

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: <input type="checkbox"/> Gray Mode <input type="checkbox"/> Yellow Mode <input type="checkbox"/> Blue Mode FSTN: <input type="checkbox"/> Black and White(Normal White/Positive Image) <input type="checkbox"/> Black and White(Normal Black/Negative Image) Rear Polarizer: <input type="checkbox"/> Reflective <input type="checkbox"/> Transflective <input type="checkbox"/> Transmissive <input type="checkbox"/> Transflective(High Transmissive)
(8) Viewing Direction	<input type="checkbox"/> 6 O'clock <input type="checkbox"/> 12 O'clock <input type="checkbox"/> ____O'clock
(9) Backlight	<input type="checkbox"/> W/O <input type="checkbox"/> LED <input type="checkbox"/> EL <input type="checkbox"/> 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	mArms	
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 $T_a \leq 60^\circ\text{C}$: 85%RH max

$T_a > 60^\circ\text{C}$: Absolute humidity must be lower

than the humidity of 85%RH at 60°C

Note 2 T_a at -20°C will be < 48hrs, at 70°C 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°C	-	23.6	24.2	V
				25°C	20.9	21.9	22.6	
				60°C	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 V_{op}

MODE \ ITEM		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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6. INTERNAL PIN CONNECTION

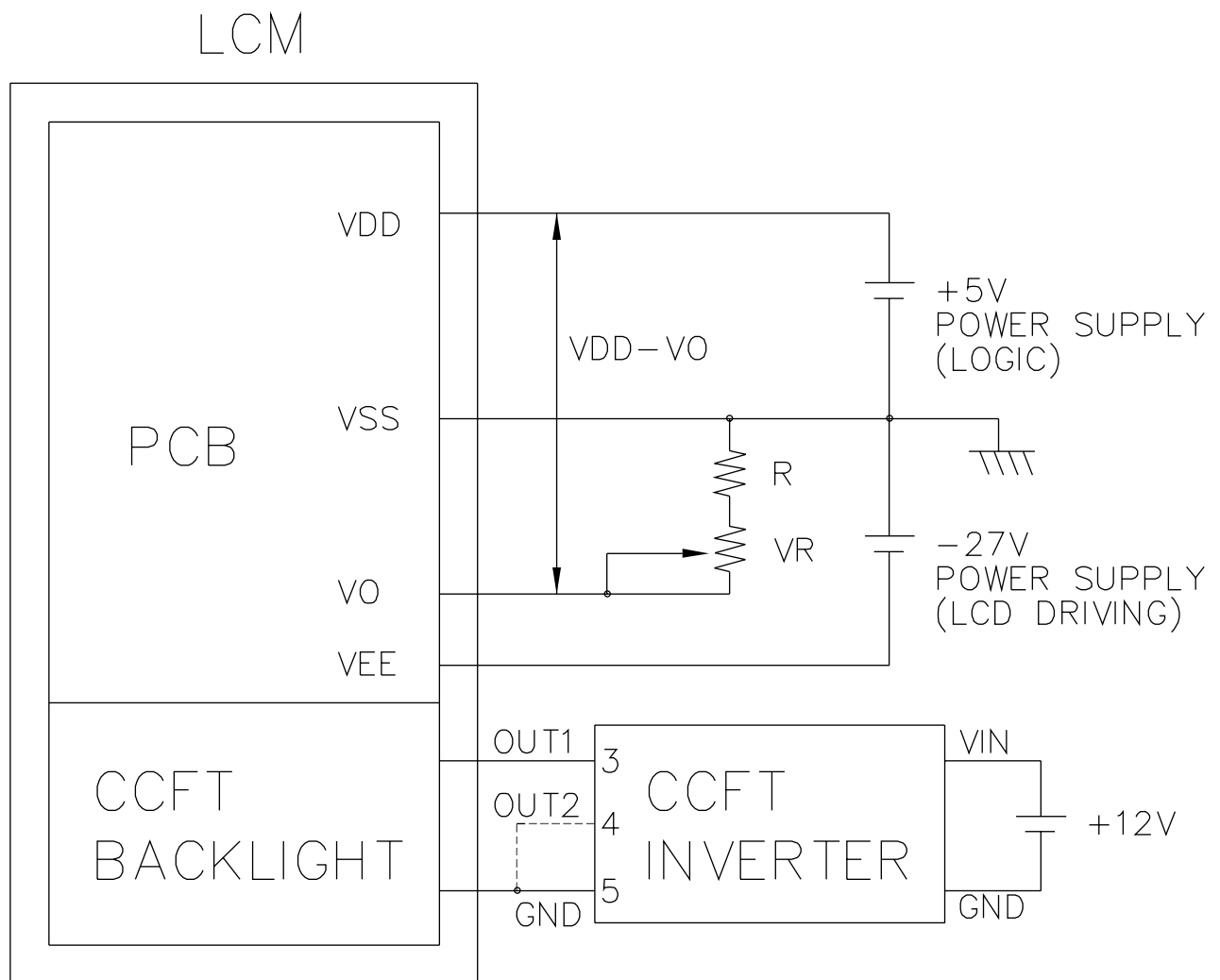
PIN NO.	SYMBOL	LEVEL	FUNCTION
1	VO	-	LCD CONTRAST ADJUST VOLTAGE
2	VEE	-	POWER SUPPLY FOR LCD DRIVING(-27V)
3	D3	H/L	DISPLAY DATA
4	D2		
5	D1		
6	D0		
7	VSS	-	GND FOR LOGIC(0V)
8	VDD	-	POWER SUPPLY FOR LOGIC(+5V)
9	CL2	H→L	DISPLAY DATA FETCH PULSE
10	CL1	H→L	DISPLAY DATA LATCH PULSE
11	FLM	H/L	SCAN START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

