

AZ Displays, Inc.

1. MECHANICAL DATA

(1) Product No.	AGM3224E
(2) Module Size	141.9 (W)mm x 117.0 (H)mm x MAX 14.0 (D)mm (CCFT B.L.)
(3) Dot Size	0.27 (W)mm x 0.27 (H)mm
(4) Dot Pitch	0.30 (W)mm x 0.30 (H)mm
(5) Number of Dots	320 (W) x 240 (H)Dots
(6) Duty	1/240
(7) LCD Display Mode	STN: ☐ Gray Mode ☐ Yellow Mode ☐ Blue Mode FSTN: ☐ Black and White(Normal White/Positive Image) ☐ Black and White(Normal Black/Negative Image) Rear Polarizer: ☐ Reflective ☐ Transflective ☐ Transmissive ☐ Transflective(High Transmissive)
(8) Viewing Direction	☐ 6 O'clock ☐ 12 O'clock ☐ ____O'clock
(9) Backlight	☐ W/O ☐ LED ☐ EL ☐ CCFT
(10) Weight	210 g (approx.)

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2. ABSOLUTE MAXIMUM RATINGS

(1) ELECTRICAL ABSOLUTE RATINGS

VSS=0V STANDARD

ITEM	SYMBOL	MIN	MAX	UNIT	COMMENT
Power Supply for Logic	VDD-VSS	-0.3	7.0	V	
Power Supply for LCD Drive	VDD-V0	0	26.0	V	
Input Voltage	VI	-0.3	VDD	V	
CCFL Driving Voltage	VFL	0	500	Vrms	
CCFL Input Current	IFL	-	7.0	mA rms	
Static Electricity	-	-	-	-	Note 1

Note 1 LCM should be grounded during handling

(2) ENVIRONMENTAL ABSOLUTE MAXIMUM RATINGS

ITEM	NORMAL TEMP.			
	OPERATING		STORAGE	
	MIN.	MAX.	MIN.	MAX.
Ambient Temperature	-10	60	-20	70
Humidity(Without Condensation)	Note 1,3		Note 2,3	

Note 1 Ta ≤ 60℃ : 85%RH max
Ta > 60℃ : Absolute humidity must be lower
than the humidity of 85%RH at 60℃

Note 2 Ta at -20℃ will be < 48hrs, at 70℃ will be < 120hrs

Note 3 Background color changes slightly depending on ambient temperature.
This phenomenon is reversible.

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3. ELECTRICAL CHARACTERISTICS

(VDD = 5V±5%)

ITEM		SYMBOL	CONDITION		MIN.	TYP.	MAX.	UNIT
Power Supply for Logic		VDD-VSS	—		4.75	5.0	5.25	V
Recommended Operating Voltage for LCD		VDD-VO	Duty=1/240 Bias=1/13	-10℃	—	23.6	24.2	V
				25℃	20.9	21.9	22.6	
				60℃	18.0	18.5	—	
Input Voltage		VIH	H level		0.8VDD	—	VDD	V
		VIL	L level		0	—	0.2VDD	V
Power Supply Current		IDD	FLM = 70 Hz VDD = 5.0 V VEE = -27.0 V VDD-VO = 21.9 V		—	7,5	—	mA
		IEE	PATTERN : □ ■ □ ■ □ ■ ■ □ ■ □ ■ □		—	5.8	—	mA
CCFL LAMP	Open Voltage	V _{Open}	Lamp Current = 5 mArms Frequency = 35 KHz		—	420	—	V _{rms}
	Lamp Voltage	V _L			—	234	—	V _{rms}
	Brightness	B			—	23000	—	cd/m ²
	Color Degree	X			—	0.34	—	—
		Y			—	0.367	—	

