

AZ DISPLAYS, INC.

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 ²
		PATTERN: (Dots All Off)		15	25	—	

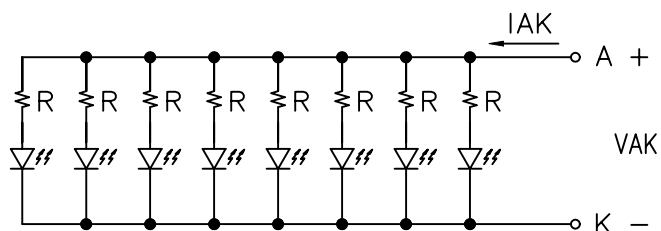
3-2.ELECTRICAL CHARACTERISTICS OF BACKLIGHT

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 VoP

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.
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			

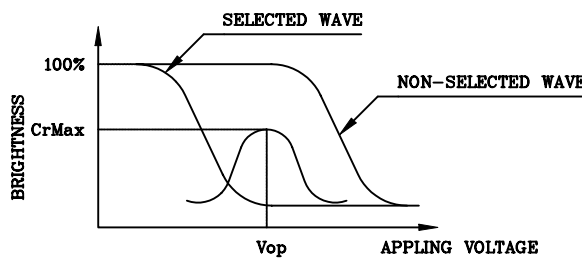
NOTE : S: Transflective(Normal)
J: Normally White , 6 O'clock

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

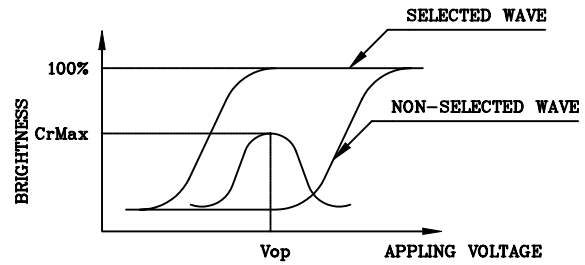
ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Response Time (rise)	Tr	-20℃	2000	4000	6000	ms	NOTE 2
		0℃	400	750	1100		
		25℃	125	250	375		
		50℃	60	120	180		
		70℃	35	70	105		
Response Time (fall)	Tf	-20℃	1000	2000	3000	ms	NOTE 2
		0℃	210	420	630		
		25℃	60	120	180		
		50℃	30	60	90		
		70℃	20	40	60		

(NOTE 1)

Definition of Operation Voltage(Vop)



(positive type)



(negative type)

*Conditions

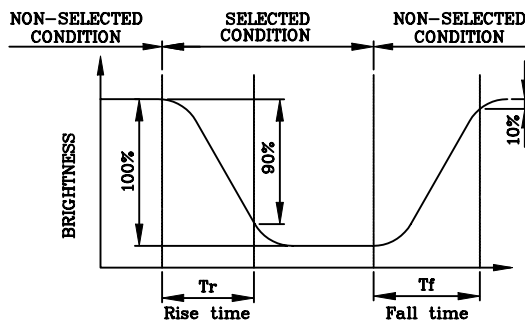
Viewing Angle : 0

Frame Frequency : 70Hz

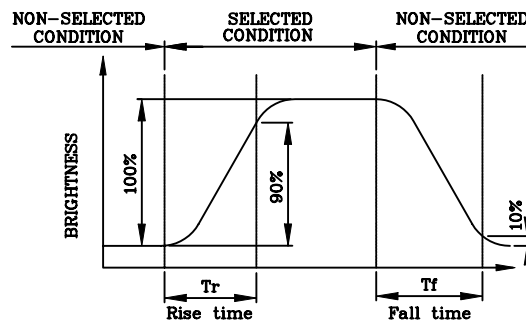
Applying Waveform : 1/N duty 1/a bias

(NOTE 2)

Definition of Response Time(Tr,Tf)



(positive type)



(negative type)

