

AZ DISPLAYS, INC.

COMPLETE LCD SOLUTIONS

SPECIFICATIONS FOR LIQUID CRYSTAL DISPLAY

PART NUMBER: □□ □ □ AGM3224E SERIES

DATE: □ □ □ □ □ □ APRIL 03, 2007

1. MECHANICAL DATA

NO	ITEM	CONTENTS	UNIT
1	Product No.	AGM3224E	—
2	Module Size	134.5(W) X 117.0(H) X MAX14.0(D)	mm
3	Dot Size	0.27 (W) x 0.27 (H)	mm
4	Dot Pitch	0.30 (W) x 0.30 (H)	mm
5	Number of Dots	320 (W) x 240 (H)	Dot
6	Duty	1/240	—
7	LCD Display Mode	FSTN : Normal White/Positive Image	—
8	Rear Polarizer	Transflective(High Transparency)	—
9	Viewing Direction	6	O'clock
10	Backlight	LED	—
11	Weight	210(approx.)	g
12	Soldering	Lead Free	—

2. ABSOLUTE MAXIMUM RATINGS

(1) ELECTRICAL ABSOLUTE RATINGS

VSS=0V

ITEM	SYMBOL	MIN	MAX	UNIT	COMMENT
Power Supply for Logic	VDD-VSS	-0.3	6.5	V	
Power Supply for LCD Drive	VDD-VO	0	26.0	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	NORMAL TEMP.			
	OPERATING		STORAGE	
	MIN.	MAX.	MIN.	MAX.
Ambient Temperature	0	50	-20	70
Humidity (Without Condensation)	Note 2,4		Note 3,4	


Note 2 $T_a \leq 50^\circ\text{C}$: 80%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 OF LCM

ITEM	SYMBOL	CONDITION		MIN.	TYP.	MAX.	UNIT
Power Supply for Logic	VDD-VSS	-		4.75	5.0	5.25	V
Supply Voltage For LC	Vop= VDD-VO	Duty=1/240	0°C	28.8	29.2	29.6	V
			25°C	27.0	27.4	27.8	
			50°C	25.0	25.4	25.8	
Input Voltage	VIH	H level		0.7VDD	-	VDD	V
	VIL	L level		0	-	0.3VDD	
Power Supply Current	IDD	FLM = 70 Hz VDD = 5.0 V VEE = -27.0 V VSS-VO= 21.9V		-	5.4	8.0	mA
	IEE	PATTERN : 		-	5.3	8.0	
LCM Surface Luminance	L IAK=35mA	ALL PIXEL ON		-	8	12	cd/m ²
		ALL PIXEL OFF		10	15	-	

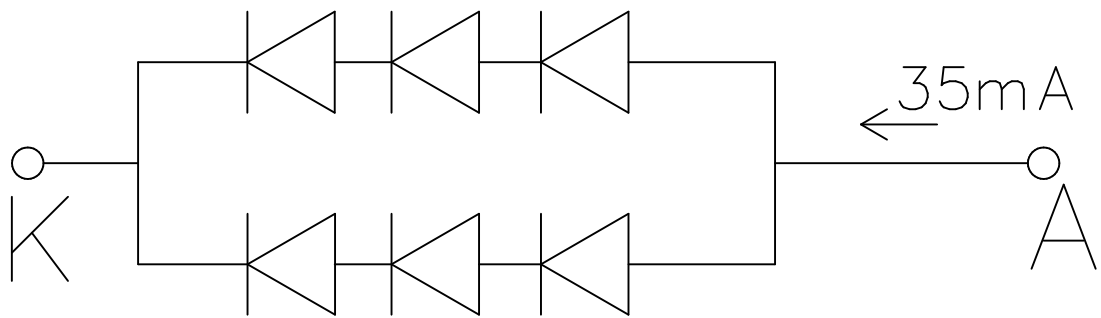
3-2.ELECTRICAL CHARACTERISTICS OF BACKLIGHT

Used LED Rating (Constant Current Driving)

Temp.=25°C

ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT	REMARK
Peak forward current	I_P	-	-	60	mA	-
Maximum reverse voltage	V_R	-	-	15	V	-
Applied forward current	I_F	-	35	-	mA	-
Applied forward voltage	V_F	8.7	10.2	11.7	V	-
LED power consumption	P_F	-	-	720	mW	-
LED life time	LL	-	40000	-	hrs	at $I_F = 35mA$ (*1)

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



4.OPTICAL CHARACTERISTICS

AT Vop

ITEM		Cr(Contrast Ratio)						?(Viewing Angle)		θ(Viewing Angle)	
		0℃		25℃		50℃		25℃		25℃	
		MIN.	TYP.	MIN.	TYP.	MIN.	TYP.	MIN.	TYP.	MIN.	TYP.
H	J	3.8	5.5	3.8	5.5	3.0	4.5	-	32	-	±36
note		NOTE6						NOTE5			

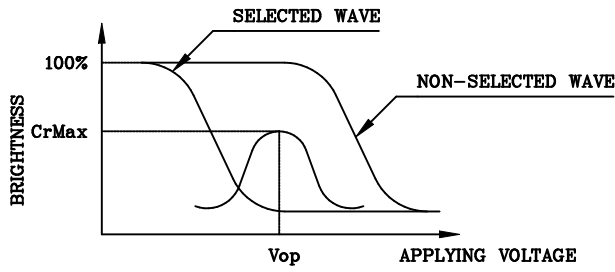
Note: H: Transflective(High transparency)
 J: Normally White

