1. MECHANICAL DATA

(1) Product No.	AGM3224D
(2) Module Size	167.1 (W)mm x 109.0 (H)mm x MAX 11.0 (D)mm (CCFT B.L.)
(3) Dot Size	0.33 (W)mm x 0.33 (H)mm
(4) Dot Pitch	0.36 (W)mm x 0.36 (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 ☐ CCFT
(10) Recommended FL Inverter	TDK CORP. CXA-L10L
(11) Weight	CCFT : about 205 g

Revised: January 25, 2002

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 LCM	VDD−VEE	0	30.0	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	OPERATING		STORAGE	
	MIN.	MAX.	MIN.	MAX.
Ambient Temperature	−20	70	−30	80
Humidity (Without Condensation)	Note 1,3		Note 2,3	

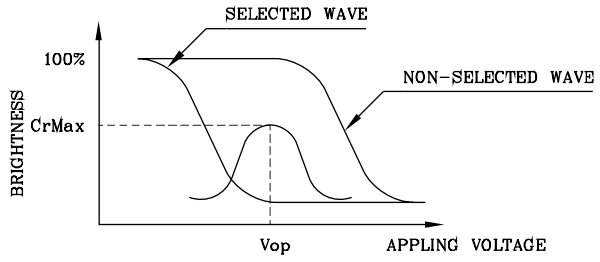
Note 1 Ta ≦ 70°C : 75%RH max
Ta > 70°C : Absolute humidity must be lower than the humidity of 75%RH at 70°C

Note 2 Ta at −30°C will be < 48hrs, at 80°C will be < 120hrs

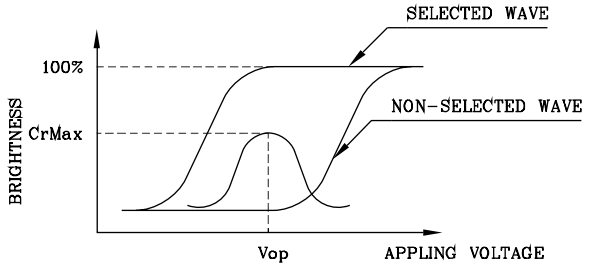
Note 3 Background color changes slightly depending on ambient temperature. This phenomenon is reversible.

(FIG 1)

Definition of Operation Voltage(Vop)



(positive type)



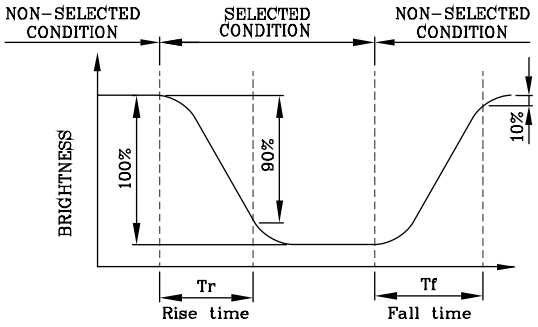
(negative type)

*Conditions

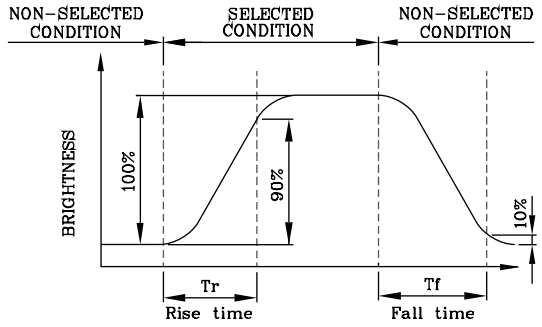
Viewing Angle : 0
Frame Frequency : 70Hz
Appling Waveform : I/N duty 1/a bias

(FIG 2)

Definition of Response Time(Tr,Tf)



(positive type)



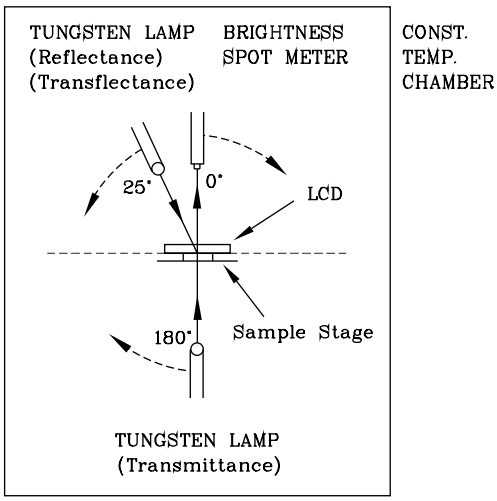
(negative type)