*Conditions

Operating Voltage : Vop

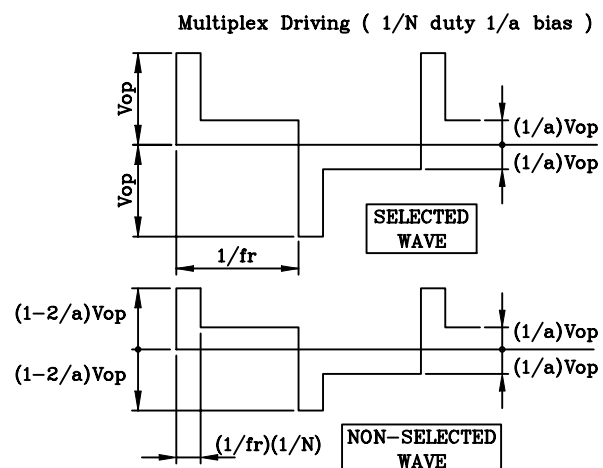
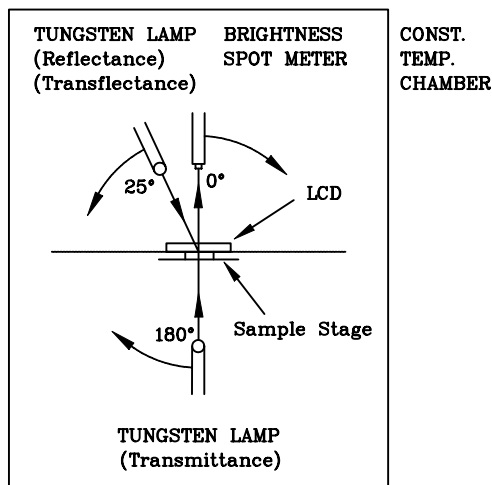
Viewing Angle (θ,φ) : (0,0)

Frame Frequency : 70Hz

Applying Waveform : 1/N duty 1/a bias

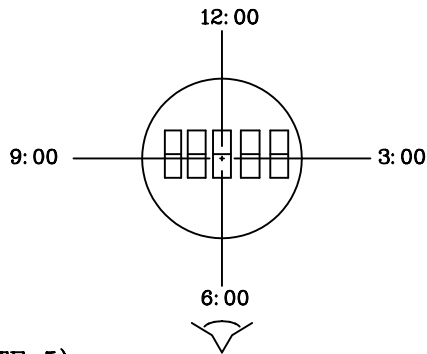
(NOTE 3)

Description of Measuring Equipment and Driving Waveforms



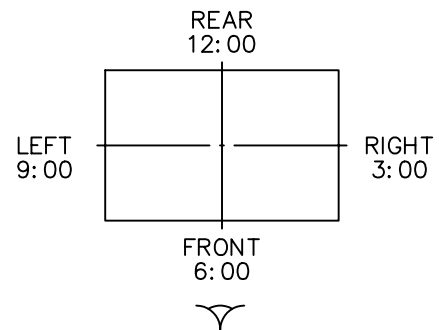
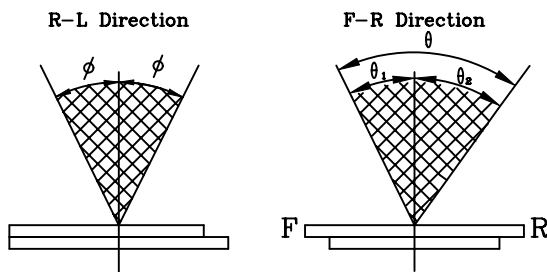
(NOTE 4)

Definition of Viewing Direction



(NOTE 5)

Definition of Viewing Angle



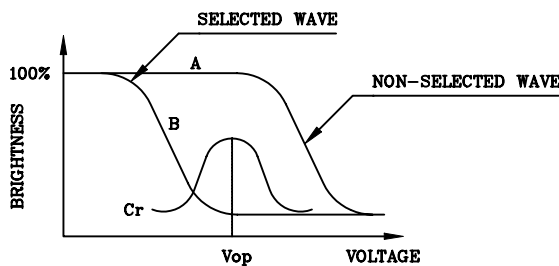
$$\theta = \theta_1 + \theta_2$$

***Conditions**

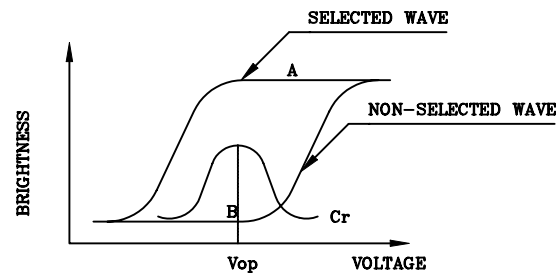
Operating Voltage : V_{op}
 Frame Frequency : 70Hz
 Applying Waveform : 1/N duty 1/a bias
 Contrast Ratio : larger than 2