AT φ=0° θ=0°

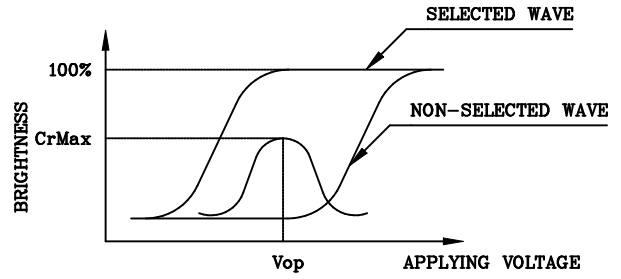
ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Response Time (rise)	Tr	0℃	600	750	1100	ms	NOTE 2
		25℃	200	250	300		
		50℃	80	100	150		
Response Time (fall)	Tf	0℃	350	450	670	ms	NOTE 2
		25℃	90	130	170		
		50℃	40	60	80		

(FIG 1)

Definition of Operation Voltage(Vop)



(positive type)



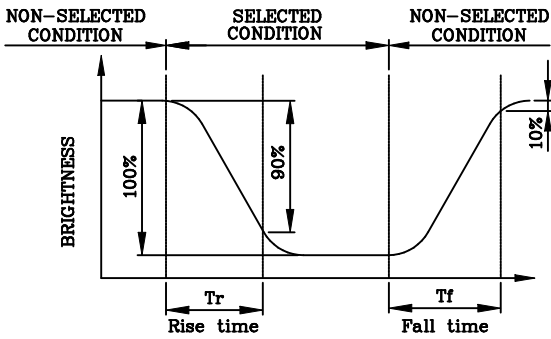
(negative type)

*Conditions

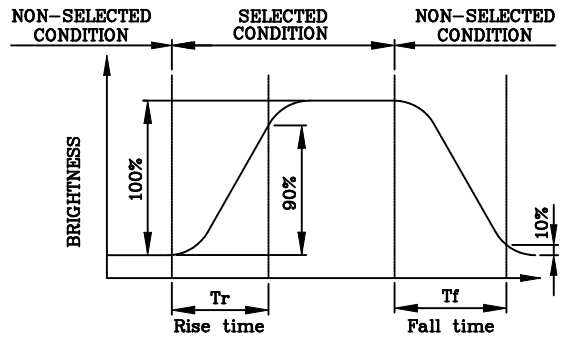
Viewing Angle : 0
 Frame Frequency : 70Hz
 Applying Waveform : 1/N duty 1/a bias

(FIG 2)

Definition of Response Time(Tr,Tf)



(positive type)



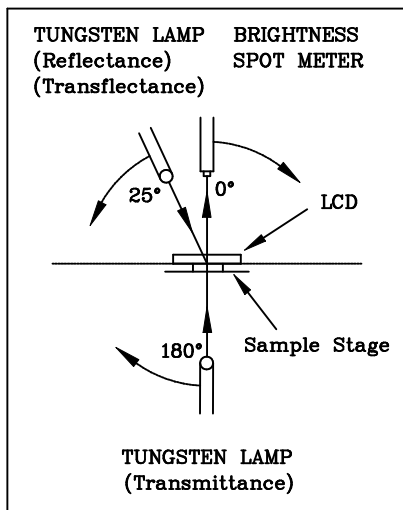
(negative type)

*Conditions

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

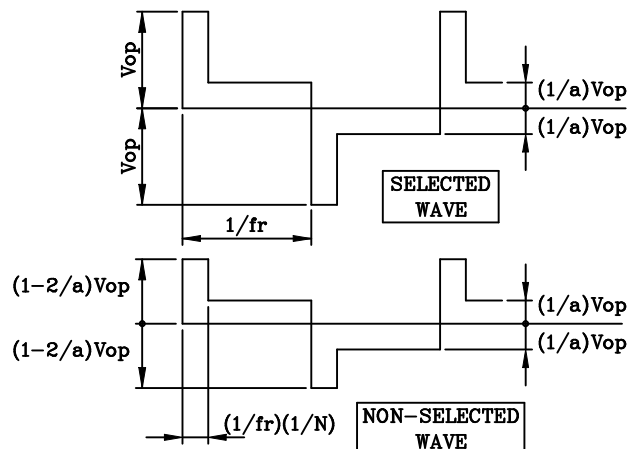
(FIG 3)

