

# AZ DISPLAYS, INC.

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## SPECIFICATIONS FOR LIQUID CRYSTAL DISPLAY

PART NUMBER:

AGM3224D

DATE:

May 20, 2005

## 1. MECHANICAL DATA

NO	ITEM	CONTENTS	UNIT
1	Product No.	AGM3224D-FLW-FBW	–
2	Module Size	160.0 (W) x 109.0 (H) x MAX.11.0 (D)	mm
3	Dot Size	0.33 (W) x 0.33 (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	Black and White(Normally White/Positive Image)	–
8	Rear Polarizer	Transflective(Normal)	–
9	Viewing Direction	6	O'clock
10	Backlight	LED B/L(White)	–
11	Controller	Excluded	–
12	DC/DC Converter	Excluded	–
13	Touch Panel	Excluded	–
14	Weight	200 (Approx.)	g

## 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	VI	-0.3	VDD+0.3	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	

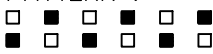
Note 2  $T_a \leq 70^\circ\text{C}$  : 75%RH max

Note 3 Please refer to item of reliability test

Note 4 Background color will change slightly depending on ambient temperature.  
That phenomenon is reversible.

## 3. ELECTRICAL CHARACTERISTICS

### 3-1. ELECTRICAL CHARACTERISTICS

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	
Power Supply for Logic	VDD-GND	-	4.75	5.0	5.25	V	
Input Voltage	VIH	H level	0.7VDD	-	VDD	V	
	VIL	L level	0	-	0.3VDD	V	
Recommended LC Driving Voltage	VDD-V0	Duty=1/240	-20°C	25.4	25.7	26.0	V
			0°C	23.8	24.1	24.4	
			25°C	22.9	23.2	23.5	
			50°C	21.5	21.8	22.1	
			70°C	20.5	20.8	21.1	
Power Supply Current	IDD	FLM = 70 Hz VDD = 5.0 V VEE = -24.0 V VDD-V0 = 23.2 V	-	4.5	7	mA	
	IEE	PATTERN : 	-	4	6	mA	
Surface Luminance of LCM	L	PATTERN: (Dots All ON)	-	6	10	cd/m <sup>2</sup>	
		PATTERN: (Dots All Off)	15	25	-		

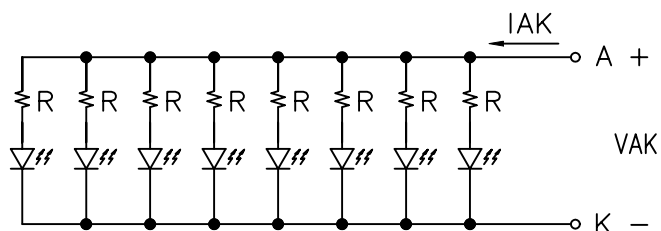
## 3-2.ELECTRICAL CHARACTERISTICS OF BACKLIGHT

Used LED Rating

Temp.=25°C

ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT	REMARK
Peak forward current	$I_P$	—	—	240	mA	—
Maximum reverse voltage	$V_R$	—	—	5	V	—
Applied forward current	$I_{AK}$	—	150	160	mA	at $V_{AK} = 5.0$ V
Applied forward voltage	$V_{AK}$	—	5.0	—	V	at $I_{AK} = 150$ mA
LED power consumption	$P_F$	—	0.75	—	W	—
LED life time	$L_L$	—	10000	—	hrs	at $V_{AK} = 150$ mA (*1)

(\*1) LED life time is defined as follows : The final brightness is at 50% of original brightness .



## 4. OPTICAL CHARACTERISTICS

AT V<sub>OP</sub>

ITEM		Cr(Contrast Ratio)										θ(Viewing Angle)		φ(Viewing Angle)	
		-20℃		0℃		25℃		50℃		70℃		25℃		25℃	
MODE		MIN.	TYP.	MIN.	TYP.	MIN.	TYP.	MIN.	TYP.	MIN.	TYP.	MIN.	TYP.	MIN.	TYP.
S	J	4.5	5.5	5.5	6.5	5.5	6.5	4.5	5.5	3.0	4.0	-	66	-	±34
NOTE		NOTE 6										NOTE 5			