(NOTE 6)

Definition of Contrast Ratio (Cr)



(positive type)



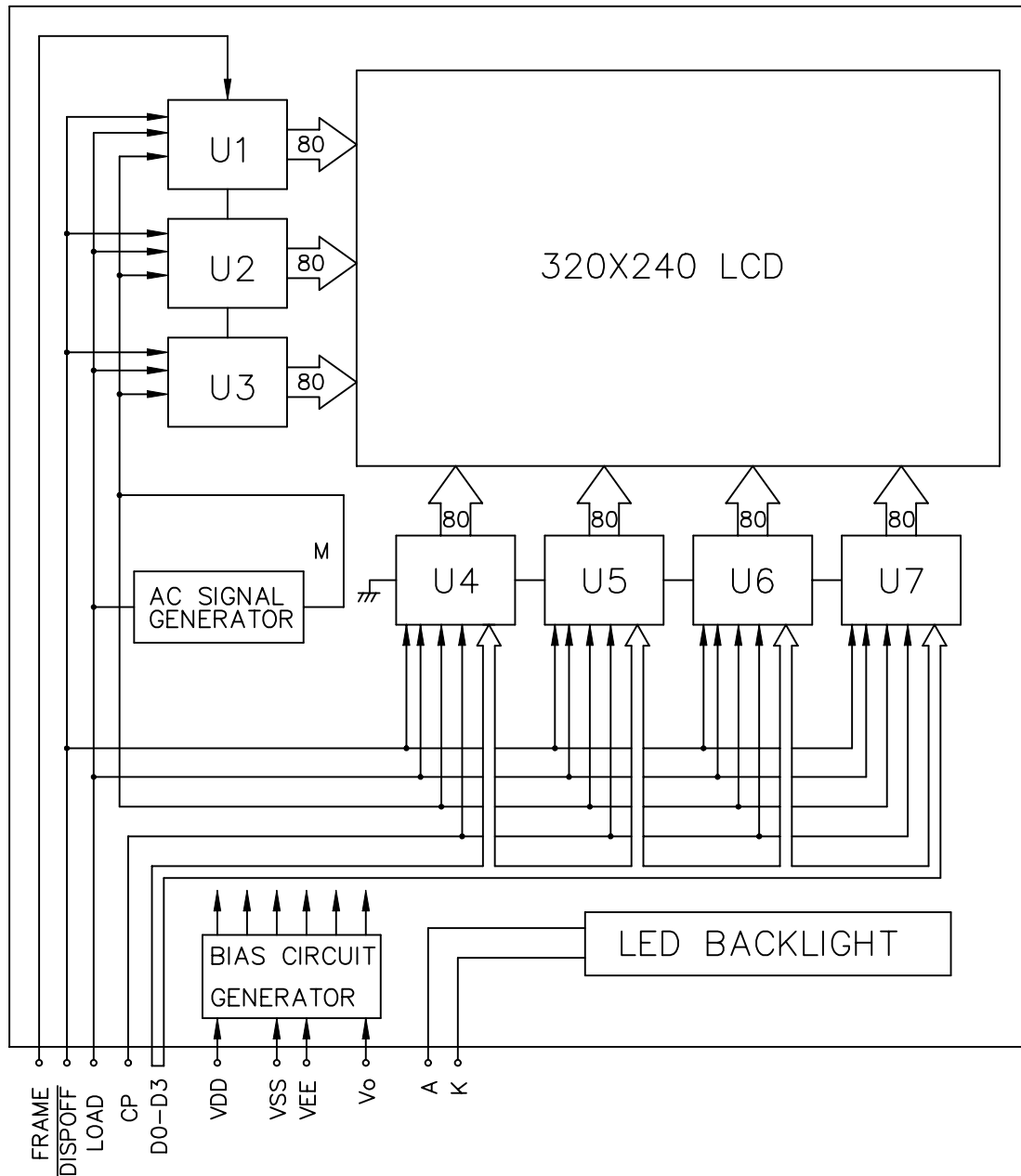
(negative type)

