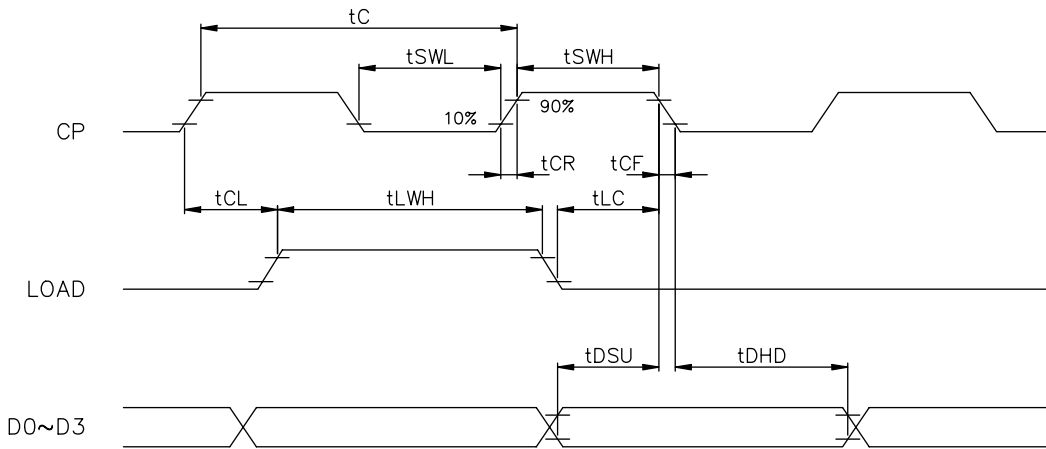


Fig . a Interface timing (SEGMENT)