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4.OPTICAL CHARACTERISTICS

AT Vop

ITEM MODE		Cr(Contrast Ratio)		θ (Viewing Angle)		ϕ (Viewing Angle)	
		25°C		25°C, Cr $\geq$ 2		25°C, Cr $\geq$ 2	
		MIN.	TYP.	MIN.	TYP.	MIN.	TYP.
S	A	—	—	—	—	—	—
	C	—	—	—	—	—	—
	J	3	5	25	45	20	30
T	E,F	3	4	30	60	20	35
	G,H	—	—	—	—	—	—
note		NOTE 5		NOTE 6			

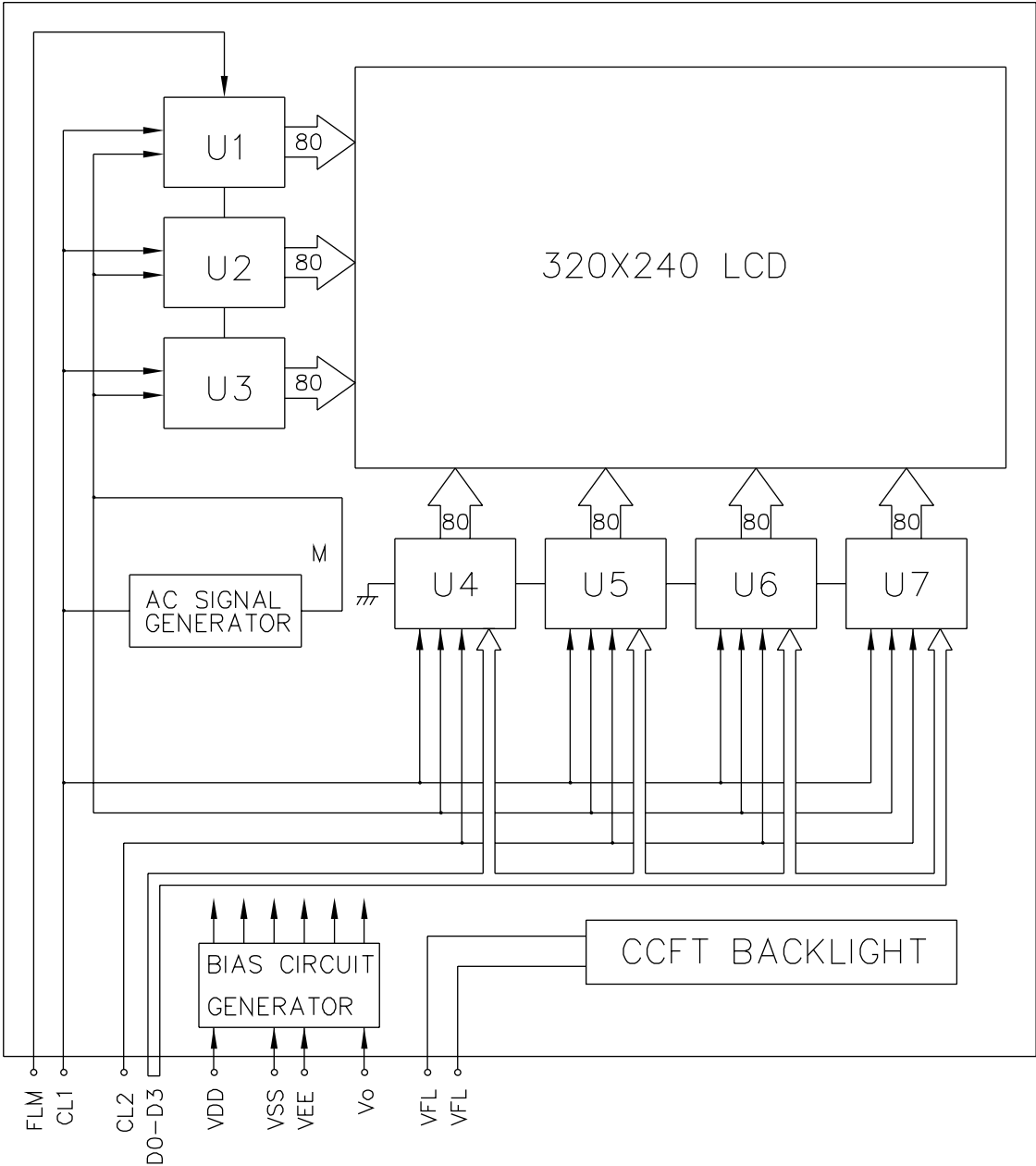
AT $\phi=0^{\circ}$ $\theta=0^{\circ}$

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Response Time (rise)	Tr	−10°C	—	1050	2100	ms	NOTE 2
		25°C	—	150	300		
		60°C	—	60	120		
Response Time (fall)	Tf	−10°C	—	1400	2400	ms	NOTE 2
		25°C	—	200	350		
		60°C	—	70	130		

note:
S: TRANSFLECTIVE
T: TRANSMISSIVE
A: GRAY