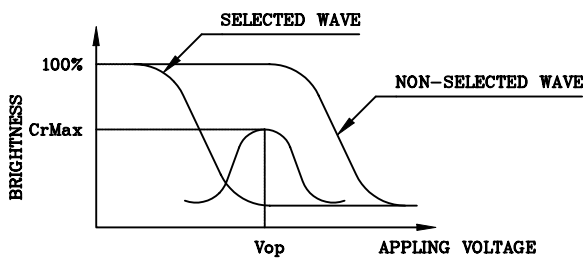
NOTE : S: Transflective(Normal)  
 J: Normally White , 6 O'clock

AT φ=0° θ=0°

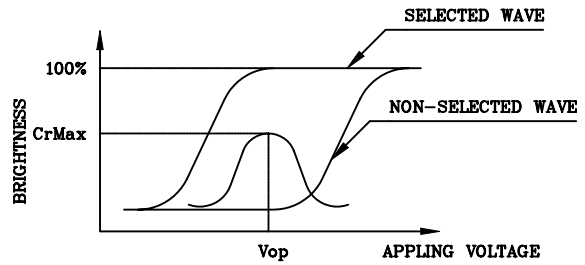
ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Response Time (rise)	Tr	-20℃	2000	4000	6000	ms	NOTE 2
		0℃	400	750	1100		
		25℃	125	250	375		
		50℃	60	120	180		
		70℃	35	70	105		
Response Time (fall)	Tf	-20℃	1000	2000	3000	ms	NOTE 2
		0℃	210	420	630		
		25℃	60	120	180		
		50℃	30	60	90		
		70℃	20	40	60		

(NOTE 1)

Definition of Operation Voltage(Vop)



(positive type)



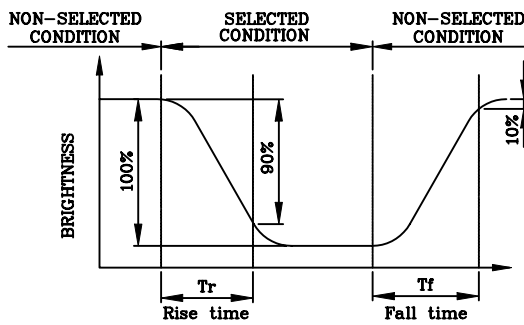
(negative type)

\*Conditions

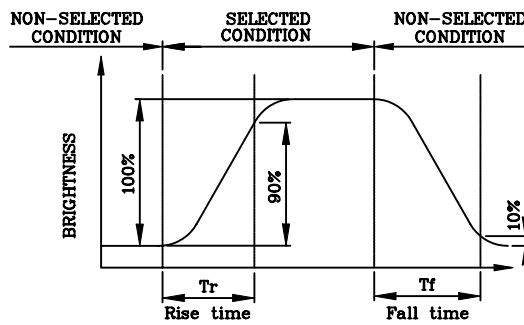
- Viewing Angle : 0
- Frame Frequency : 70Hz
- Applying Waveform : 1/N duty 1/a bias

(NOTE 2)

Definition of Response Time(Tr,Tf)



(positive type)



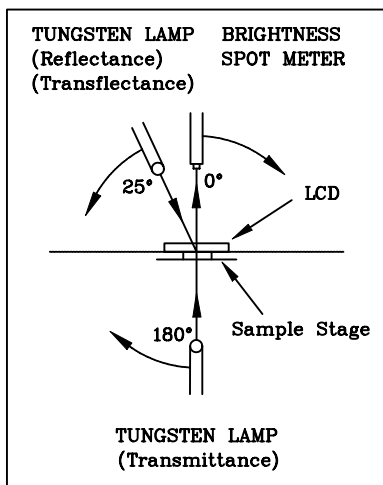
(negative type)