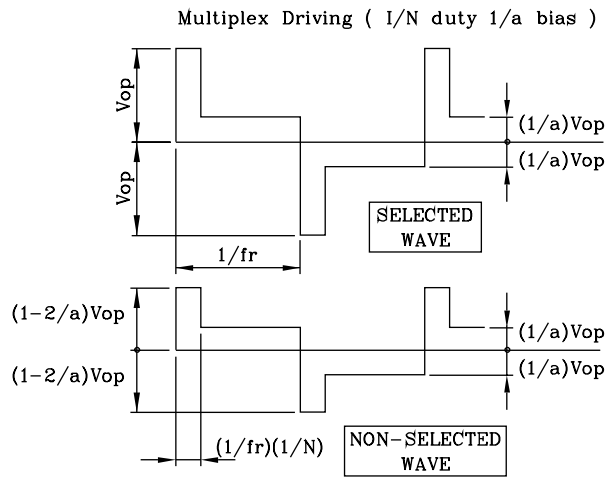
*Conditions

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

(FIG 3)

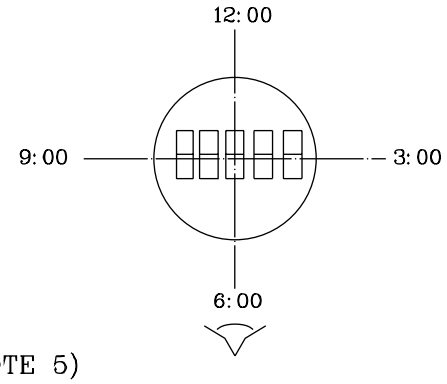
Description of Measuring Equipment and Driving Waveforms





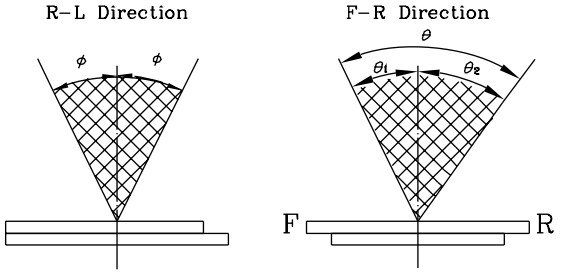
(NOTE 4)

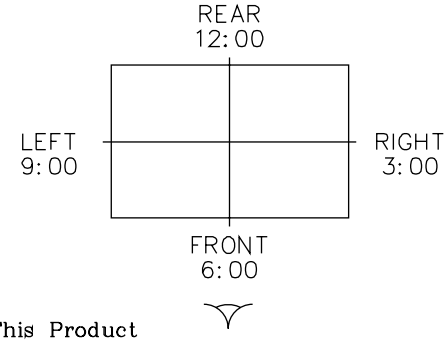
Definition of Viewing Direction



(NOTE 5)

Definition of Viewing Angle





*For This Product

The Viewing Direction Is 6 O'clock

So $\theta 1 > \theta 2$

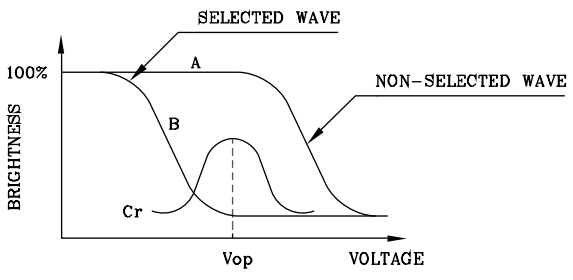
$\theta = \theta_1 + \theta_2$

*Conditions

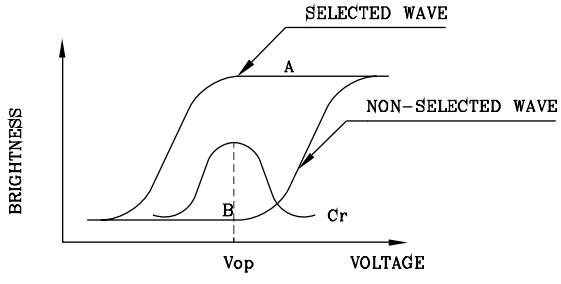
Operating Voltage : Vop
Frame Frequency : 70Hz
Appling Waveform : 1/N duty 1/a bias
Contrast Ratio : larger than 2