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

***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

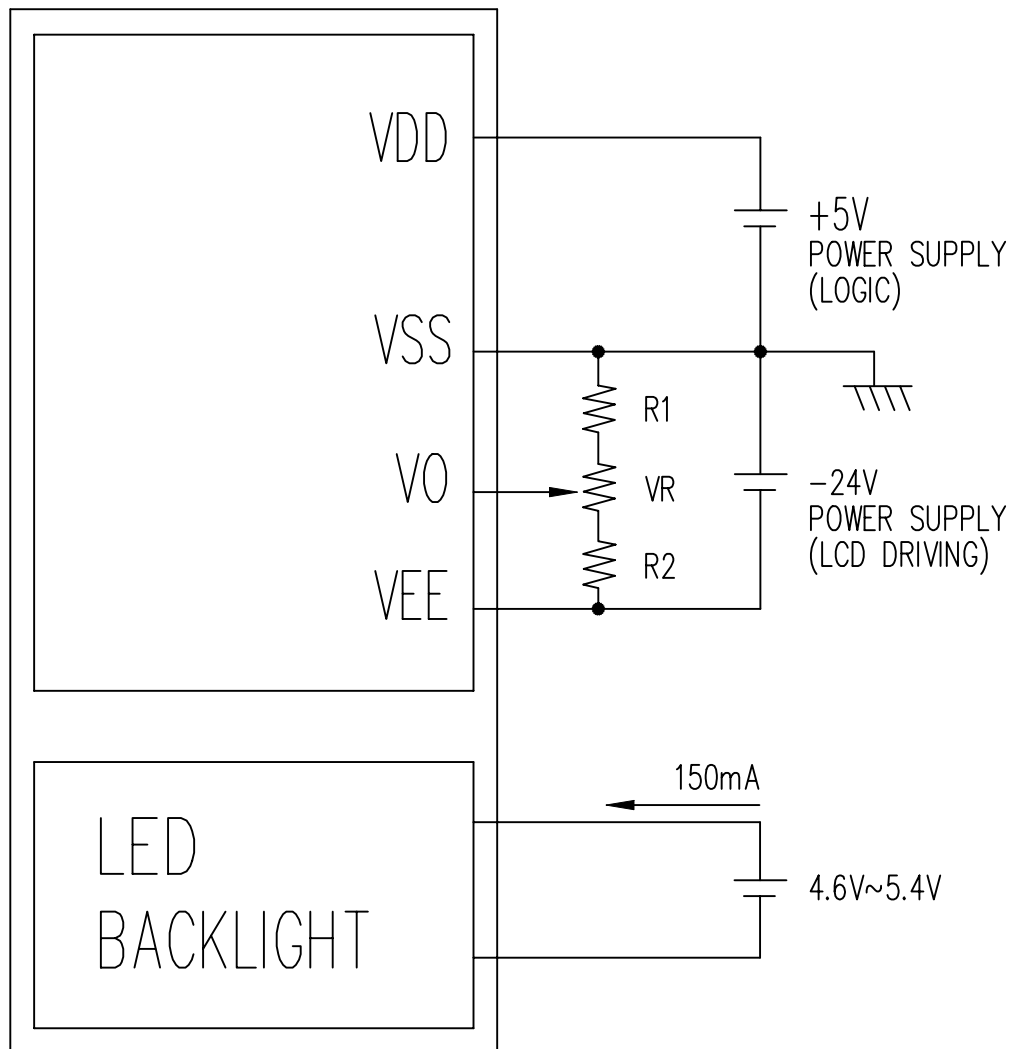
PIN NO.	SYMBOL	LEVEL	FUNCTION
1	D0	H/L	DISPLAY DATA SIGNAL
2	D1		
3	D2		
4	D3		
5	DISPOFF	H/L	H:ON/L:OFF
6	FRAME	H	SCAN START-UP SIGNAL
7	NC	—	NO CONNECTION
8	LOAD	H-L	INPUT DATA LATCH SIGNAL
9	CP	H-L	DATA INPUT CLOCK SIGNAL
10	VDD	—	POWER SUPPLY FOR LOGIC(+5V)
11	VSS	—	SIGNAL GROUND(0V)
12	VEE	—	POWER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