\*Conditions

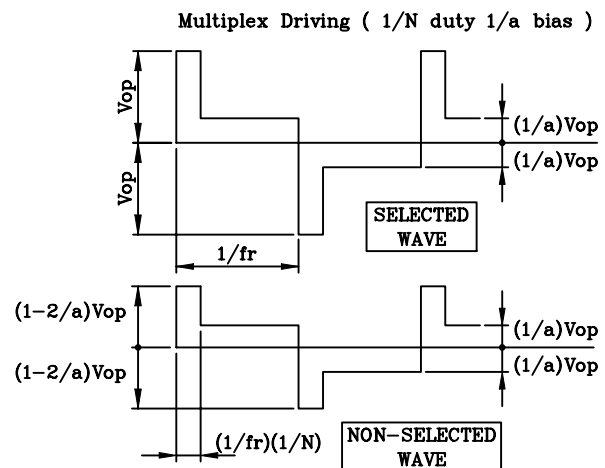
- Operating Voltage : Vop
- Viewing Angle (θ,φ) : (0,0)
- Frame Frequency : 70Hz
- Applying Waveform : 1/N duty 1/a bias

(NOTE 3)

Description of Measuring Equipment and Driving Waveforms

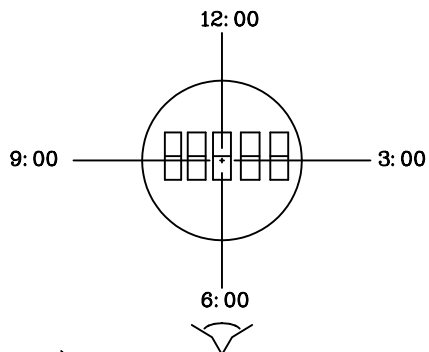


CONST.  
TEMP.  
CHAMBER



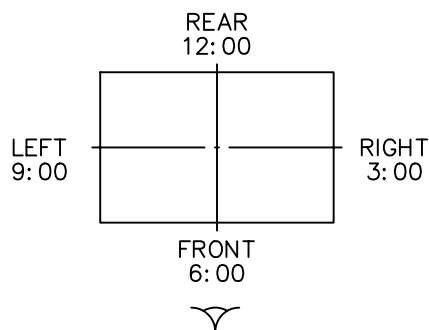
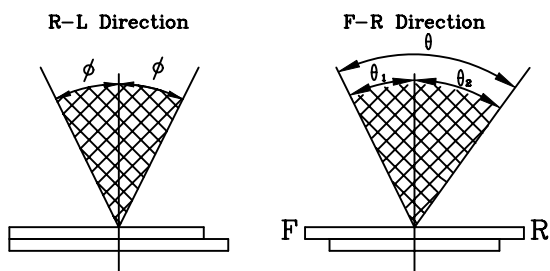
(NOTE 4)

Definition of Viewing Direction



(NOTE 5)

Definition of Viewing Angle



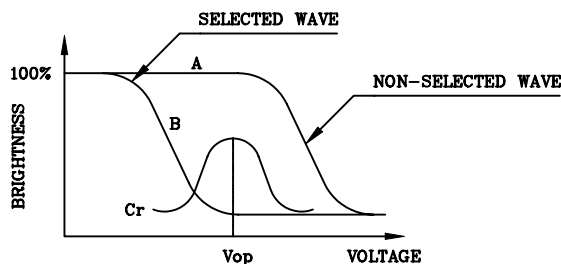
$$\theta = \theta_1 + \theta_2$$

**\*Conditions**

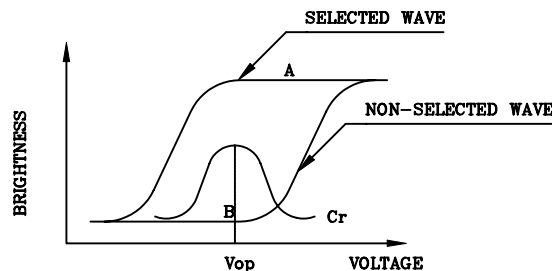
- Operating Voltage :  $V_{op}$
- Frame Frequency : 70Hz
- Applying Waveform : 1/N duty 1/a bias
- Contrast Ratio : larger than 2

(NOTE 6)

Definition of Contrast Ratio (Cr)



(positive type)



(negative type)