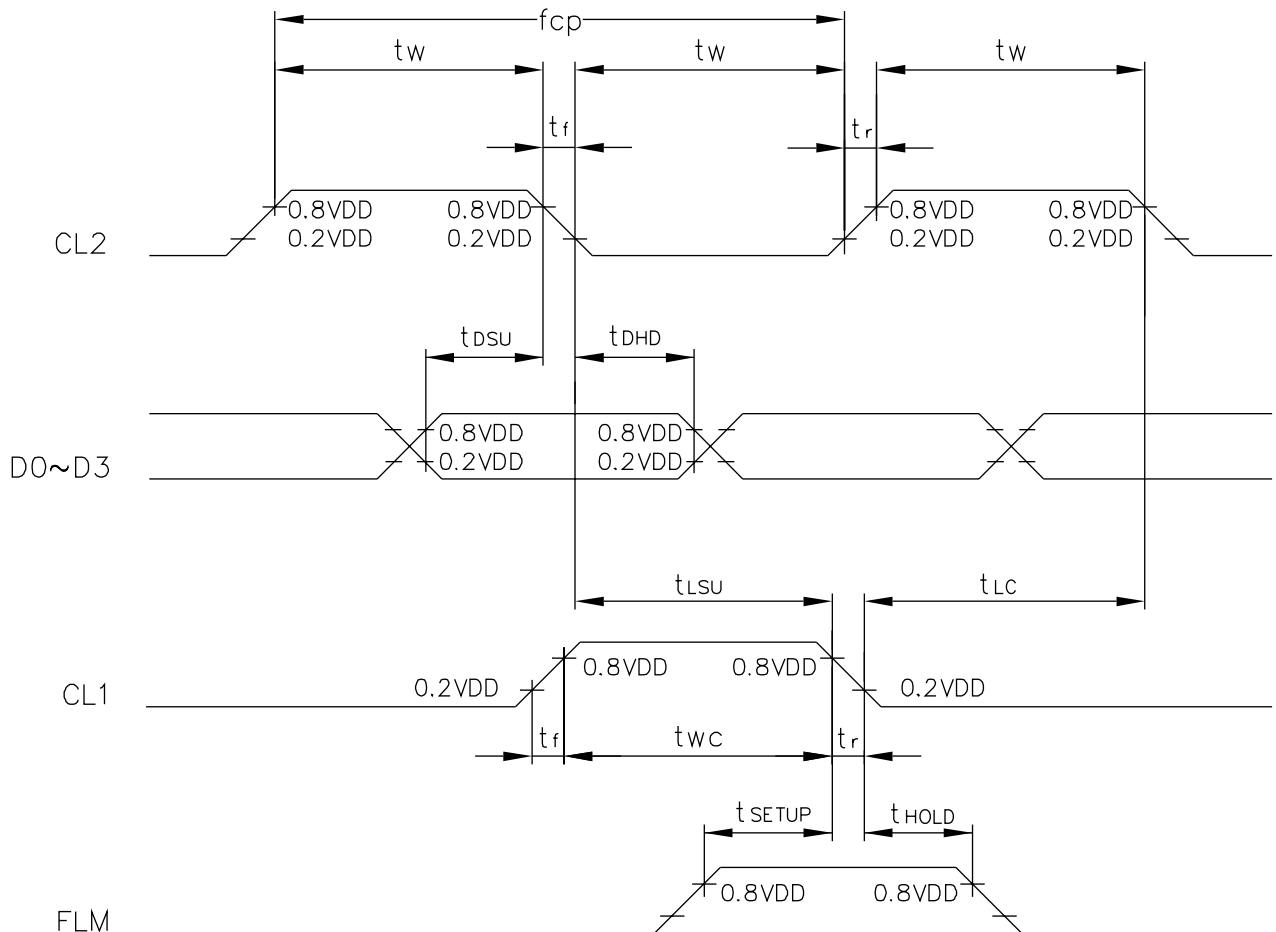
R: 4.3K Ω

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

