

# AZ DISPLAYS, INC.

---

## SPECIFICATIONS FOR LIQUID CRYSTAL DISPLAY

PART NUMBER:

AGM3224C

DATE:

October 19, 2005

## 1. MECHANICAL DATA

NO	ITEM	CONTENTS	UNIT
1	Product No.	AGM3224C	—
2	Module Size	154.6 (W) x 114.8 (H) x 10.5 (D)	mm
3	Dot Size	0.345 (W) x 0.345 (H)	mm
4	Dot Pitch	0.36 (W) x 0.36 (H)	mm
5	Number of Dots	320 (W) x 240 (H)	Dot
6	Duty	1/240	—
7	LCD Display Mode	FSTN, Normally Black	—
8	Rear Polarizer	Transmissive Type	—
9	Viewing Direction	12	O'clock
10	Backlight	CCFL	—
11	Controller	Excluded	—
12	DC/DC Converter	Excluded	—
13	Touch Panel	Included	—
14	Weight	225 (Approx.)	g

## 2. ABSOLUTE MAXIMUM RATINGS

### (1) ELECTRICAL ABSOLUTE RATINGS

VSS=0V

	SYMBOL	MIN.	MAX.	UNIT	COMMENT
Power Supply for Logic	VDD-VSS	-0.3	7.0	V	
Power Supply for LCD Drive	VEE-VSS	0	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	WIDE TEMP.			
	OPERATING		STORAGE	
	MIN.	MAX.	MIN.	MAX.
Ambient Temperature	-20	70	-40	80
Humidity (Without Condensation)	Note 2,4		Note 3,4	

Note 2  $T_a \leq 70^\circ\text{C}$  : 75%RH max

Note 3 Please refer to item of reliability test

Note 4 Background color will change slightly depending on ambient temperature.

That phenomenon is reversible.

Note 5 Operation temp not include CCFL Lamp

## 3. ELECTRICAL CHARACTERISTICS

### 3-1. ELECTRICAL CHARACTERISTICS OF LCM

ITEM			SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	
Power Supply for Logic			VDD-VSS	-	3.0	3.3	3.6	V	
					4.5	5.0	5.5		
Recommended LC Driving Voltage (Wide Temp. LCM)			VEE-VSS	Duty=1/240	-20°C	25.3	25.7	26.1	V
					0°C	23.6	24.0	24.4	
					25°C	22.3	22.7	23.1	
					50°C	20.9	21.3	21.7	
					70°C	19.9	20.3	20.7	
Input Voltage			VIH	H level	0.8VDD	-	VDD	V	
			VIL	L level	0	-	0.2VDD		
Power Supply Current			IDD	FLM = 70 Hz VSS = 0 V VDD = 5 V VEE-VSS= 22.7 V	-	0.5	1.0	mA	
			IEE	PATTERN : □ ■ □ ■ □ ■ ■ □ ■ □ ■ □	-	8	12		
LCM	Surface Luminance	CCFL	T696H26CK	VSS=0V VEE-VSS=22.7V	PATTERN: (Dots All ON)	100	120	-	cd/m <sup>2</sup>
					PATTERN: (Dots All OFF)	-	12	25	

## 3-2. ELECTRICAL CHARACTERISTICS OF BACKLIGHT

Used CCFL Rating

Temp.=25°C

ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT	REMARK
Lamp voltage	V <sub>L</sub>	—	470	—	V <sub>rms</sub>	—
Lamp current	I <sub>L</sub>	4	5	6	mArms	—
Lamp power consumption	P <sub>L</sub>	—	2.35	—	W	(*1)
Lamp frequency	F <sub>L</sub>	20	35	50	KHz	—
Lamp life time	L <sub>L</sub>	—	20000	—	hrs	I <sub>L</sub> = 5 mArms (*2)

(\*1) Power consumption excluded inverter loss .

(\*2) Lamp life time is defined as follows : The final brightness is at 50% of original brightness .

## 4. OPTICAL CHARACTERISTICS

WIDE TEMPERATURE MODE

AT V<sub>OP</sub>

ITEM MODE		Cr(Contrast Ratio)										$\theta$ (Viewing Angle)		$\theta$ (Viewing Angle)	
		-20°C		0°C		25°C		50°C		70°C		25°C		25°C	
		MIN.	TYP.	MIN.	TYP.	MIN.	TYP.	MIN.	TYP.	MIN.	TYP.	MIN.	TYP.	MIN.	TYP.
T	H	10	15	12	18	14	20	5	7	2	3	—	*F: 25 R: 45	—	*L: 30 R: 30
NOTE		NOTE 6										NOTE 5			

NOTE :