(NOTE 6)

Definition of Contrast Ratio (Cr)



(positive type)



(negative type)

Contrast Ratio : Cr=A/B

*Conditions

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

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 LC Driving Voltage		VDD−VO	Duty=1/240 Bias=1/13	−20°C	−	24.1	25.0	V
				0°C	−	22.7	23.6	
				25°C	21.3	22.0	22.8	
				50°C	20.3	20.8	−	
				70°C	20.1	20.9	−	
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 = −24.0 V VDD−VO = 22.0 V PATTERN :		−	7.7	−	mA
		IEE			−	3.9	−	mA
CCFL LAMP	Open Voltage	V_{Open}	Lamp Current = 5 mArms Frequency = 35 KHz		−	420	−	Vrms
	Lamp Voltage	V_L			−	260	−	Vrms
	Brightness	B			−	26000	−	cd/m²
	Color Degree	X			−	0.34	−	−
		Y			−	0.367	−	

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.
R	A	−	−	−	−	−	−	−	−	−	−	−	−	−	−
	C	−	−	−	−	−	−	−	−	−	−	−	−	−	−
	J	−	−	−	−	−	−	−	−	−	−	−	−	−	−
S	A	−	−	−	−	−	−	−	−	−	−	−	−	−	−
	C	−	−	−	−	−	−	−	−	−	−	−	−	−	−
	J	−	−	−	−	−	−	−	−	−	−	−	−	−	−
T	E,F	−	3.8	−	6.4	9.2	10.8	−	8.5	−	7.3	35	65	20	30
	G,H	−	20.7	−	30.4	48	56	−	13.5	−	9.21	40	70	25	35
note		NOTE6										NOTE5			