C: YELLOW
E,F: BLUE
G,H: NORMALLY BLACK
J: NORMALLY WHITE

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5. BLOCK DIAGRAM



* AC SIGNAL SETTING

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

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6.INTERNAL PIN CONNECTION

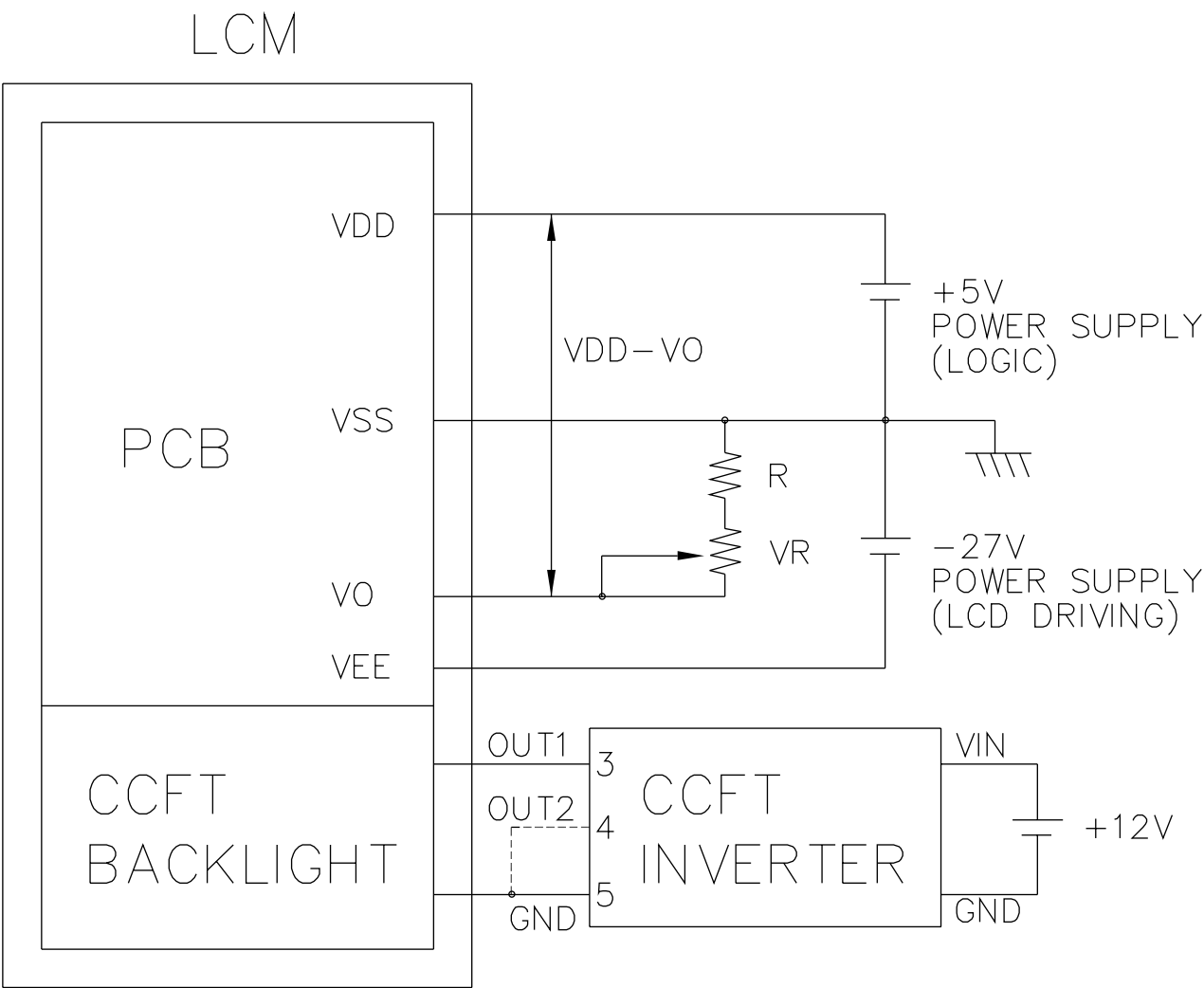
PIN NO.	SYMBOL	LEVEL	FUNCTION
1	VO	—	LCD CONTRAST ADJUST VOLTAGE
2	VEE	—	POWER SUPPLY FOR LCD DRIVING(−27V)
3	D3	H/L	DISPLAY DATA
4	D2		
5	D1		
6	D0		
7	VSS	—	GND FOR LOGIC(0V)
8	VDD	—	POWER SUPPLY FOR LOGIC(+5V)
9	CL2	H→L	DISPLAY DATA FETCH PULSE
10	CL1	H→L	DISPLAY DATA LATCH PULSE
11	FLM	H/L	SCAN START PULSE
12	NC	—	NO CONNECTION
13	NC	—	NO CONNECTION
14	REV	H/L	DISPLAY DATA REVERSE