\* : under Cr>5 Condition

T : Transmissive

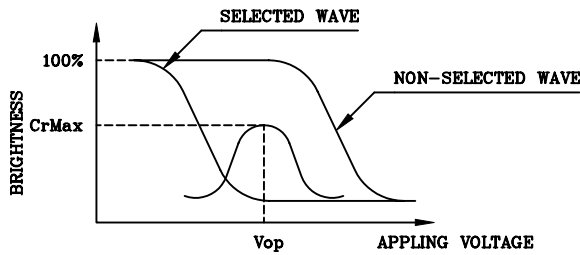
H : Normally Black, 12 O'clock

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

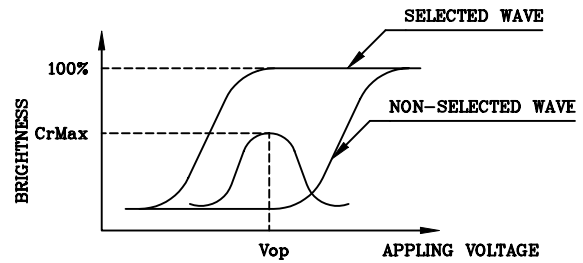
ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Response Time (rise)	Tr	-20℃	3200	4000	6000	ms	NOTE 2
		0℃	880	1100	1600		
		25℃	240	300	450		
		50℃	95	120	180		
		70℃	48	60	90		
Response Time (fall)	Tf	-20℃	2000	2500	3700	ms	NOTE 2
		0℃	360	450	670		
		25℃	95	120	180		
		50℃	55	70	110		
		70℃	32	40	60		

(NOTE 1)

Definition of Operation Voltage(Vop)



(positive type)



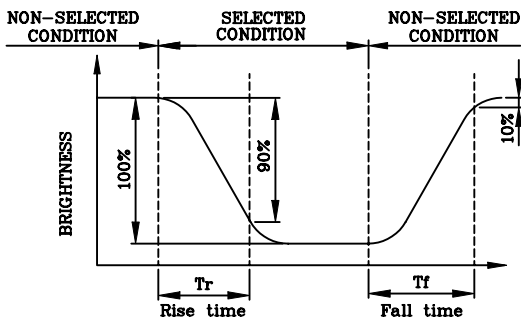
(negative type)

\*Conditions

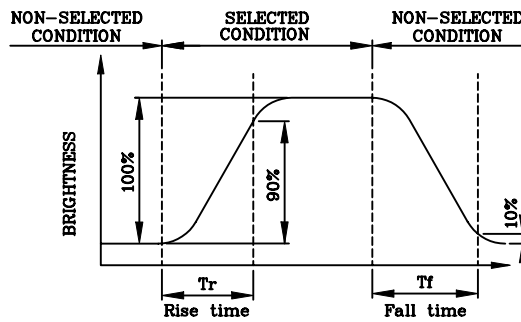
- Viewing Angle : 0
- Frame Frequency : 70Hz
- Applying Waveform : 1/N duty 1/a bias

(NOTE 2)

Definition of Response Time(Tr,Tf)



(positive type)



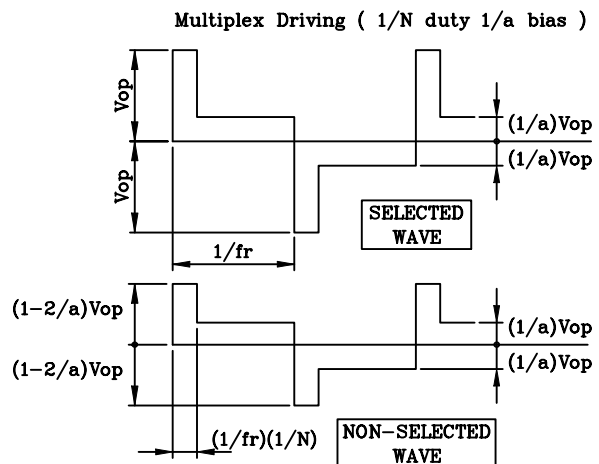
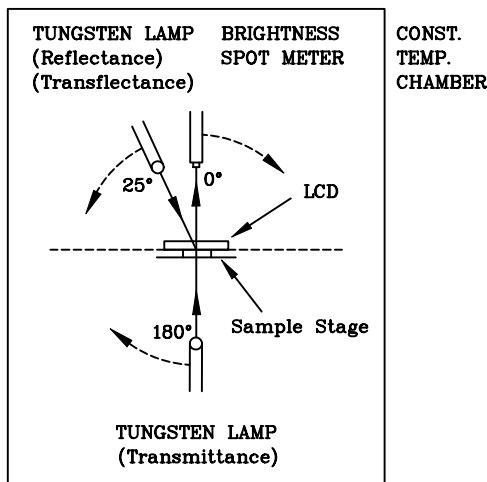
(negative type)