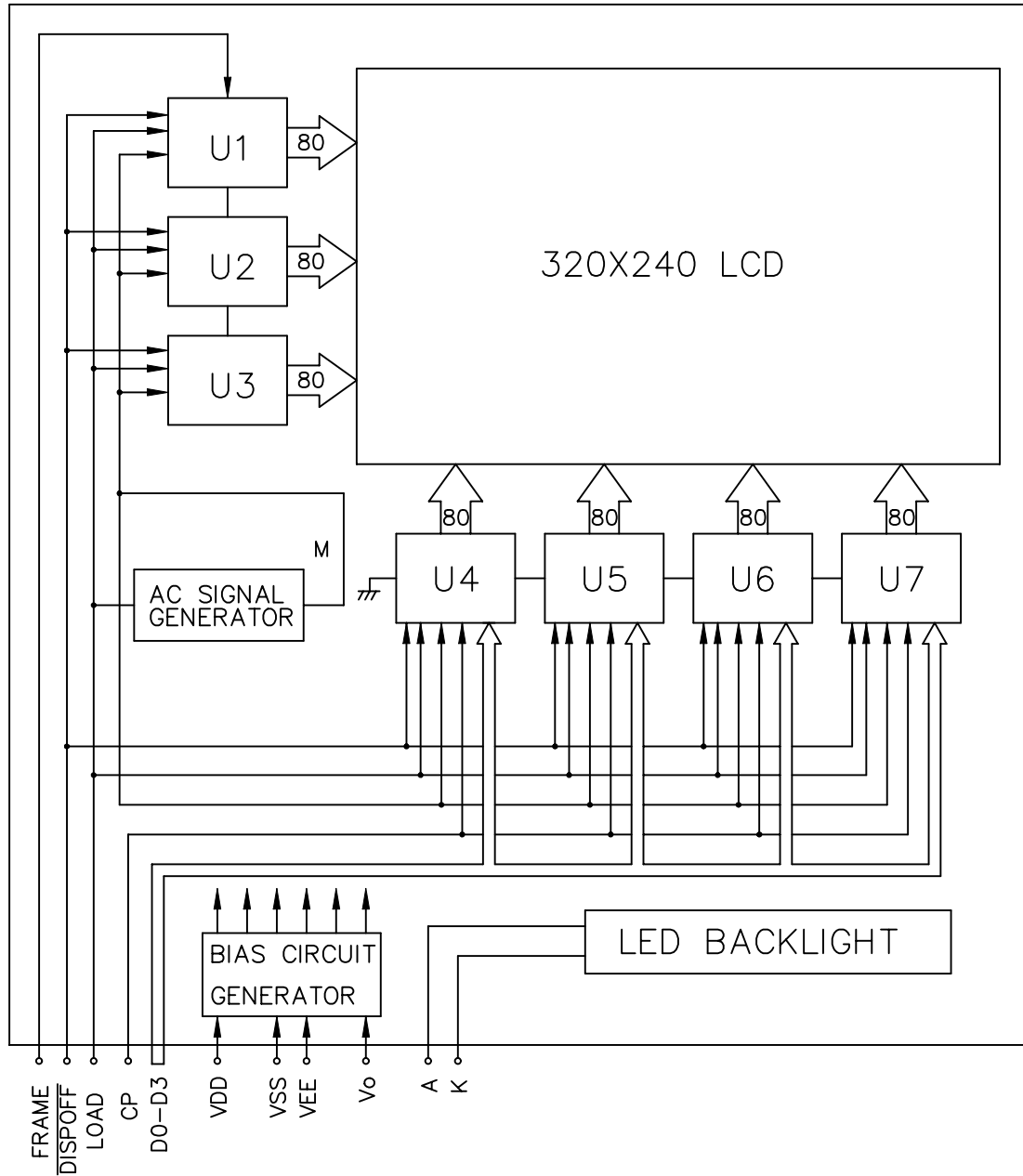
Contrast Ratio :  $Cr=A/B$

**\*Conditions**

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



## 5. BLOCK DIAGRAM



\* AC SIGNAL SETTING

J1	J2	J3	J4	J5	J6	J7	J8
L	H	H	L	L	L	L	L

## 6. INTERNAL PIN CONNECTION

CN1:PITCH 1.25mm WIDTH 18.75mm

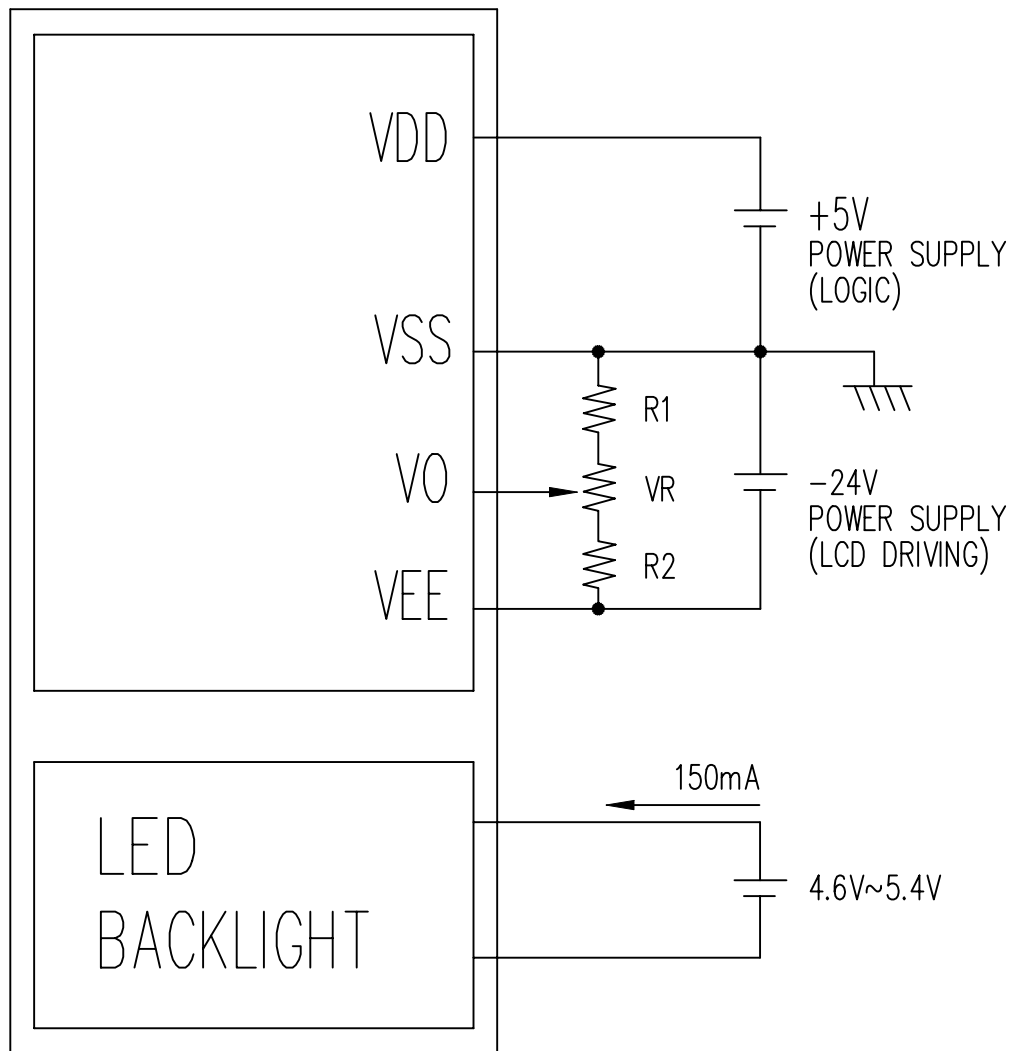
PIN NO.	SYMBOL	LEVEL	FUNCTION
1	D0	H/L	DISPLAY DATA SIGNAL
2	D1		
3	D2		
4	D3		
5	DISPOFF	H/L	H:ON/L:OFF
6	FRAME	H	SCAN START-UP SIGNAL
7	NC	-	NO CONNECTION
8	LOAD	H-L	INPUT DATA LATCH SIGNAL
9	CP	H-L	DATA INPUT CLOCK SIGNAL
10	VDD	-	POWER SUPPLY FOR LOGIC(+5V)
11	VSS	-	SIGNAL GROUND(0V)
12	VEE	-	POWER SUPPLY FOR LCD
13	VO	-	LCD CONTRAST ADJUST VOLTAGE
14	FGND	-	FRAME GROUND

CN2:J.A.E./IL-G-4S-S3C2

PIN NO.	SYMBOL	LEVEL	FUNCTION
1	A	-	POWER SUPPLY VOLTAGE FOR LED
2	NC	-	-
3	NC	-	-
4	K	-	GROUND

## 7. POWER SUPPLY

LCM



(Note)