Description of Measuring Equipment and Driving Waveforms



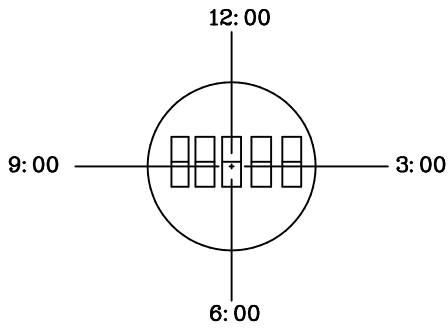
CONST.
TEMP.
CHAMBER

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



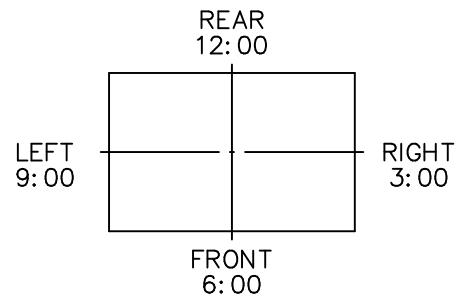
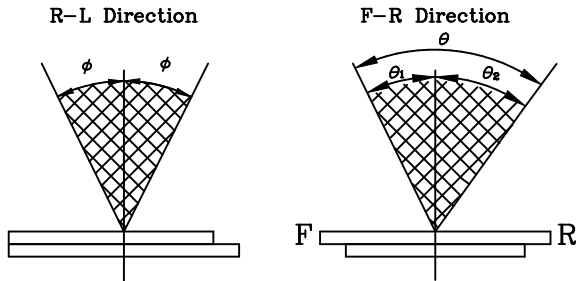
(FIG 4)

Definition of Viewing Direction



(FIG 5)

Definition of Viewing Angle



*For This Product

The Viewing Direction Is 6 O'clock
So $\theta_1 > \theta_2$

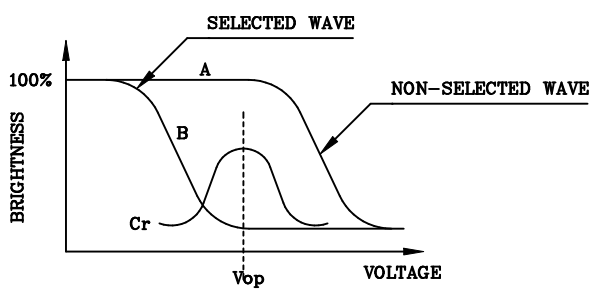
$$\theta = \theta_1 + \theta_2$$

*Conditions

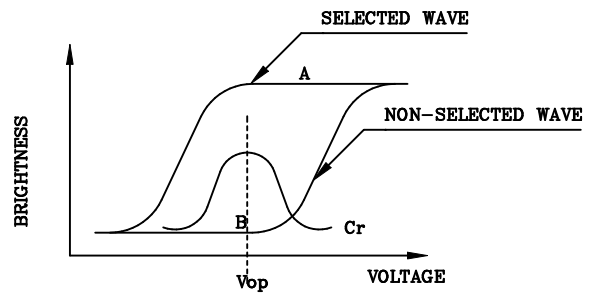
- Operating Voltage : V_{op}
- Frame Frequency : 70Hz
- Applying Waveform : 1/N duty 1/a bias
- Contrast Ratio : larger than 2

(FIG 6)

Definition of Contrast Ratio (Cr)



(positive type)



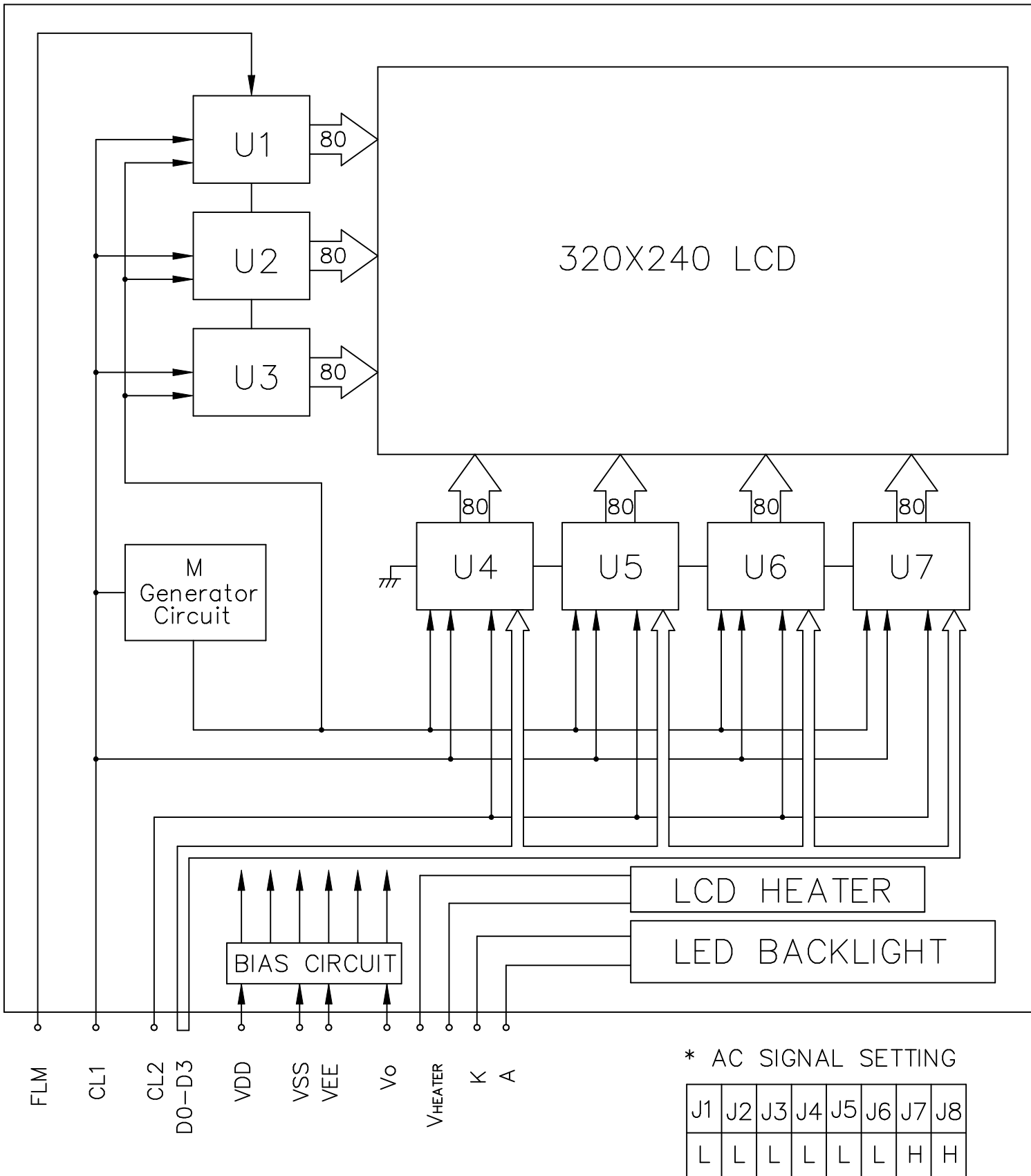
(negative type)