\*Conditions

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

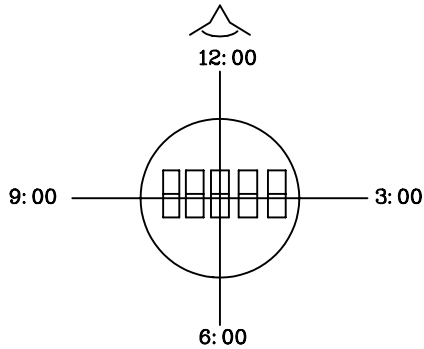
(NOTE 3)

Description of Measuring Equipment and Driving Waveforms



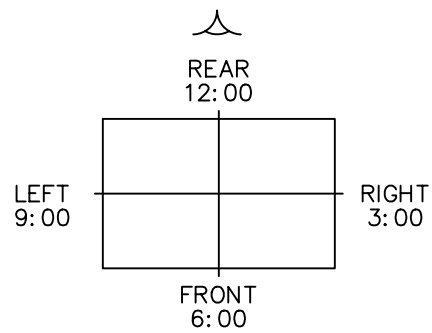
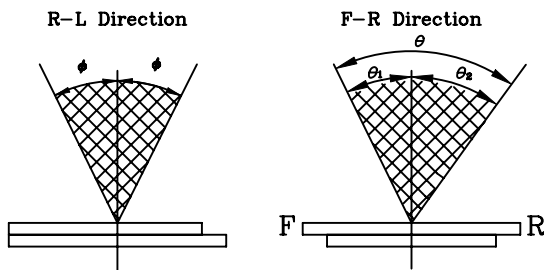
(NOTE 4)

Definition of Viewing Direction



(NOTE 5)

Definition of Viewing Angle



**\*For This Product**  
 The Viewing Direction Is 12 O'clock  
 So  $\theta_1 < \theta_2$

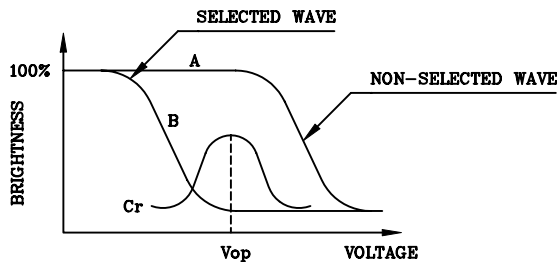
$$\theta = \theta_1 + \theta_2$$

**\*Conditions**

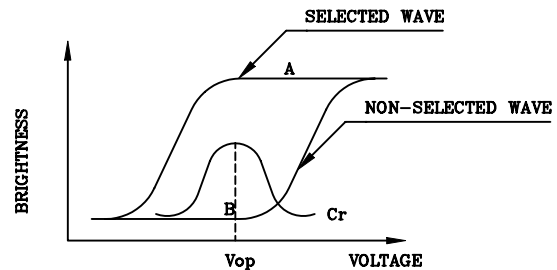
Operating Voltage :  $V_{op}$   
 Frame Frequency : 70Hz  
 Applying Waveform : 1/N duty 1/a bias  
 Contrast Ratio : larger than 2

(NOTE 6)

Definition of Contrast Ratio (Cr)



(positive type)



(negative type)