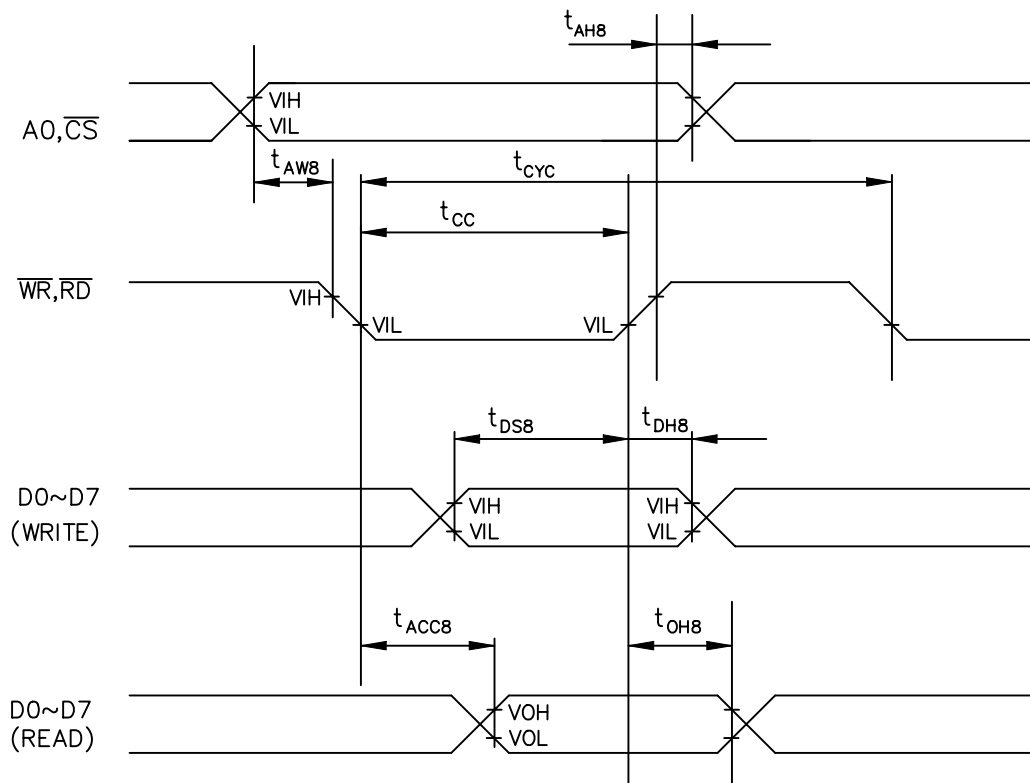
$$1.R1+VR+R2=10K\sim 20K\Omega$$

## 8. TIMING CHARACTERISTICS

### 8-1. READ/WRITE CHARACTERISTICS(8080 FAMILY MPU)

VDD=5.0V±5%

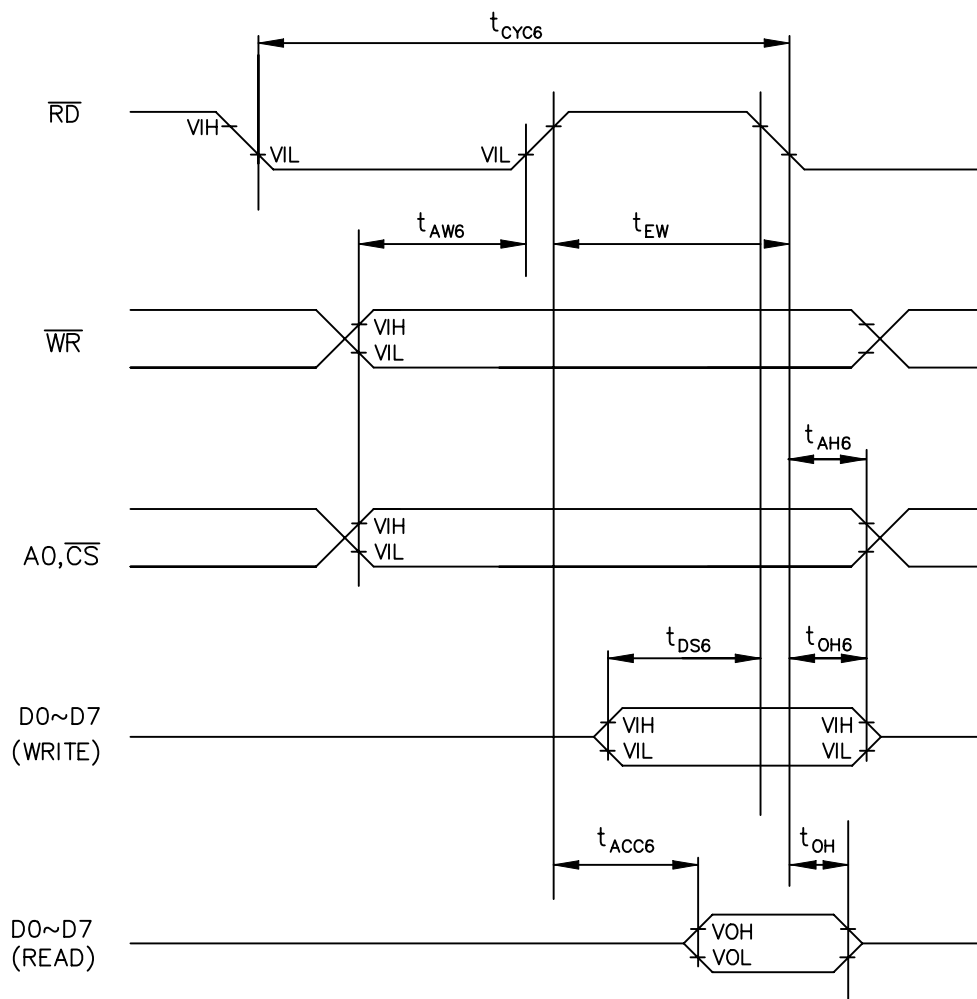
ITEM	ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT
A0, $\overline{CS}$	ADDRESS HOLD TIME	$t_{AH8}$	10	-	-	ns
	ADDRESS SETUP TIME	$t_{AW8}$	0	-	-	ns