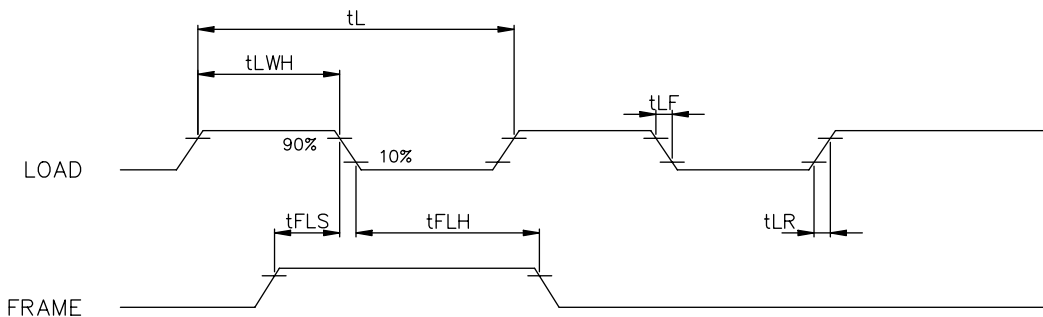
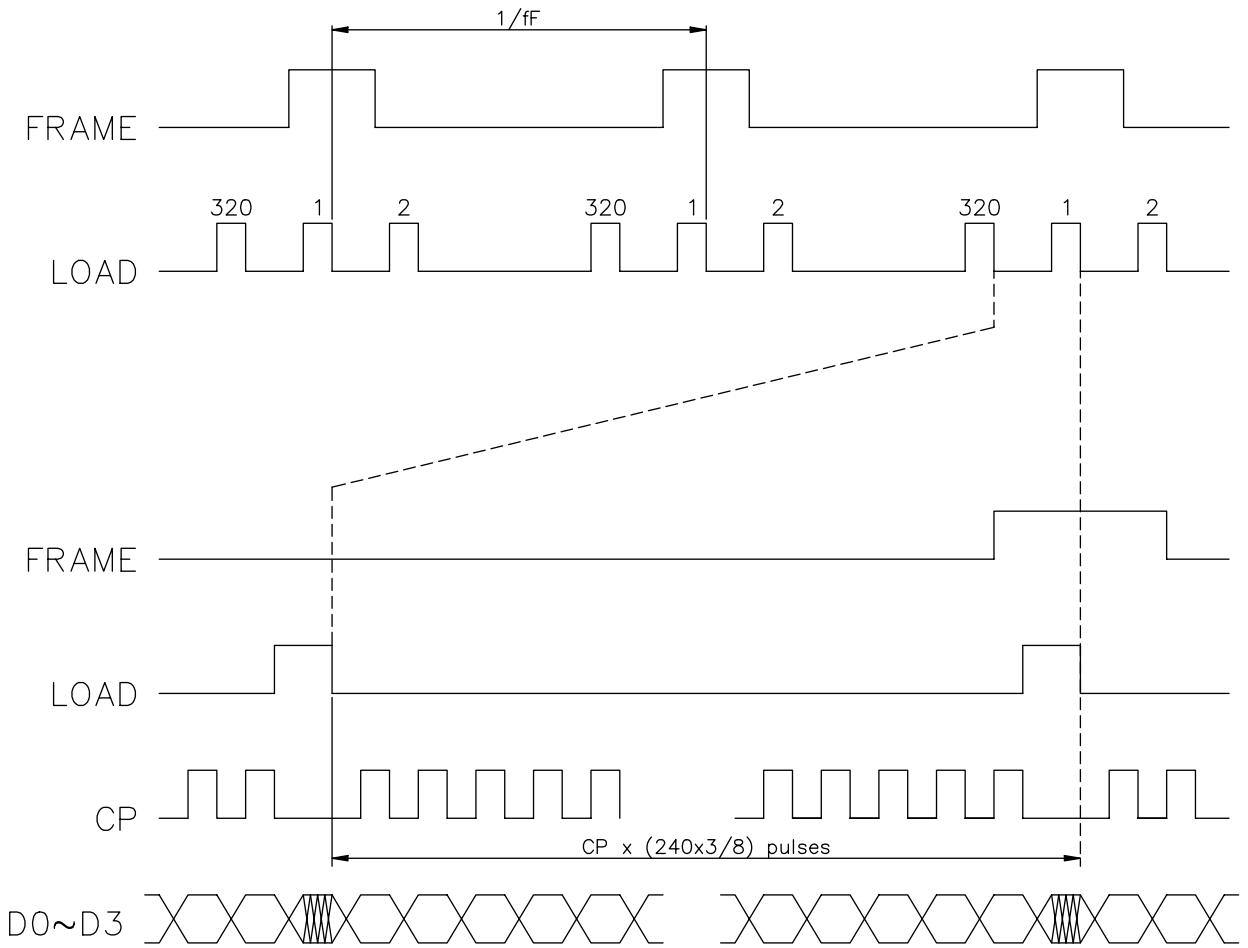
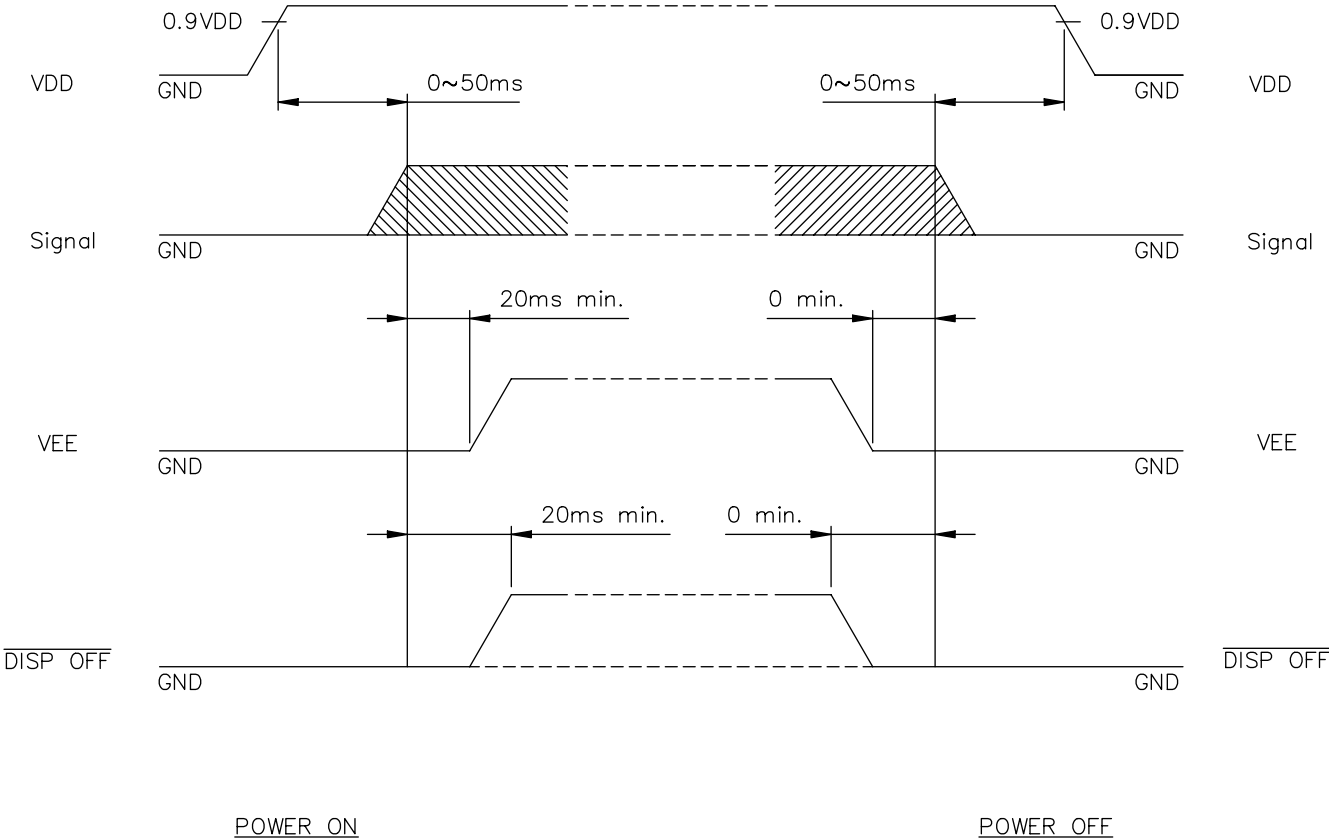


Fig . b Interface timing (COMMON)

## 8-2. TIMING CHART OF INPUT SIGNAL



## 8-3. POWER ON/OFF TIMING



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

## 8-4.DISPLAY PATTERN