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

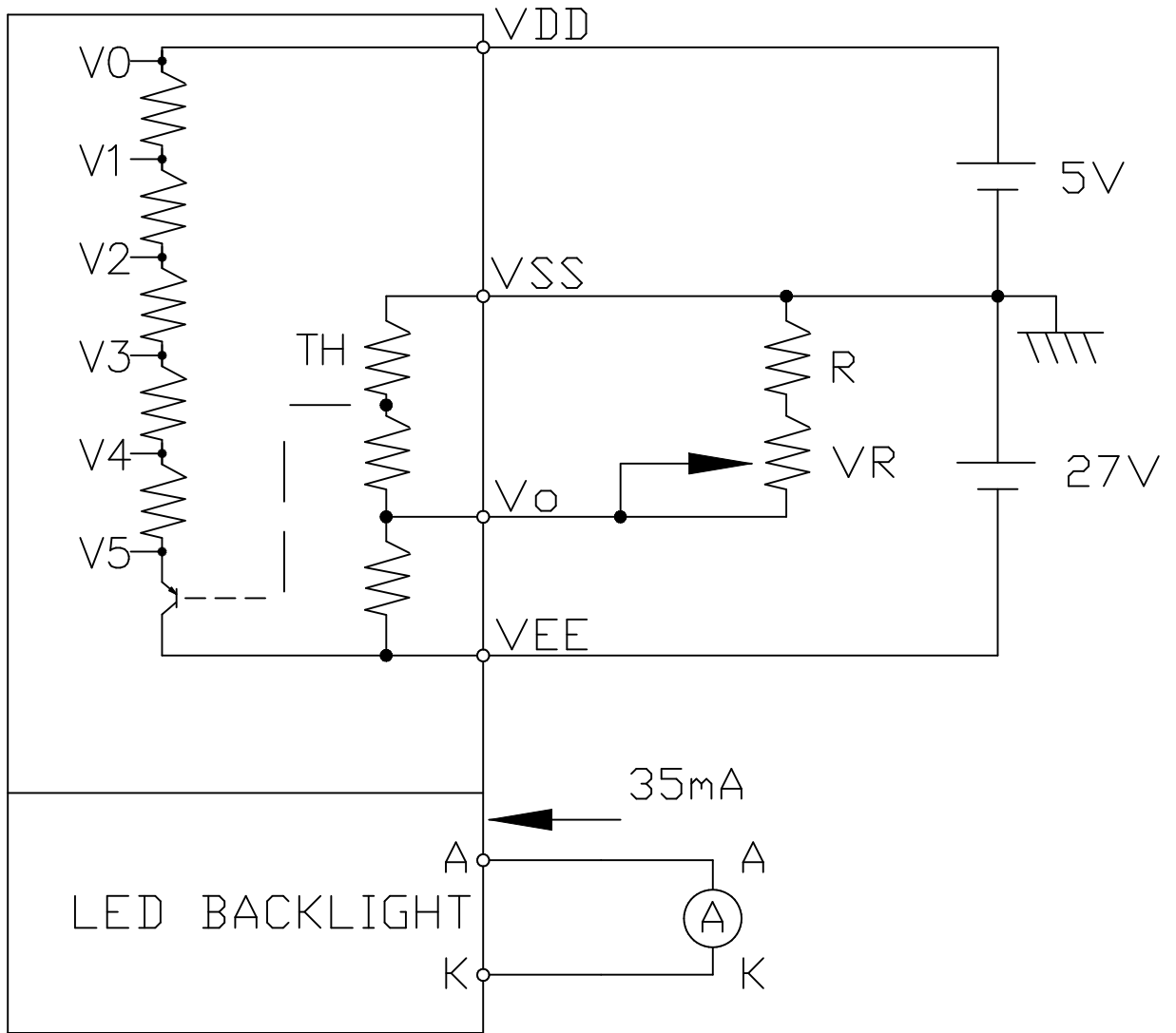
*Conditions

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

5. BLOCK DIAGRAM



7. POWER SUPPLY

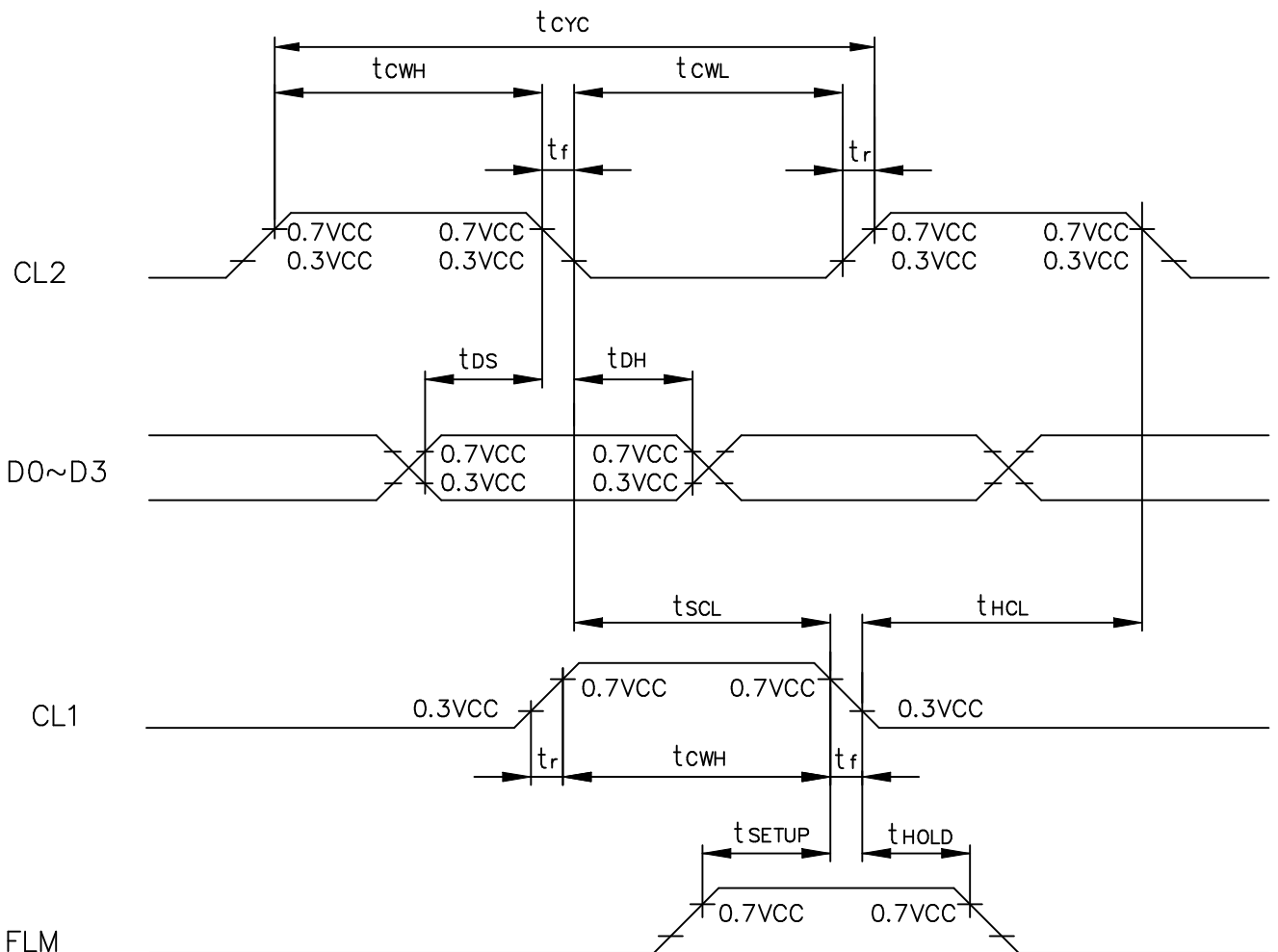


RECOMMENDED VR : 30K~50K Ω
 R : 4.3K Ω