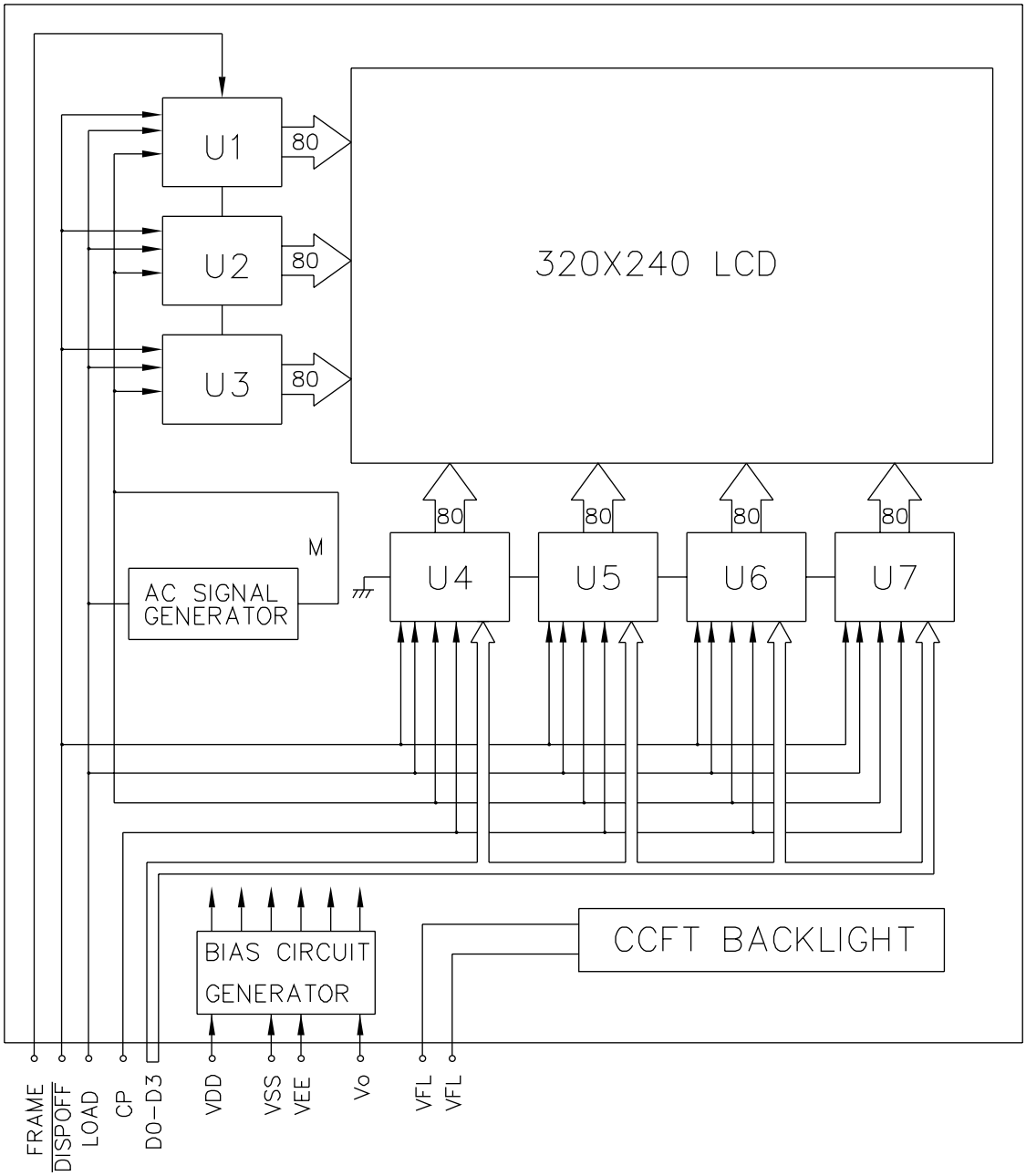
AT φ=0° θ=0°

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Response Time (rise)	Tr	−20℃	−	1000	2000	ms	NOTE 2
		0℃	−	820	1640		
		25℃	−	200	400		
		50℃	−	160	320		
		70℃	−	80	160		
Response Time (fall)	Tf	−20℃	−	500	1000	ms	NOTE 2
		0℃	−	360	720		
		25℃	−	210	420		
		50℃	−	70	140		
		70℃	−	50	100		

note:

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

5. BLOCK DIAGRAM



* AC SIGNAL SETTING

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

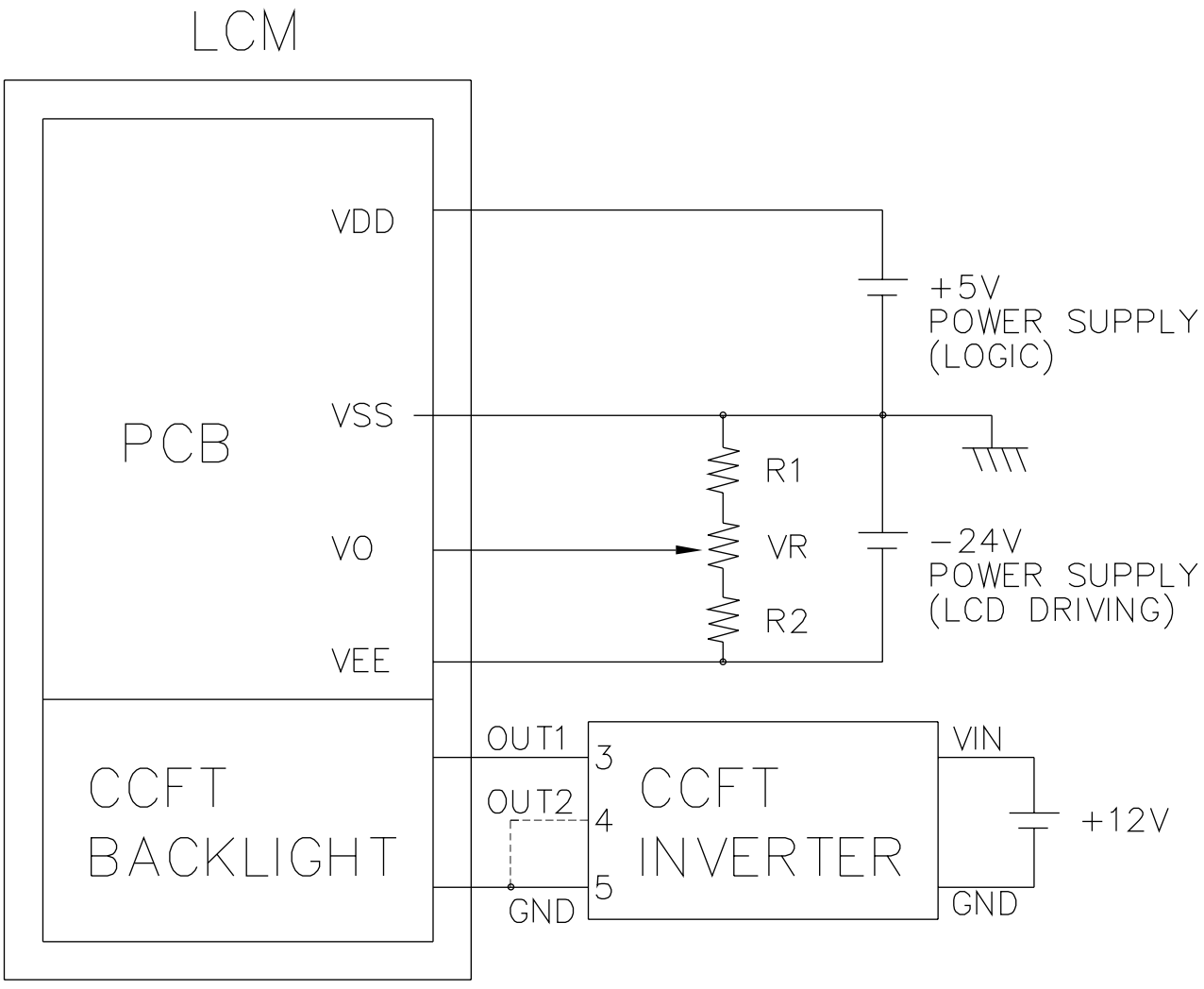
6. INTERNAL PIN CONNECTION

PIN NO.	SYMBOL	LEVEL	FUNCTION
1	D0	H/L	DISPLAY DATA SIGNAL
2	D1		
3	D2		
4	D3		
5	$\overline{\text{DISPOFF}}$	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	–	FRONT PANEL GROUND

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

PIN NO.	SYMBOL	LEVEL	FUNCTION
1	V_{FL}	–	POWER SUPPLY FOR CCFT BACKLIGHT
2	NC	–	–
3	NC	–	–
4	V_{FL}	–	POWER SUPPLY FOR CCFT BACKLIGHT