$\overline{WR}, \overline{RD}$	SYSTEM CYCLE TIME	$t_{cyc8}$	1	-	-	ns
	STROBE PULSE WIDTH	$t_{cc}$	120	-	-	ns
D0 to D7	DATA HOLD TIME	$t_{DH8}$	5	-	-	ns
	DATA SETUP TIME	$t_{DS8}$	120	-	-	ns
	$\overline{RD}$ ACCESS TIME	$t_{ACC8}$	-	-	50	ns
	OUTPUT DISABLE TIME	$t_{OH8}$	10	-	50	ns



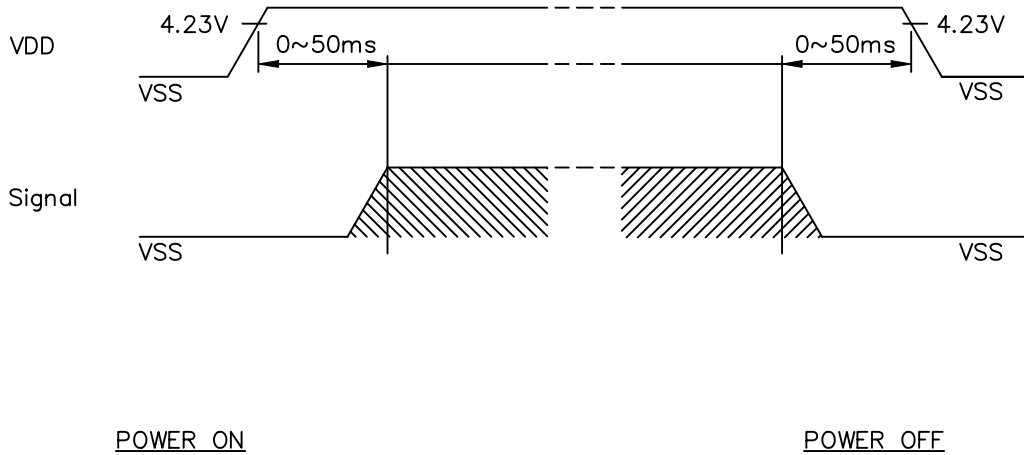
## 8-2.READ/WRITE CHARACTERISTICS(6800 FAMILY MPU)