CCFL CONNECTOR :J.A.E./IL-G-4S-S3C2 OR EQUIVALENT

PIN NO.	SYMBOL	LEVEL	FUNCTION
1	V _{FL}	—	POWER SUPPLY FOR CCFT BACKLIGHT
2	NC	—	—
3	NC	—	—
3	V _{FL}	—	POWER SUPPLY FOR CCFT BACKLIGHT

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7. POWER SUPPLY



1. VR: 30K~50K Ω

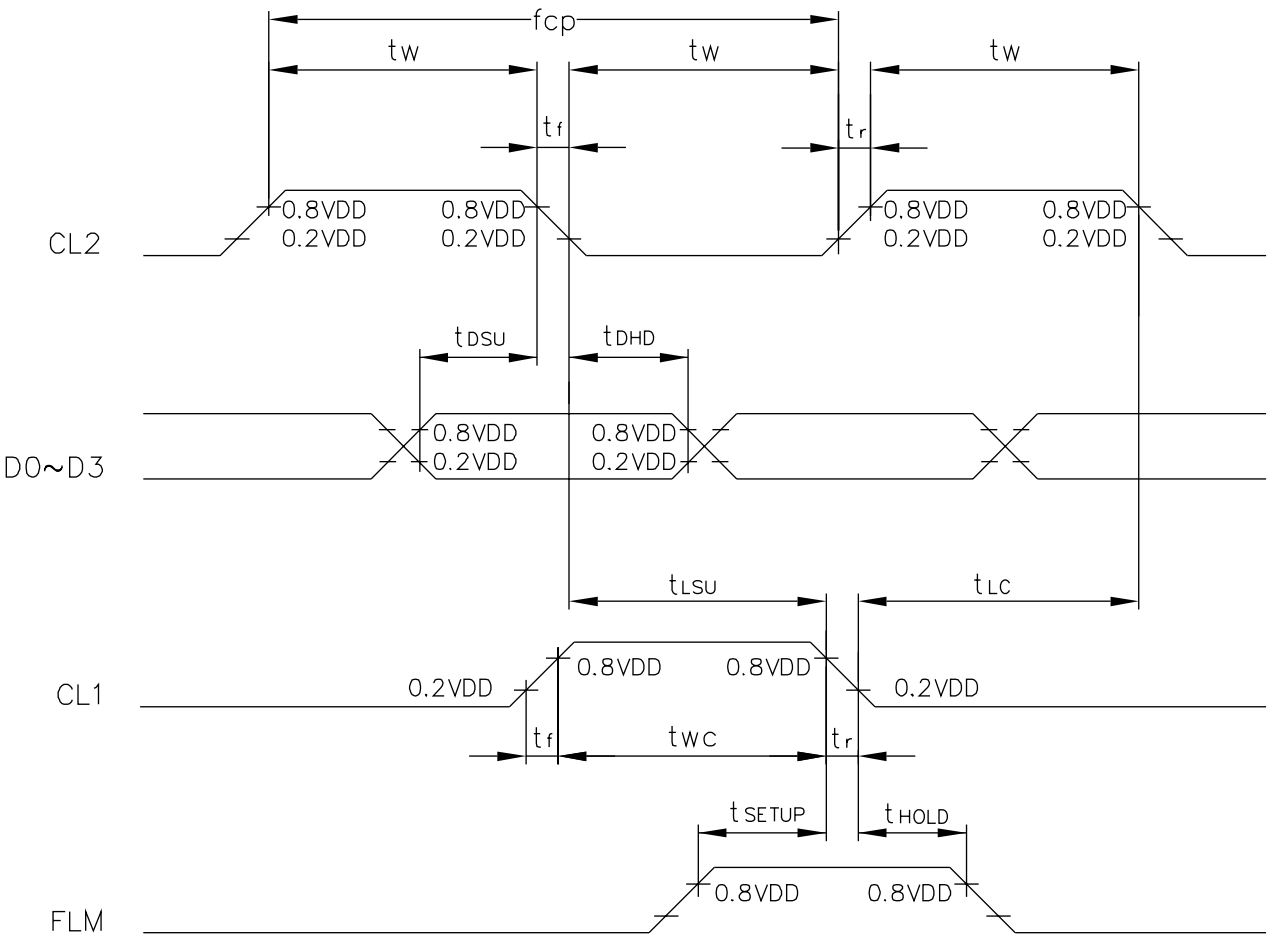
R: 4.3K Ω

2. RECOMMENDED CCFT INVERTER : CXA-L10L(TDK)

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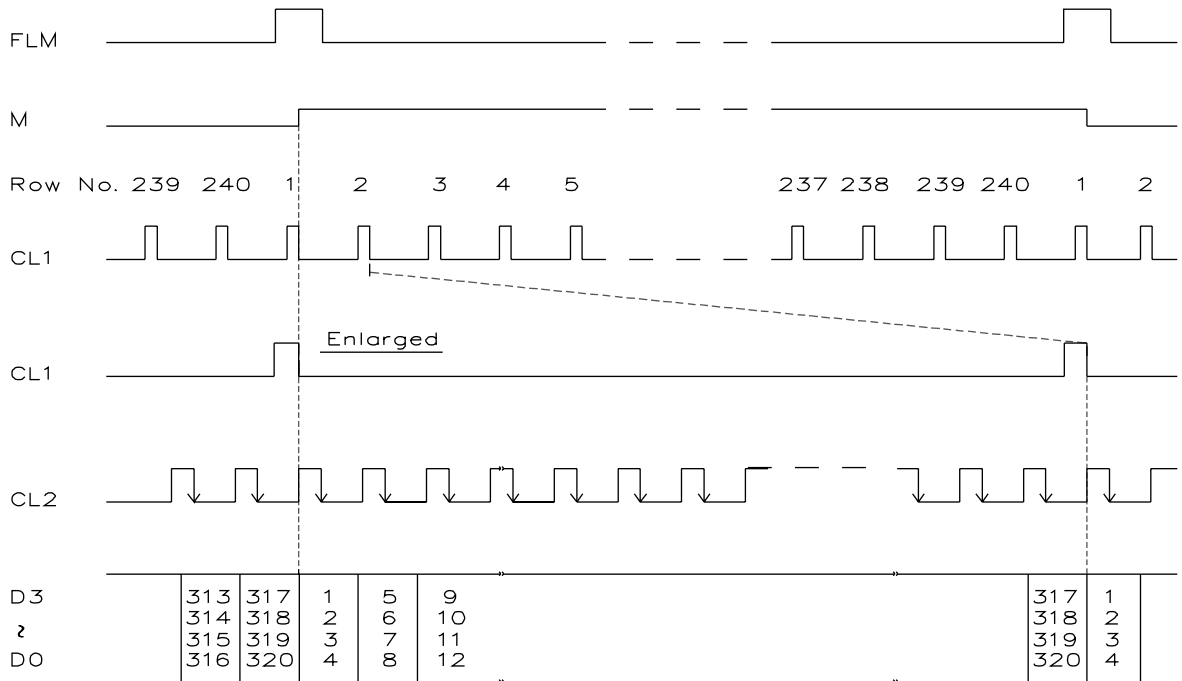
8.1 TIMING CHARACTERISTICS

ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT
CLOCK FREQUENCY	fcp	—	—	6.5	MHZ
CLOCK PULSE WIDTH	tw	63	—	—	ns
CLOCK RISE,FALL TIME	tr , tf	—	—	20	ns
DATA SET UP TIME	tDSU	50	—	—	ns
DATA HOLD TIME	tDHD	50	—	—	ns
CL1 SET UP TIME	tLSU	80	—	—	ns
CL1 → CLOCK TIME	tLC	80	—	—	ns
”FLM” SET UP TIME	tSETUP	100	—	—	ns
”FLM” HOLD TIME	tHOLD	100	—	—	ns
”CL1” PULSE WIDTH	twc	125	—	—	ns