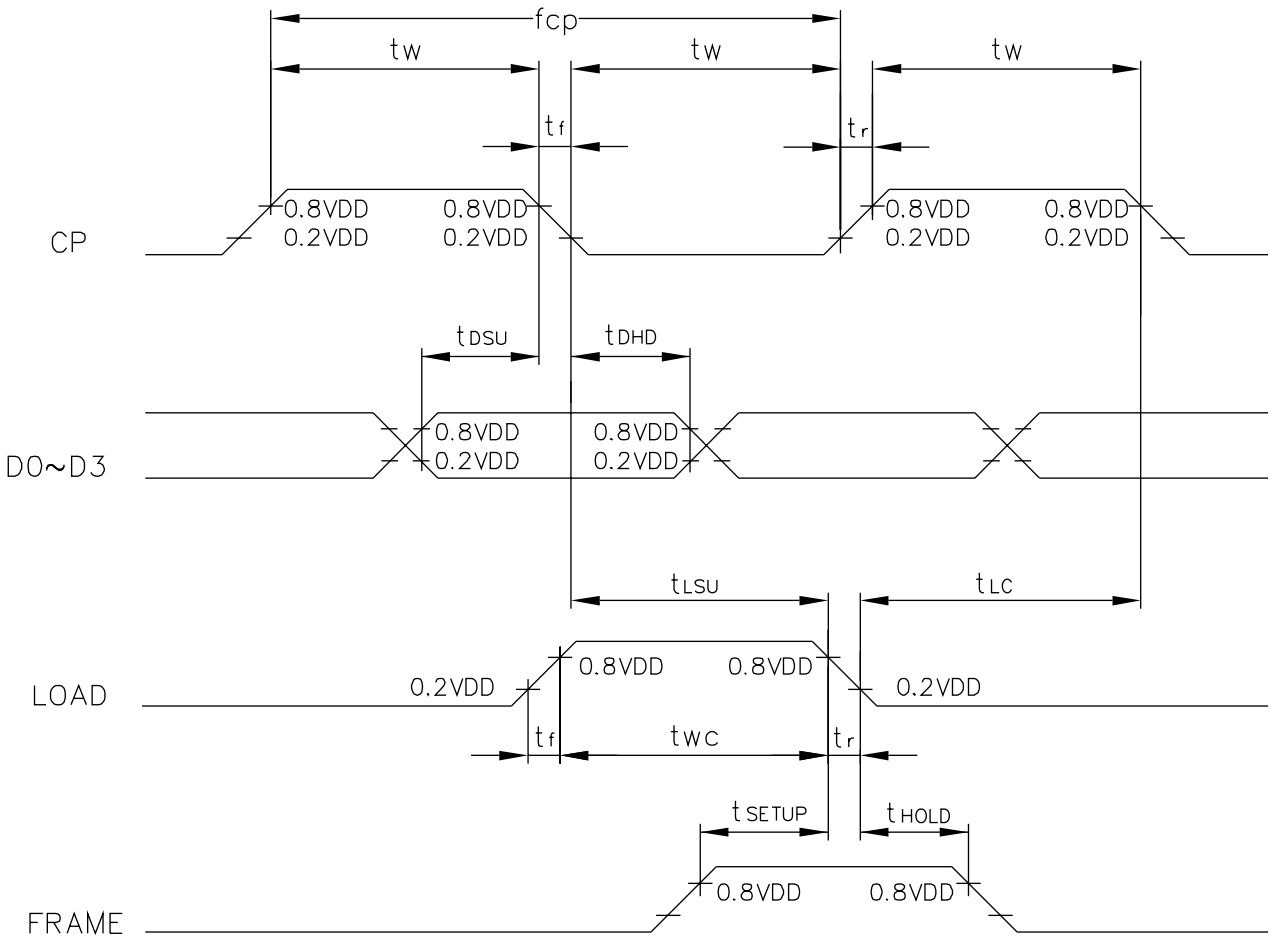
7. POWER SUPPLY



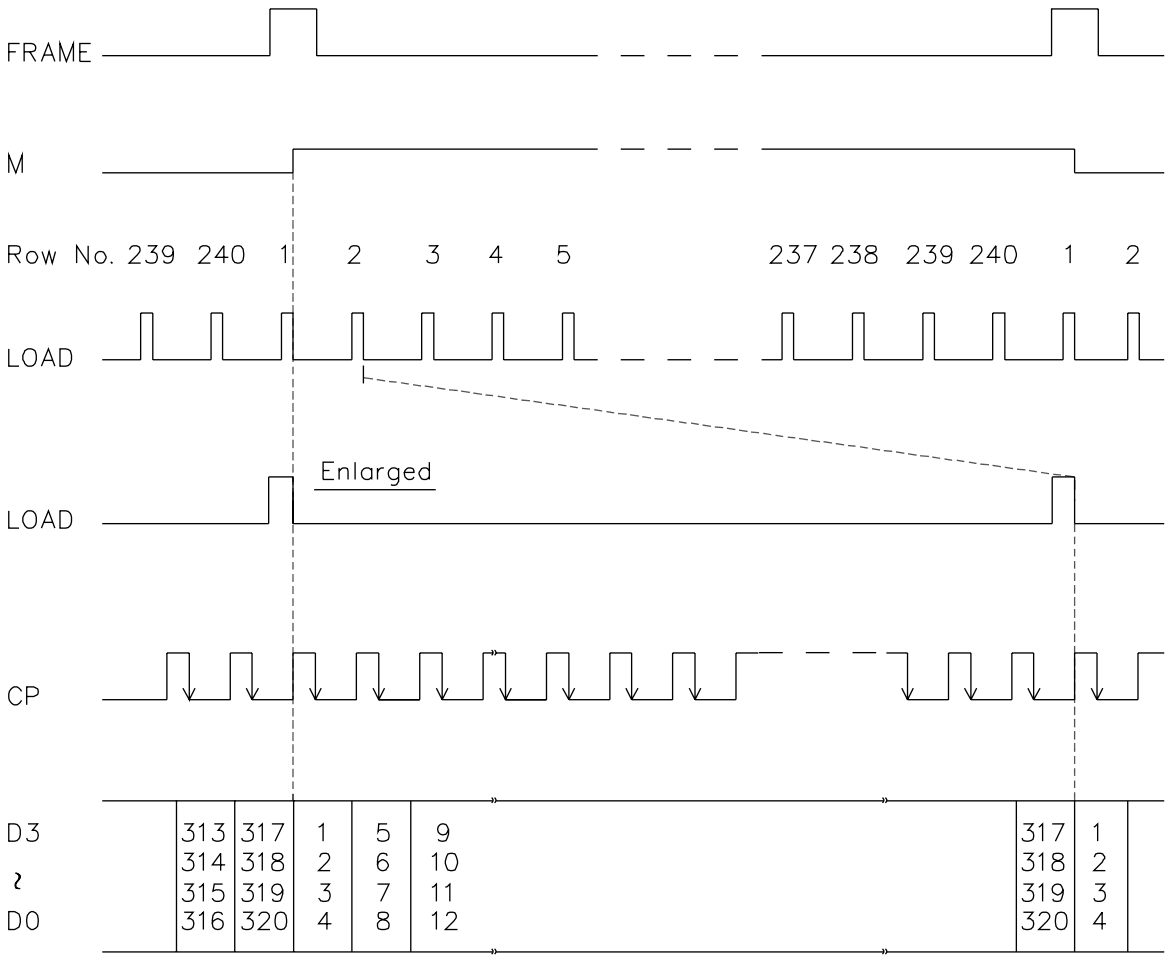
1. R1+VR+R2=10K~20KΩ
2. RECOMMENDED CCFT INVERTER : CXA-L10L(TDK)