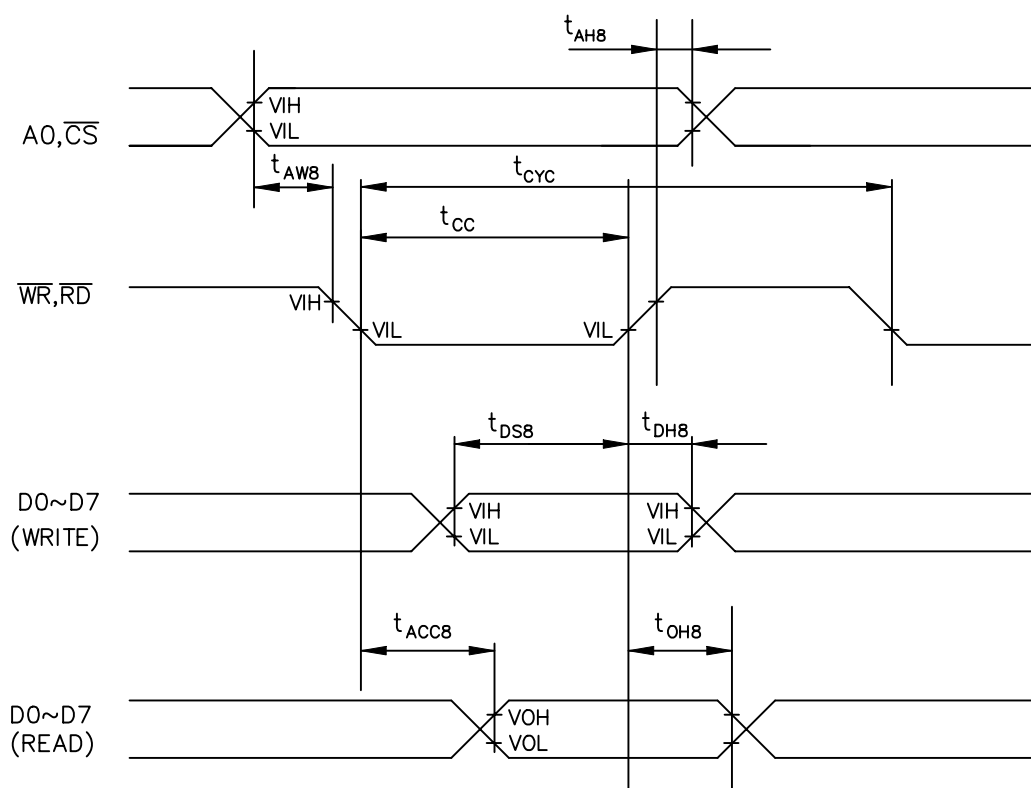
$$1. R1 + VR + R2 = 10K \sim 20K \Omega$$