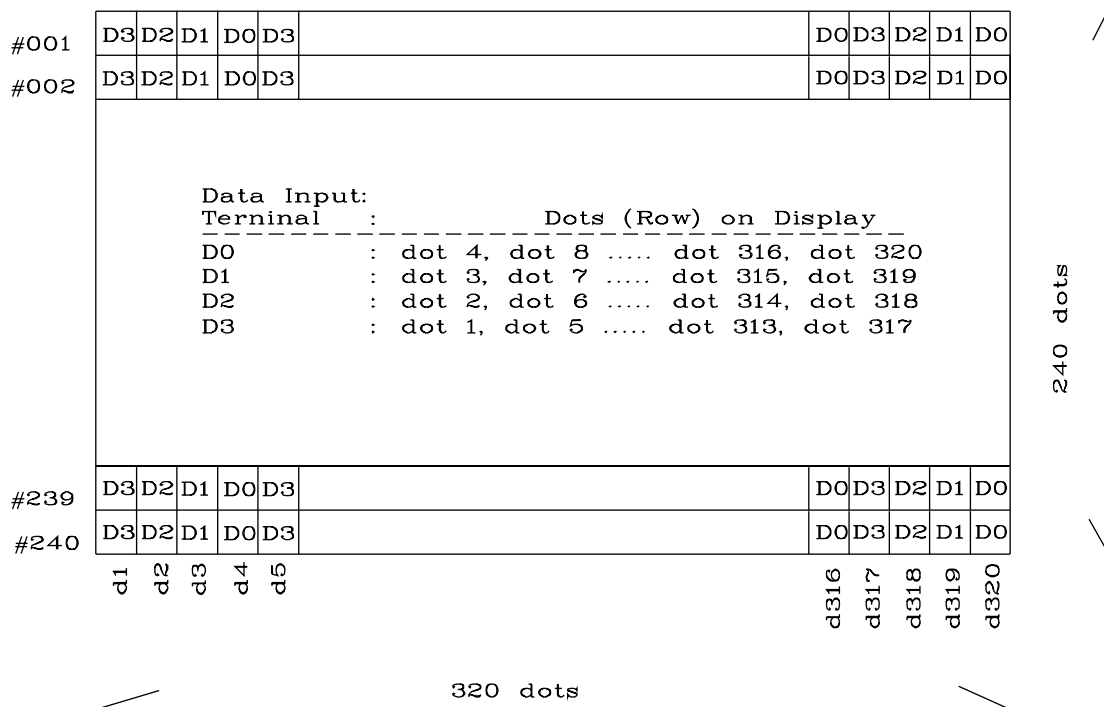


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8.2 TIMING CHART OF INPUT SIGNALS

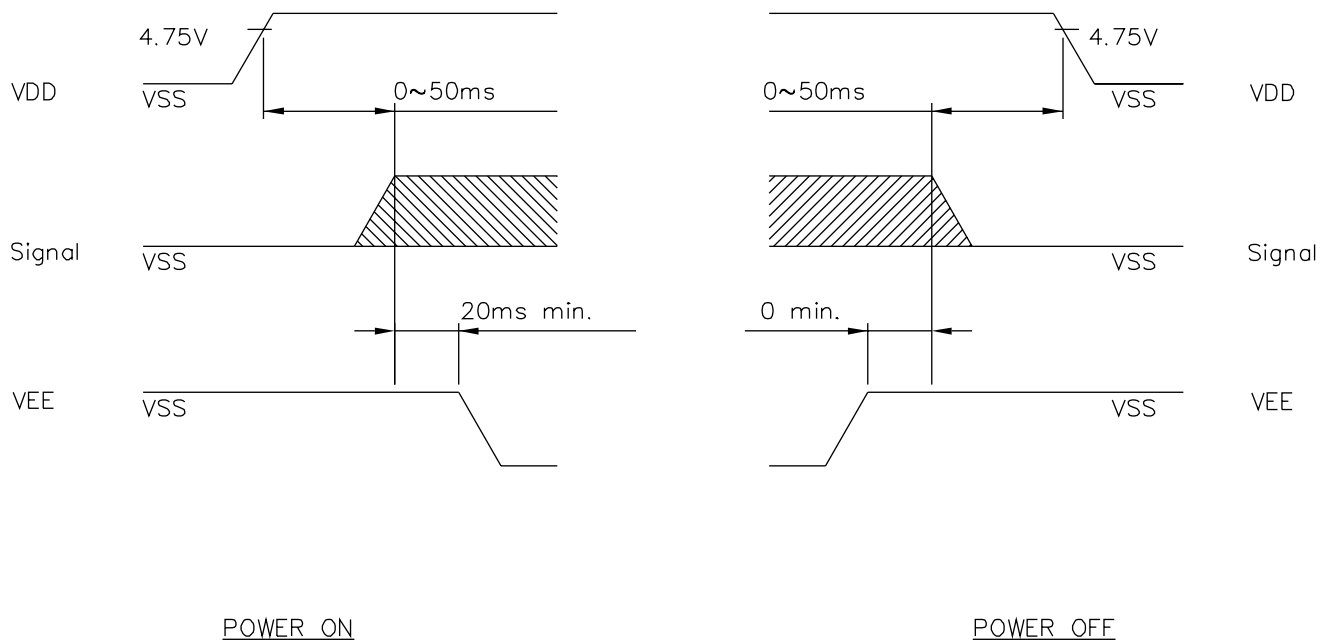


8.3 DISPLAY PATTERN



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8.4 POWER ON/OFF TIMING

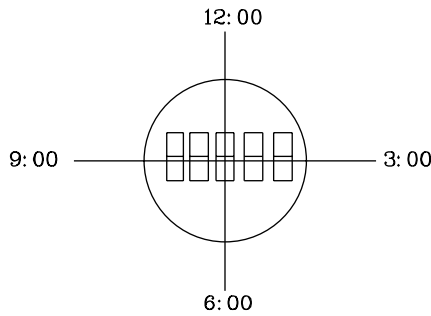


Missing pixels may occur when the LCM is driven beyond above power interface timing sequence.