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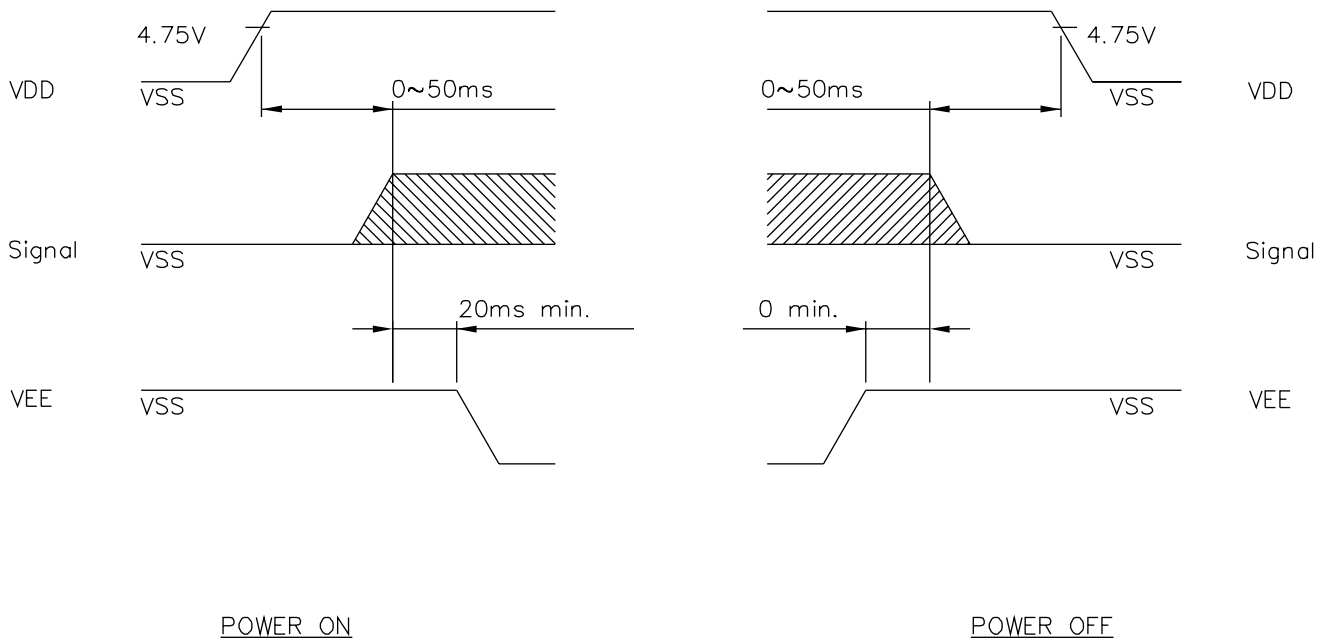
8.1 TIMING CHARACTERISTICS

ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT
CLOCK FREQUENCY	f _{cp}	–	–	6.5	MHZ
CLOCK PULSE WIDTH	t _w	63	–	–	ns
CLOCK RISE,FALL TIME	t _r , t _f	–	–	20	ns
DATA SET UP TIME	t _{dsu}	50	–	–	ns
DATA HOLD TIME	t _{dhd}	50	–	–	ns
CL1 SET UP TIME	t _{lsu}	80	–	–	ns
CL1 → CLOCK TIME	t _{lc}	80	–	–	ns
"FLM" SET UP TIME	t _{setup}	100	–	–	ns
"FLM" HOLD TIME	t _{hold}	100	–	–	ns
"CL1" PULSE WIDTH	t _{wc}	125	–	–	ns



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8.4 POWER ON/OFF TIMING

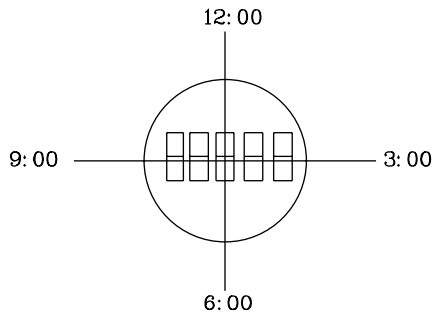


Missing pixels may occur when the LCM is driven beyond above power interface timing sequence.

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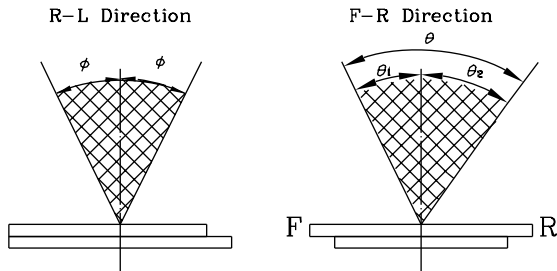
(NOTE 4)

Definition of Viewing Direction



(NOTE 5)

Definition of Viewing Angle



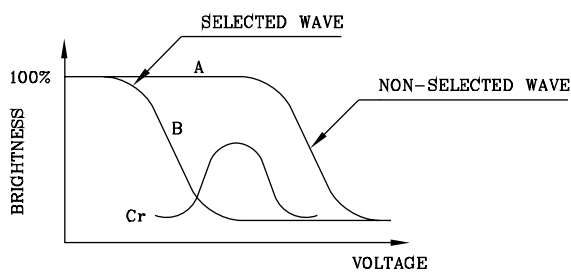
$$\theta = \theta_1 + \theta_2$$

*Conditions

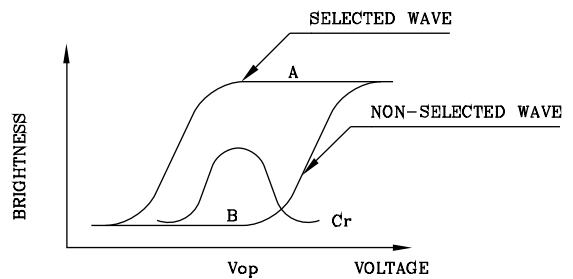
- Operating Voltage : Vop
- Frame Frequency : 70Hz
- Applying Waveform : 1/N duty 1/a bias
- Contrast Ratio : larger than 2

(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