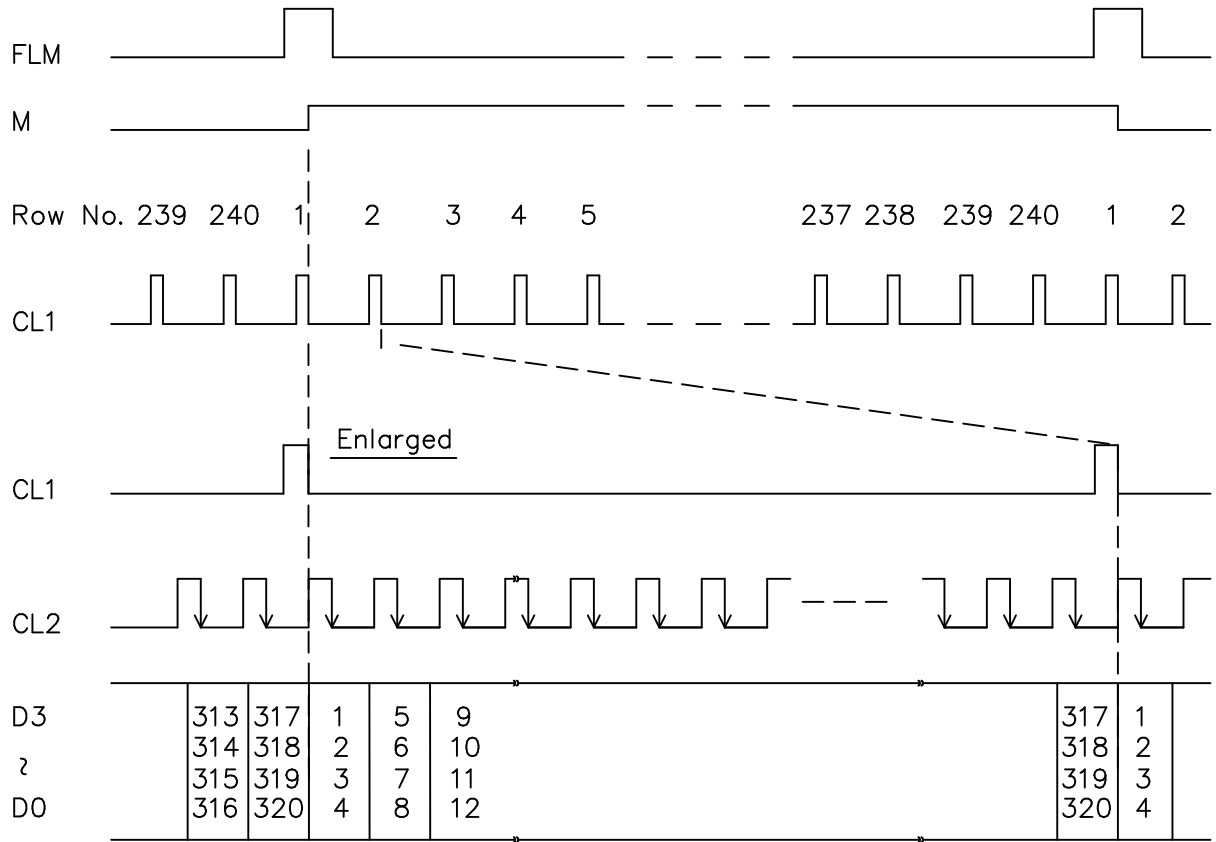
8. TIMING CHARACTERISTICS

8-1 COMMON DRIVER OPERATION TIMING

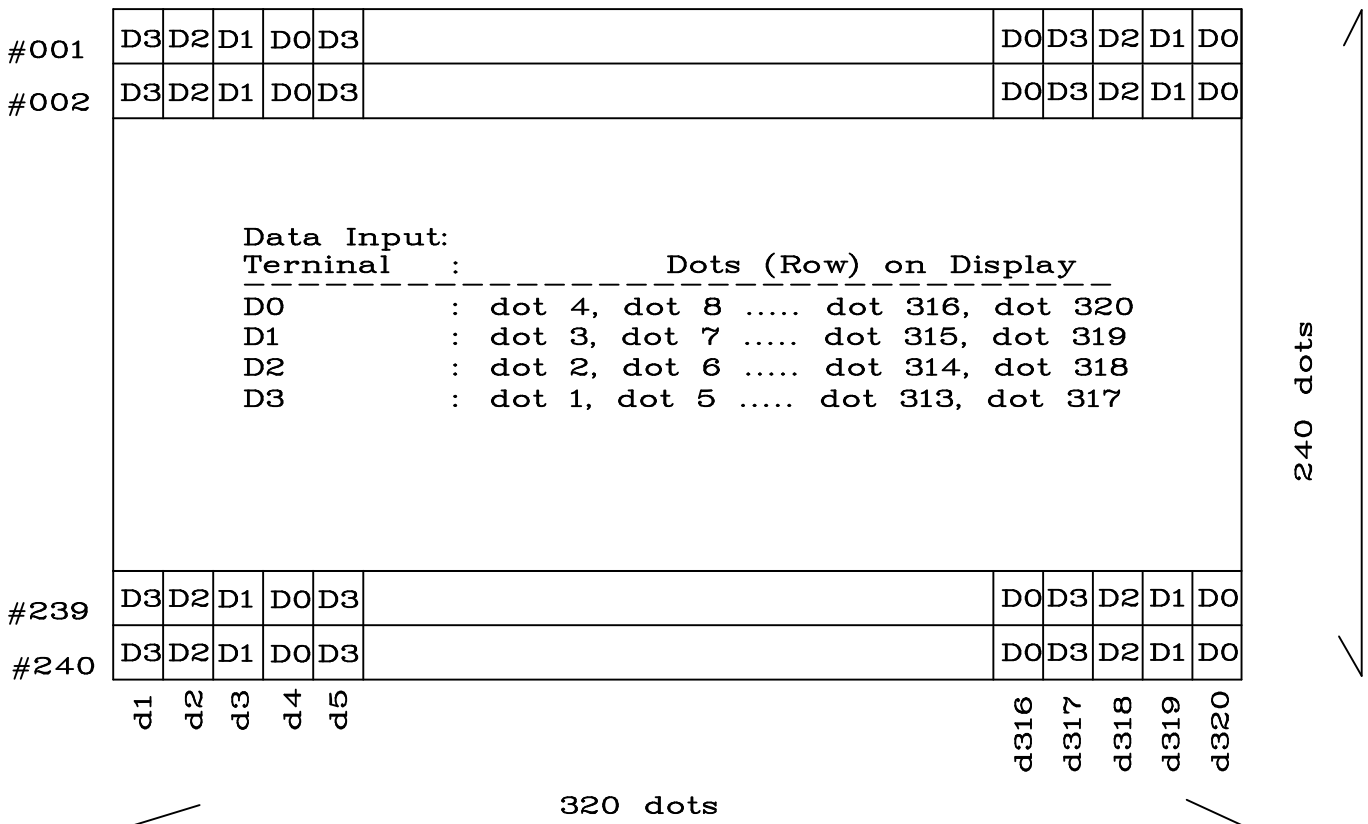
ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT
CLOCK CYCLE TIME	t_{cyc}	125	—	—	ns
CLOCK HIGH LEVEL WIDTH	t_{cWH}	40	—	—	ns
CLOCK LOW LEVEL WIDTH	t_{cWL}	40	—	—	ns
CLOCK RISE TIME	t_r	—	—	30	ns
CLOCK FALL TIME	t_f	—	—	30	ns
DATA SETUP TIME	t_{DS}	20	—	—	ns
DATA HOLD TIME	t_{DH}	20	—	—	ns
CLOCK SETUP TIME	t_{SCL}	80	—	—	ns
CLOCK HOLD TIME	t_{HCL}	80	—	—	ns
FLM SETUP TIME	t_{SETUP}	100	—	—	ns
FLM HOLD TIME	t_{HOLD}	100	—	—	ns