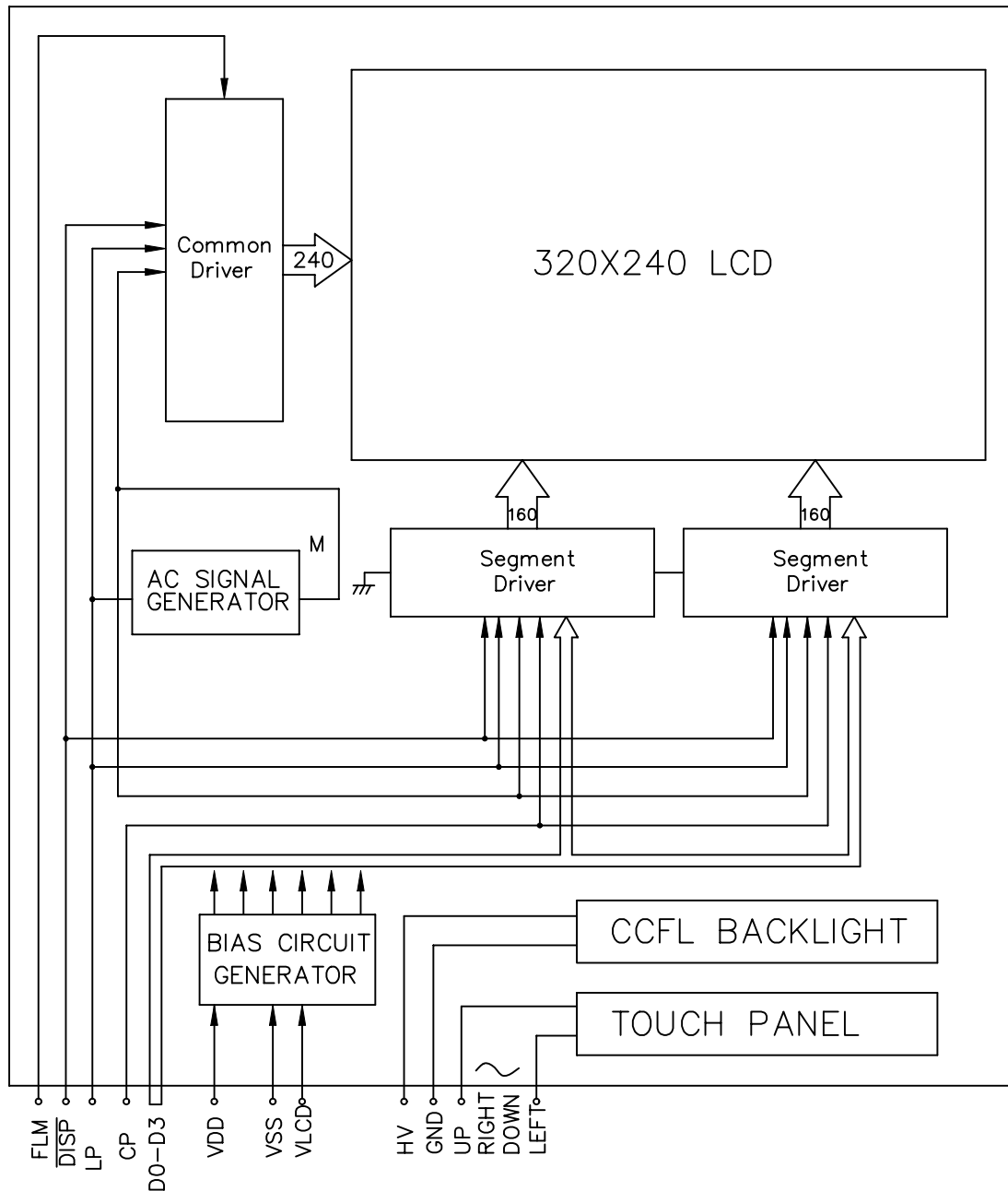
$$\text{Contrast Ratio : } Cr = A/B$$

**\*Conditions**

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



## 5. BLOCK DIAGRAM



## 6. INTERNAL PIN CONNECTION

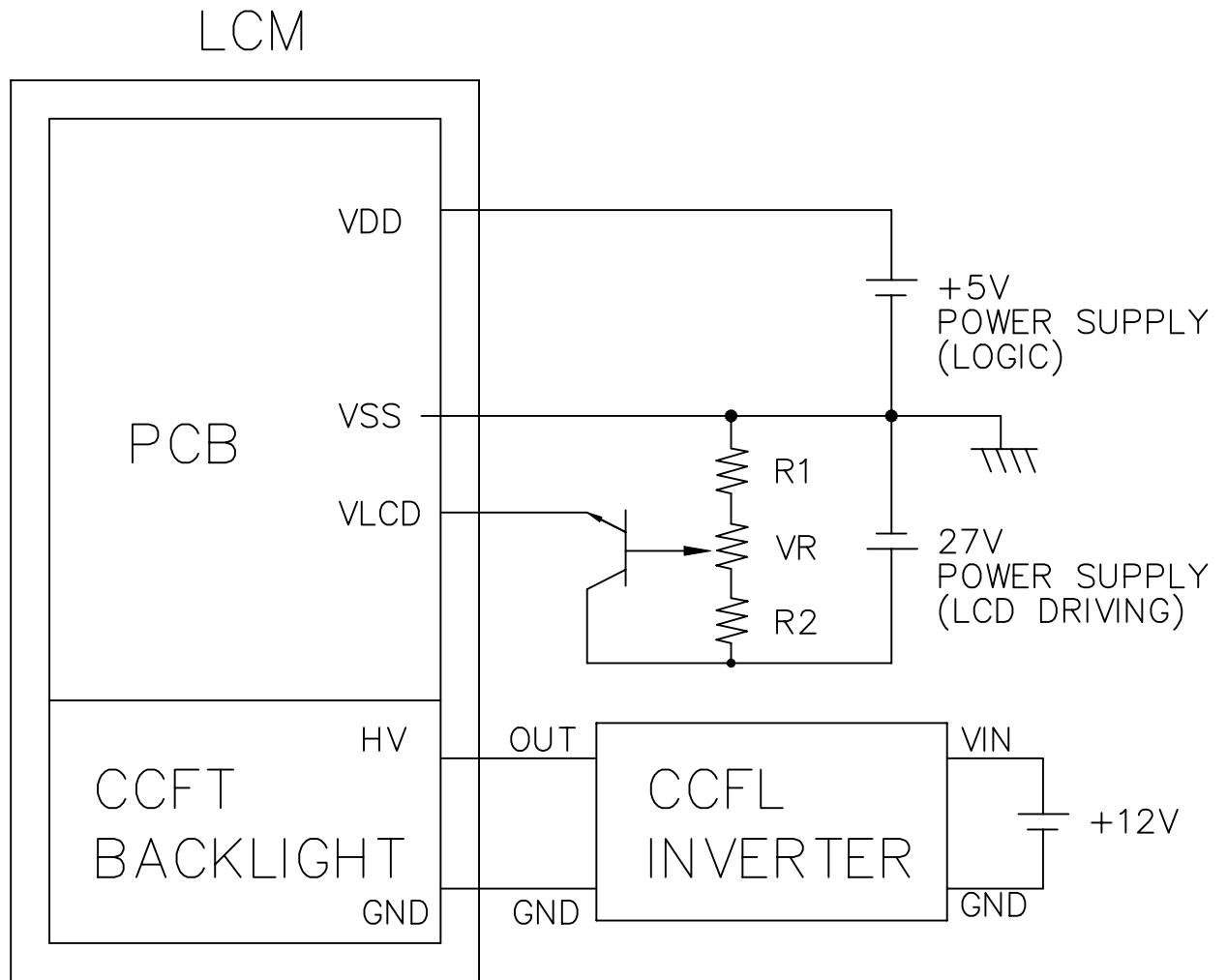
\*CN1 : LCD Connector (Molex 53398-1290)