8. TIMING CHARACTERISTICS

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

VDD=5.0V±5%

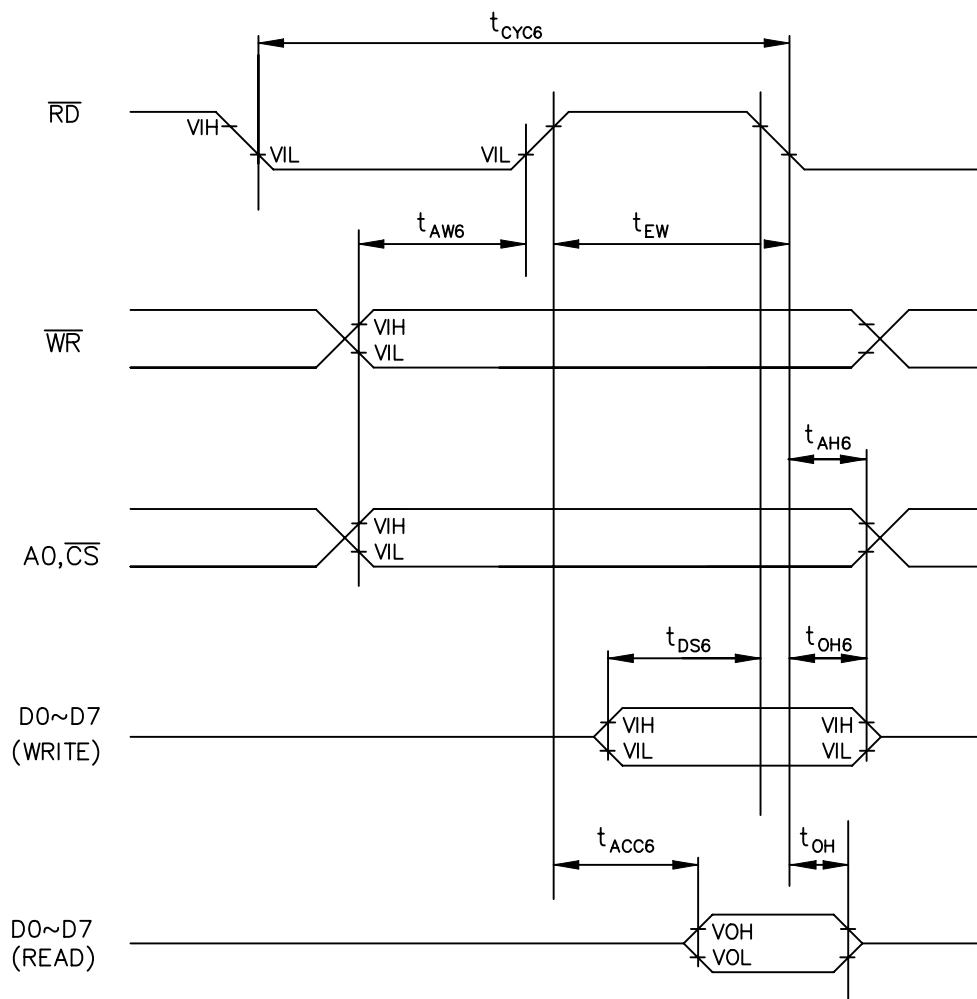
ITEM	ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT
A0, $\overline{CS}$	ADDRESS HOLD TIME	t_{AH8}	10	—	—	ns
	ADDRESS SETUP TIME	t_{AW8}	0	—	—	ns
$\overline{WR}, \overline{RD}$	SYSTEM CYCLE TIME	t_{cyc8}	1	—	—	ns
	STROBE PULSE WIDTH	t_{cc}	120	—	—	ns
D0 to D7	DATA HOLD TIME	t_{DH8}	5	—	—	ns
	DATA SETUP TIME	t_{DS8}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



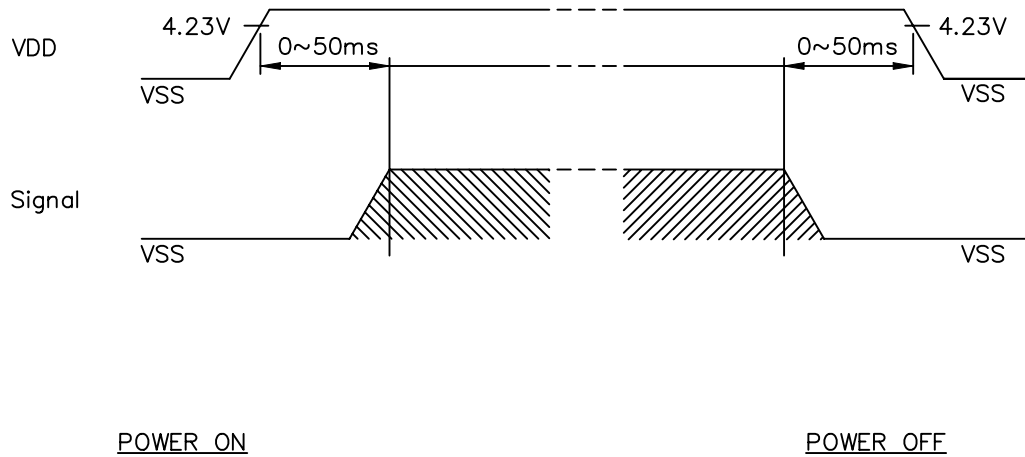
8-2.READ/WRITE CHARACTERISTICS(6800 FAMILY MPU)