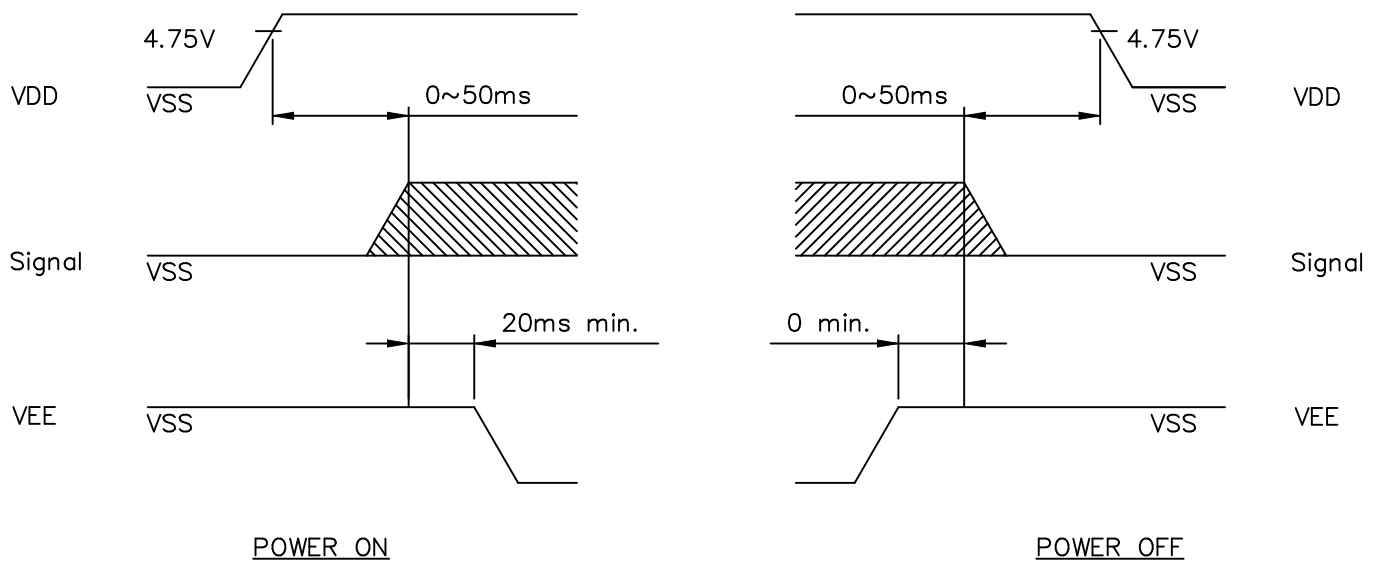
8-2TIMING CHART OF INPUT SIGNALS



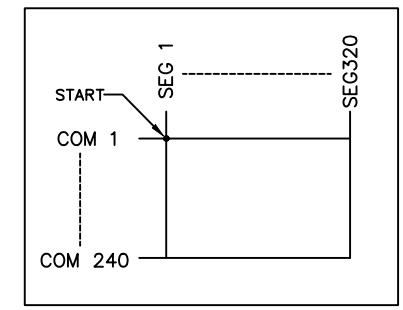
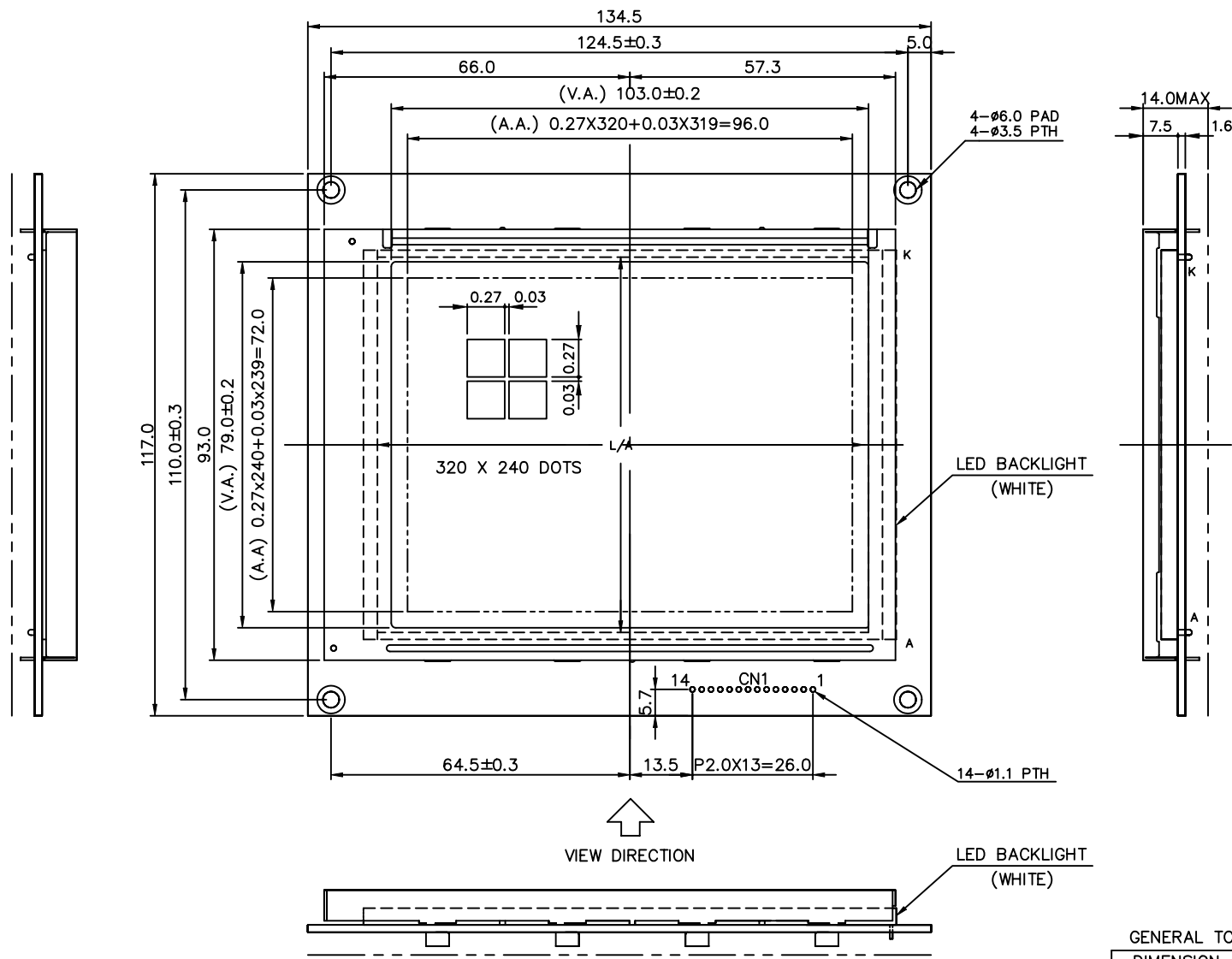
8-3DISPLAY PATTERN



8-4 POWER ON/OFF TIMING



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



DISPLAY PATTERN

- NOTES:
 1.RESOLUTION: 320X240 DOTS
 2.BACKLIGHT: LED (WHITE)

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)
ANGLE	±1° (DEG)

AZ DISPLAYS, INC.

AGM3224E

APPROVE	DESIGN	DATE	SCALE	UNIT	THIRD ANGLE P.
CHECK	J.H. SUN	90.05.05	1/1	mm	
DRAWN	J.H. SUN	90.05.05			
	NAME	DATE			

REV. NO.	DESCRIPTION	DATE	DESIGN	CHECK	APPROVE

DWG NO. M0718A13A

*(CN1) INTERFACE PIN CONNECTION

PinNo.	Symbol	Level	Function	PinNo.	Symbol	Level	Function
1	VO	-	Operating voltage for LCD driving	8	VDD	-	Power supply for logic(+5V)
2	VEE	-	Power supply for LCD driving	9	CL2	H→L	Display data fetch pulse
3	D3	H/L	Display data 3	10	CL1	H→L	Display data latch pulse
4	D2	H/L	Display data 2	11	FLM	H/L	Scan start pulse
5	D1	H/L	Display data 1	12	K	-	Power supply for LED backlight(K)
6	D0	H/L	Display data 0	13	A	-	Power supply for LED backlight(A)
7	VSS	-	GND for logic(0V)	14	NC	-	-