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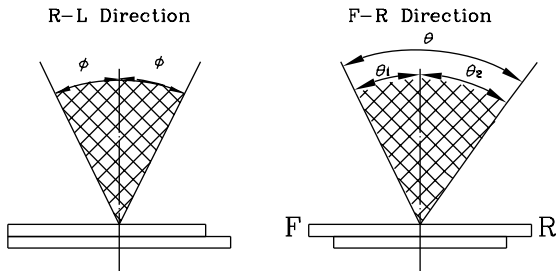
(NOTE 4)

Definition of Viewing Direction



(NOTE 5)

Definition of Viewing Angle



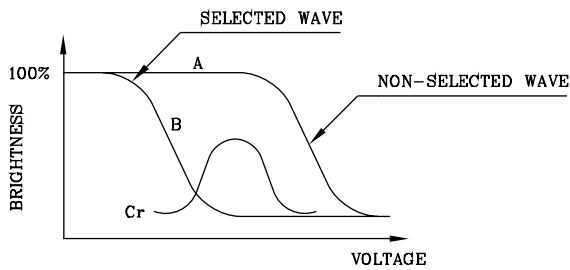
$$\theta = \theta_1 + \theta_2$$

*Conditions

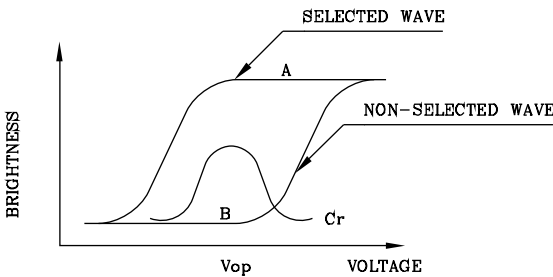
Operating Voltage : V_{op}
Frame Frequency : 70Hz
Applying Waveform : 1/N duty 1/a bias
Contrast Ratio : larger than 2

(NOTE 6)

Definition of Contrast Ratio (Cr)



(positive type)

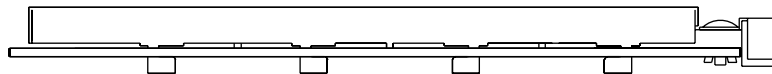


(negative type)

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

*Conditions

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



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

PinNo.	Symbol	Level	Function
1	V0	—	Operating voltage for LCD driving
2	VEE	—	Power supply for LCD driving
3	D3	H/L	Display data 3
4	D2	H/L	Display data 2
5	D1	H/L	Display data 1
6	D0	H/L	Display data 0
7	VSS	—	GND for logic(0V)
8	VDD	—	Power supply for logic(+5V)
9	CL2	H↔L	Display data latch pulse
10	CL1	H↔L	Display data latch pulse
11	FLM	H/L	Scan start pulse
12	NC	—	No Connection
13	NC	—	No Connection
14	REV	H/L	Display data reverse

NOTES :

- 1.RESOLUTION : 320 X 240 Dots
- 2.CONTROLLER : WITHOUT
- 3.DC/DC : WITHOUT

	AGM3224E		AZ DISPLAYS, INC.	
	NAME	DATE		
APPROVE			TITLE	
CHECK			DWG-NO	MBAX078X
DESIGN				UNIT : mm
DRAW	MAY PING	86.03.24		SCALE : 1/1