VDD=5.0V±5%

ITEM	ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT
A0, $\overline{\text{CS}}$, $\overline{\text{WR}}$	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
$\overline{\text{RD}}$	ENABLE PULSE WIDTH	t_{RDW}	120	—	50	ns



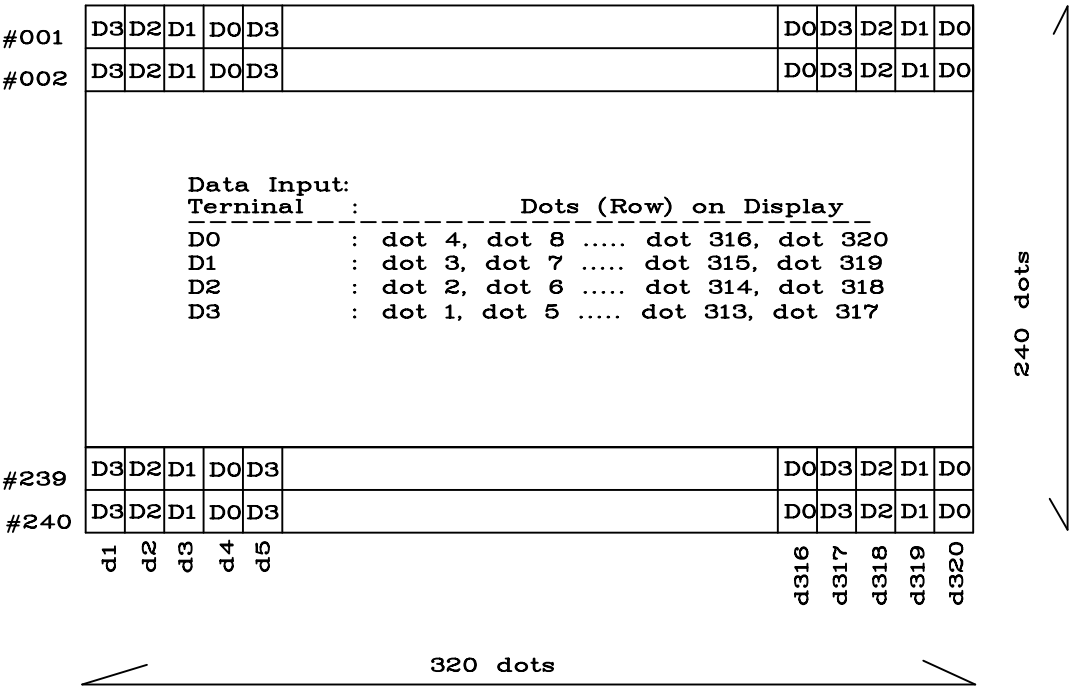
8-3. POWER ON/OFF TIMING



(Note)

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

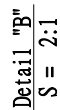
8-4.DISPLAY PATTERN



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



1. RESOLUTION : 320 x 240 DOTS
2. DRIVER IC: "SAMSUNG" KS0086
3. BACKLIGHT: LED
4. FRAME: SECC (0.5t)

GENERAL TOLERANCE LIST

DIMENSION	TOLERANCE
$L \leq 6$	± 0.25 (mm)
$6 < L \leq 18$	± 0.3 (mm)
$18 < L \leq 50$	± 0.4 (mm)
$50 < L \leq 125$	± 0.5 (mm)
$125 < L$	± 0.6 (mm)

AZ DISPLAYS, INC.

AGM3224D[illegible]

P/N: PITCH 1.25mm WIDTH 18.75mm			FUNCTION
PIN NO.	SYMBOL	LEVEL	
1	D0		
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) E
11	VSS	-	SIGNAL GROUND(0V)
12	VBE	-	POWER SUPPLY FOR LCD
13	V0	-	LCD CONTRAST ADJUST VOLTAGE
14	FGND	-	FRAME GROUND