Pin No.	SYMBOL	LEVEL	FUNCTION
1	FLM	H/L	FIRST LINE MARKER
2	LP	H→L	DATA LATCH SIGNAL
3	CP	H→L	DATA SHIFT CLOCK SIGNAL
4	$\overline{\text{DISPOFF}}$	H/L	H: ON/L: OFF
5	VDD	—	POWER SUPPLY FOR LOGIC
6	VSS	—	GND
7	VLCD	—	POWER SUPPLY FOR LCD DRIVER (+)
8	D0	H/L	DISPLAY DATA
9	D1	H/L	DISPLAY DATA
10	D2	H/L	DISPLAY DATA
11	D3	H/L	DISPLAY DATA
12	VSS	—	GND

\*CN2 : CCFL Connector (JST BHR-03VS-1)

Pin No.	SYMBOL	LEVEL	FUNCTION
1	GND	—	GROUND LINE (FROM INVERTER)
2	NC	—	NO CONNECTION
3	HV	AC	POWER SUPPLY FOR CCFL

## 7. POWER SUPPLY

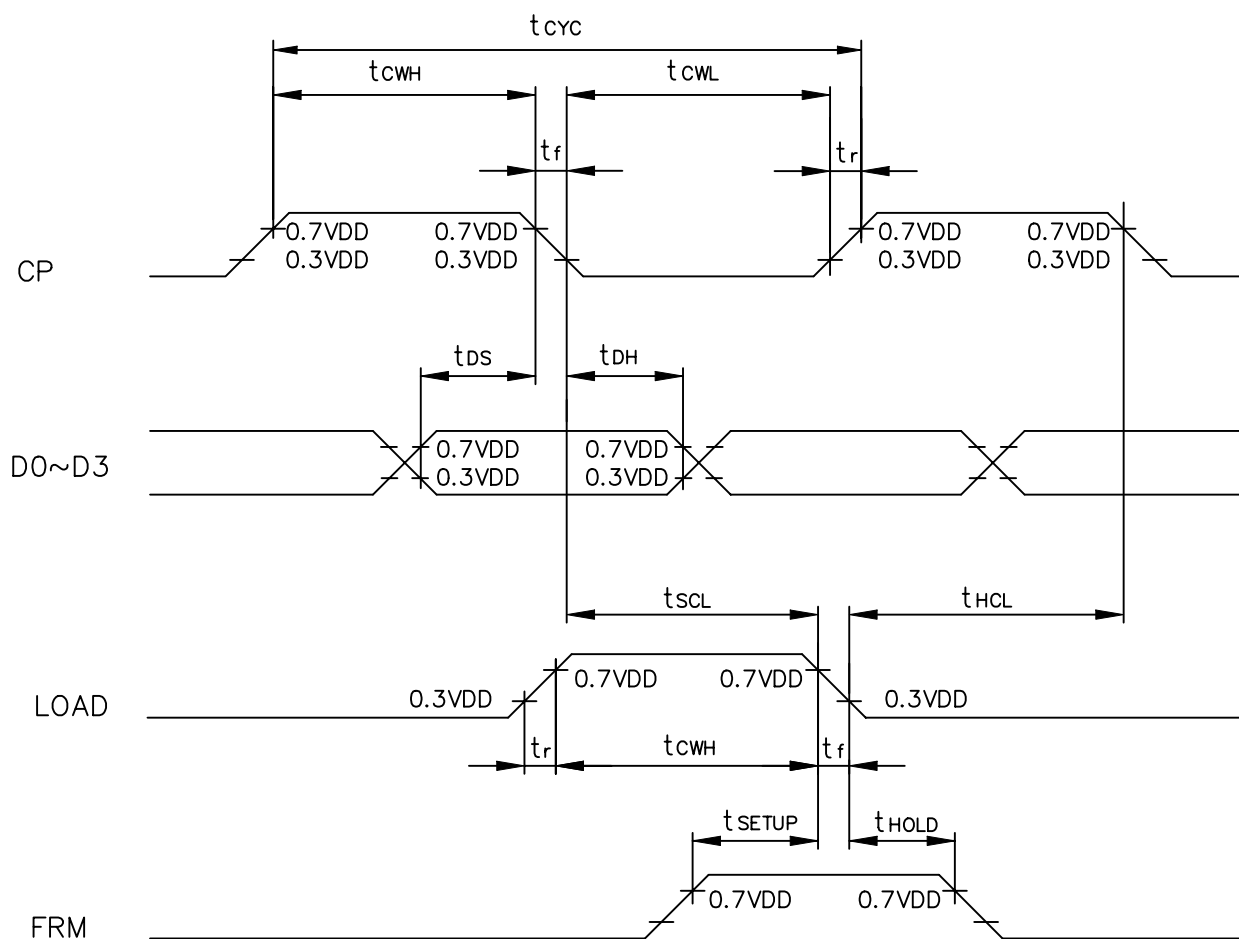


$$R1 + VR + R2 = 10K \sim 20K \Omega$$

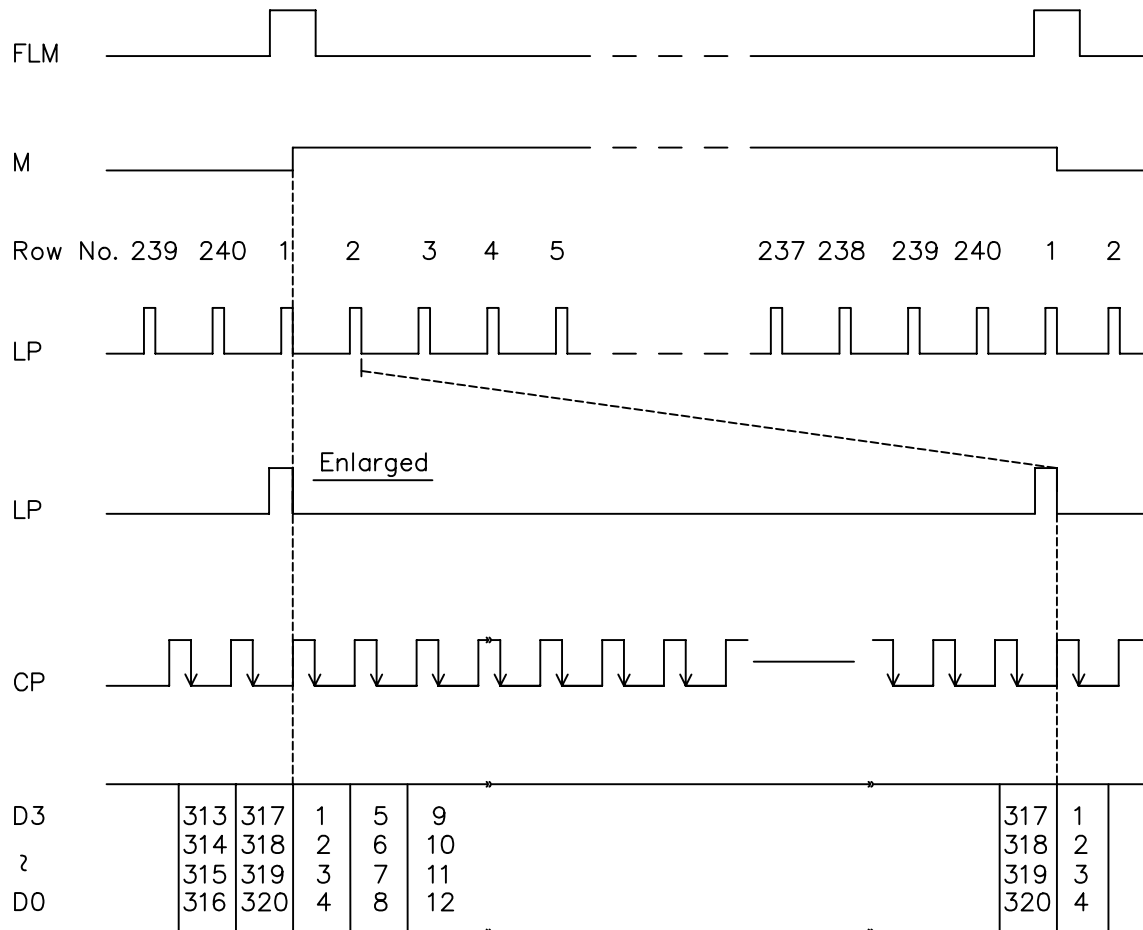
## 8. TIMING CHARACTERISTICS

### 8-1. INTERFACE TIMING

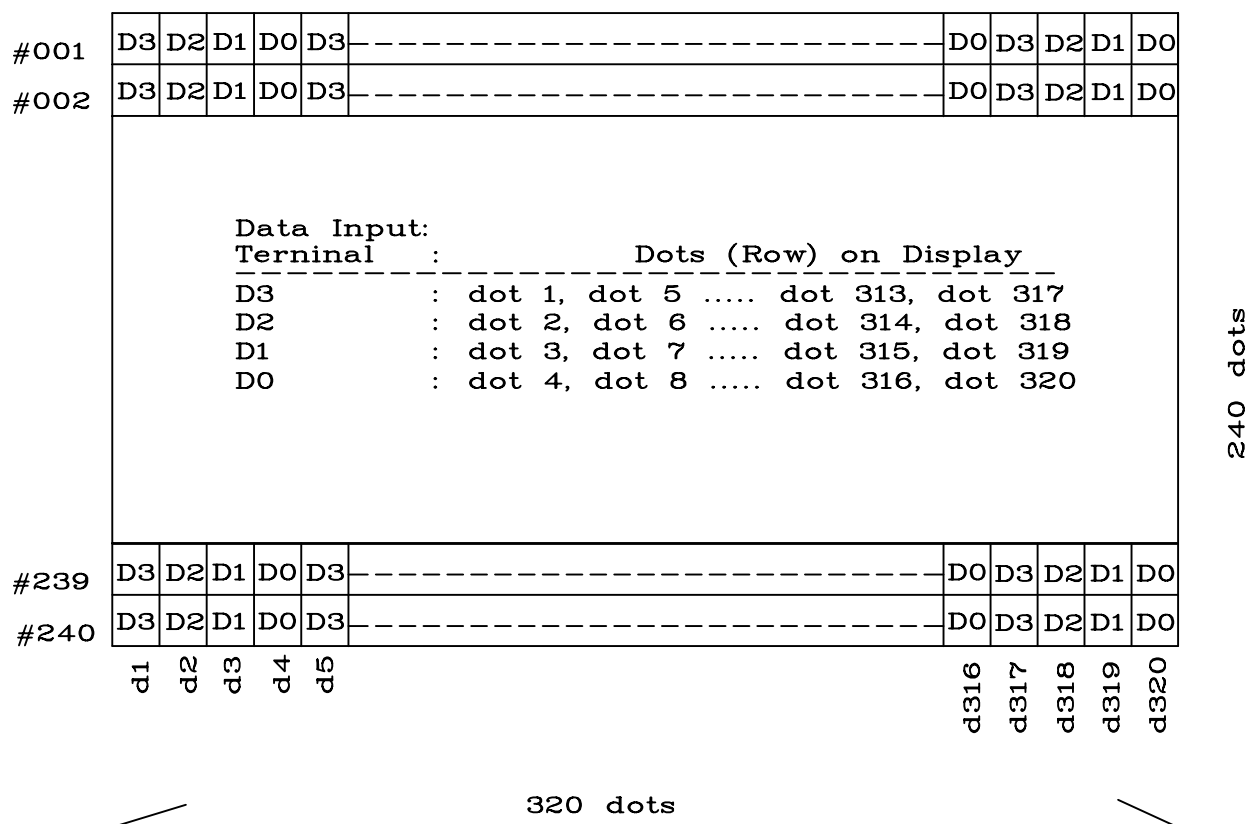
ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT
CLOCK CYCLE TIME	$t_{cyc}$	125	—	—	ns
CLOCK HIGH LEVEL WIDTH	$t_{cwh}$	51	—	—	ns
CLOCK LOW LEVEL WIDTH	$t_{cwl}$	51	—	—	ns
CLOCK RISE TIME	$t_r$	—	—	50	ns
CLOCK FALL TIME	$t_f$	—	—	50	ns
DATA SETUP TIME	$t_{ds}$	30	—	—	ns
DATA HOLD TIME	$t_{dh}$	40	—	—	ns
CLOCK SETUP TIME	$t_{scl}$	51	—	—	ns
CLOCK HOLD TIME	$t_{hcl}$	51	—	—	ns
FRAME SETUP TIME	$t_{setup}$	100	—	—	ns
FRAME HOLD TIME	$t_{hold}$	100	—	—	ns