8.1 TIMING CHARACTERISTICS

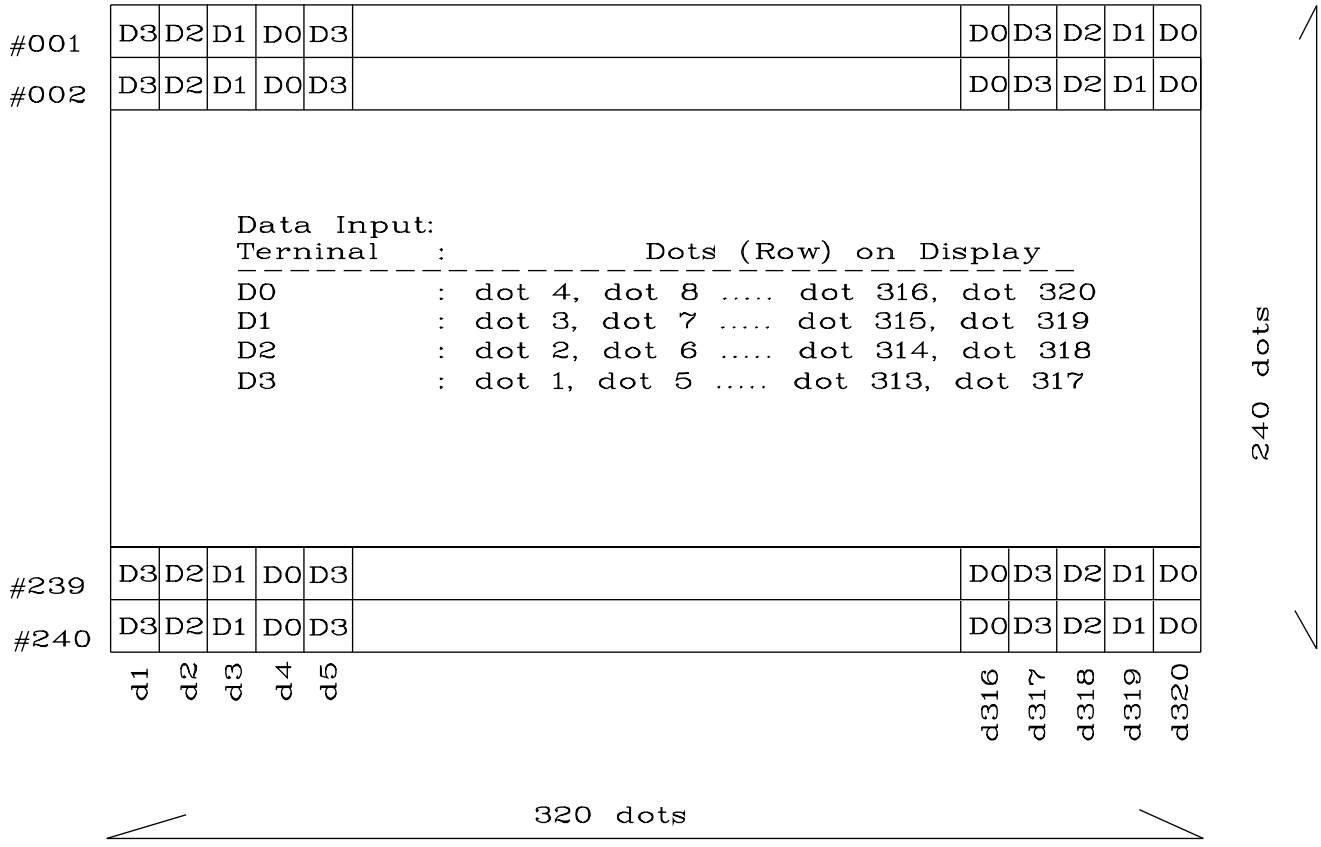
ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT
CLOCK FREQUENCY	fcp	–	–	6.5	MHZ
CLOCK PULSE WIDTH	tw	63	–	–	ns
CLOCK RISE,FALL TIME	tr , tf	–	–	20	ns
DATA SET UP TIME	tDSU	50	–	–	ns
DATA HOLD TIME	tDHD	50	–	–	ns
LOAD SET UP TIME	tLSU	80	–	–	ns
LOAD → CLOCK TIME	tLC	80	–	–	ns
"FRAME" SET UP TIME	tSETUP	100	–	–	ns
"FRAME" HOLD TIME	tHOLD	100	–	–	ns
"LOAD" PULSE WIDTH	tWC	125	–	–	ns