VDD=5.0V±5%

ITEM	ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT
A0, $\overline{CS}$ , $\overline{WR}$	ADDRESS HOLD TIME	$t_{AH6}$	0	-	-	ns
	ADDRESS SETUP TIME	$t_{AW6}$	0	-	-	ns
	SYSTEM CYCLE TIME	$t_{CYC6}$	1	-	-	ns
D0 to D7	DATA HOLD TIME	$t_{DH6}$	0	-	-	ns
	DATA SETUP TIME	$t_{DS6}$	100	-	-	ns
	ACCESS TIME	$t_{ACC6}$	-	-	85	ns
	OUTPUT DISABLE TIME	$t_{OH6}$	10	-	50	ns
$\overline{RD}$	ENABLE PULSE WIDTH	$t_{RDW}$	120	-	50	ns



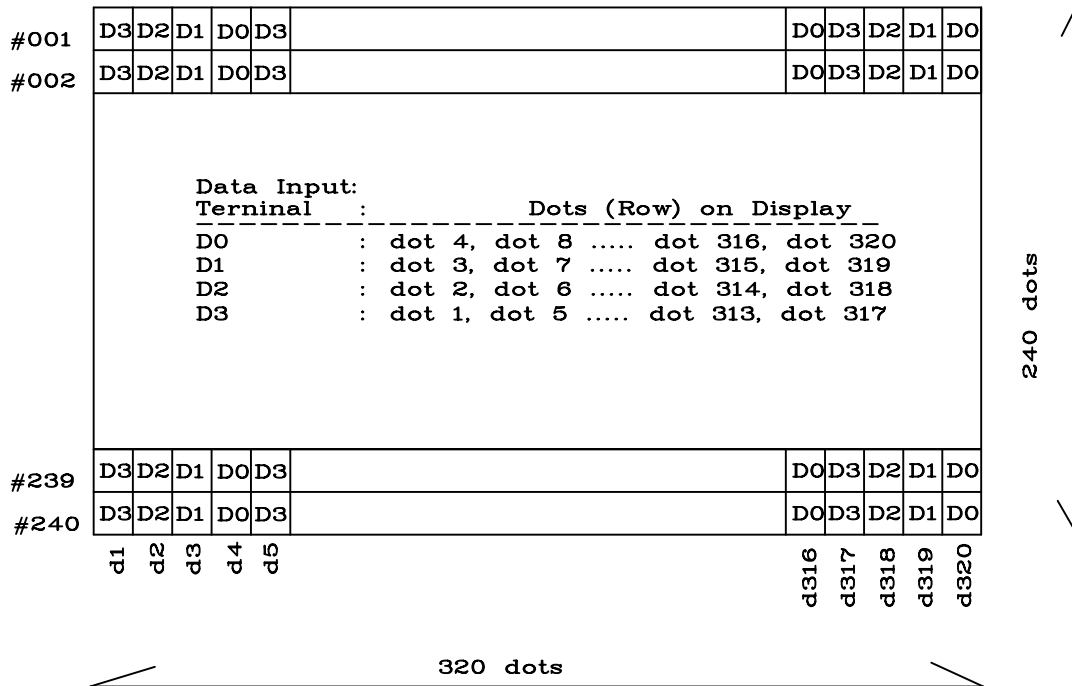
## 8-3. POWER ON/OFF TIMING



(Note)

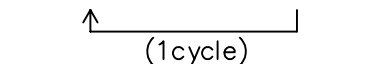
The missing pixels may occur when the LCM is driven beyond above power interface timing sequence.

## 8-4.DISPLAY PATTERN



## 9. RELIABILITY TEST

### WIDE TEMPERATURE RELIABILITY TEST

NO	ITEM	CONDITION			STANDARD	NOTE
1	High Temp. Storage	70°C	120Hrs		Appearance without defect	
2	Low Temp. Storage	-40°C	120Hrs		Appearance without defect	
3	High Temp. & High Humi. Storage	60°C 90%RH	120Hrs		Appearance without defect	
4	High Temp. Operating Display	60°C	120Hrs		Appearance without defect	
5	Low Temp. Operating Display	-20°C	120Hrs		Appearance without defect	
6	Thermal Shock	-20°C, 30min → 70°C, 30min  (1cycle)			Appearance without defect	10 cycles