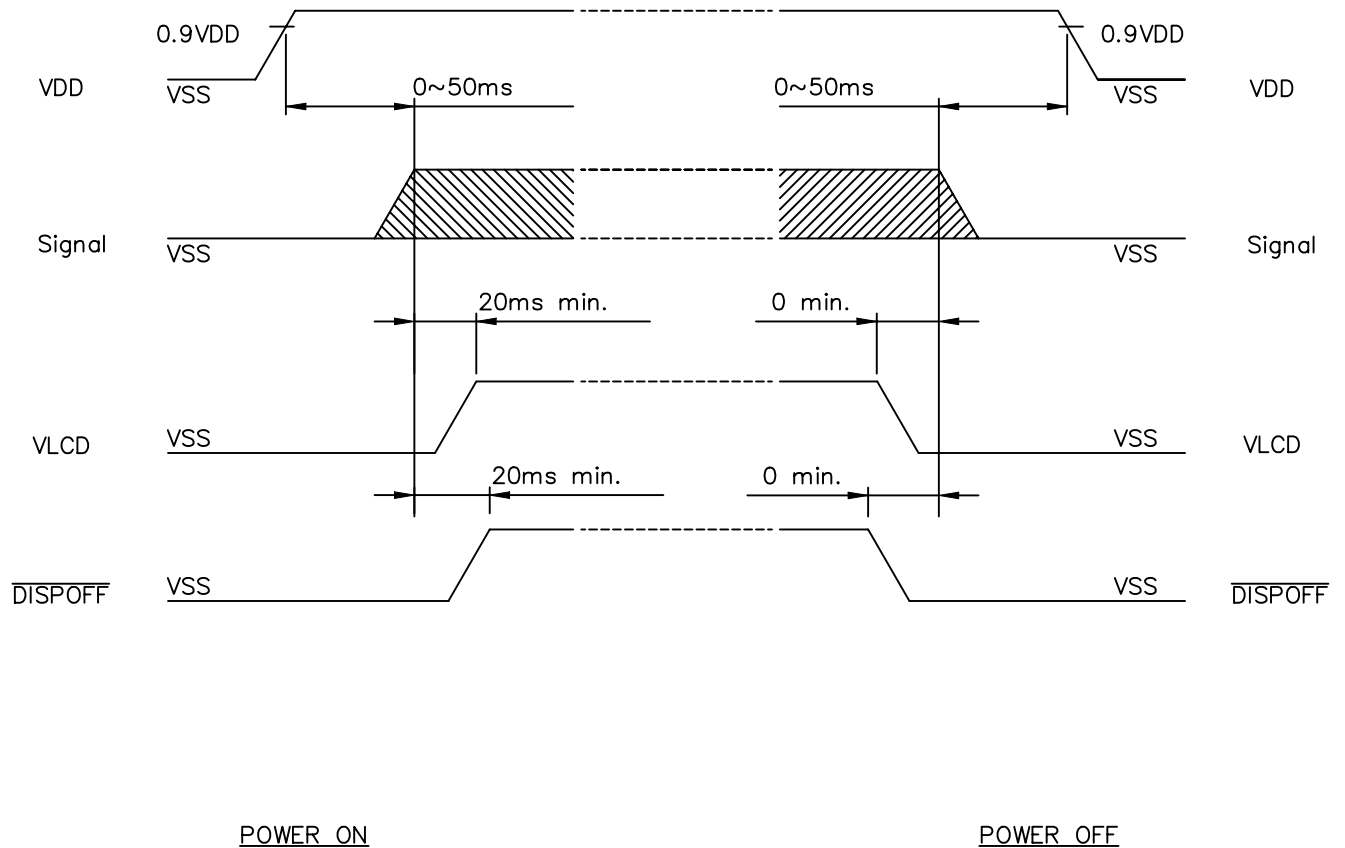
## 8-2. TIMING CHART OF INPUT SIGNALS



## 8-3.DISPLAY PATTERN



## 8-4. POWER ON/OFF TIMING



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