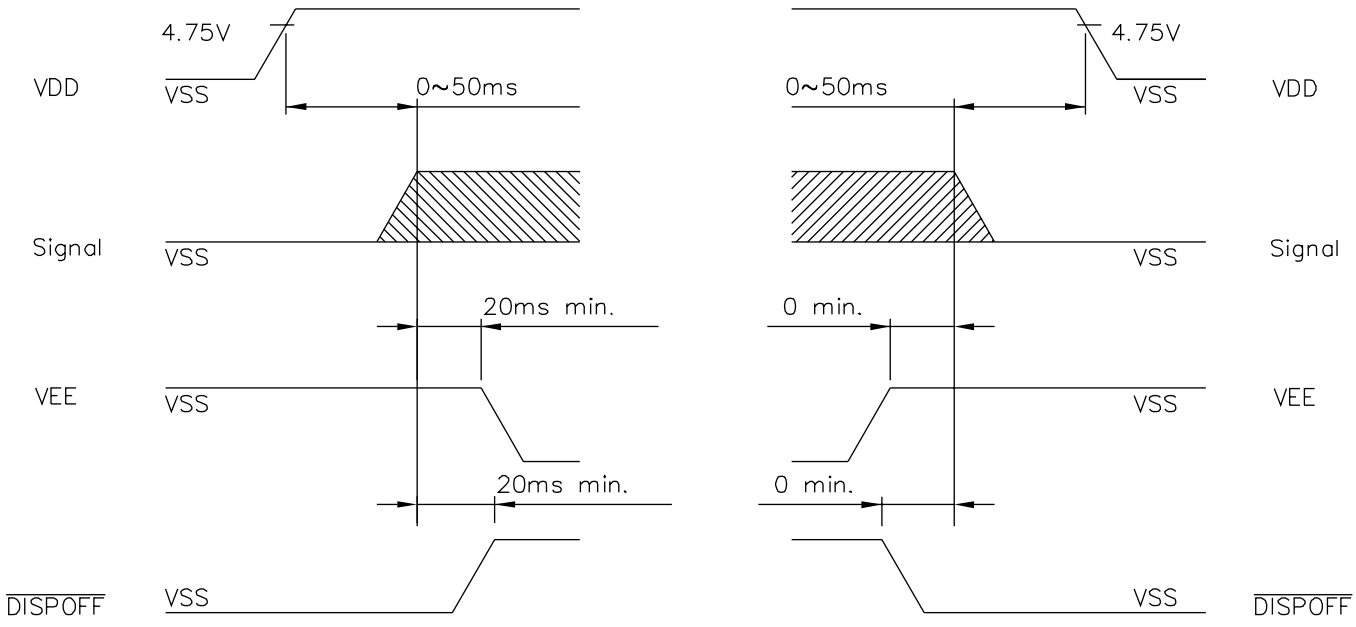
8.2 TIMING CHART OF INPUT SIGNALS



8.3 DISPLAY PATTERN



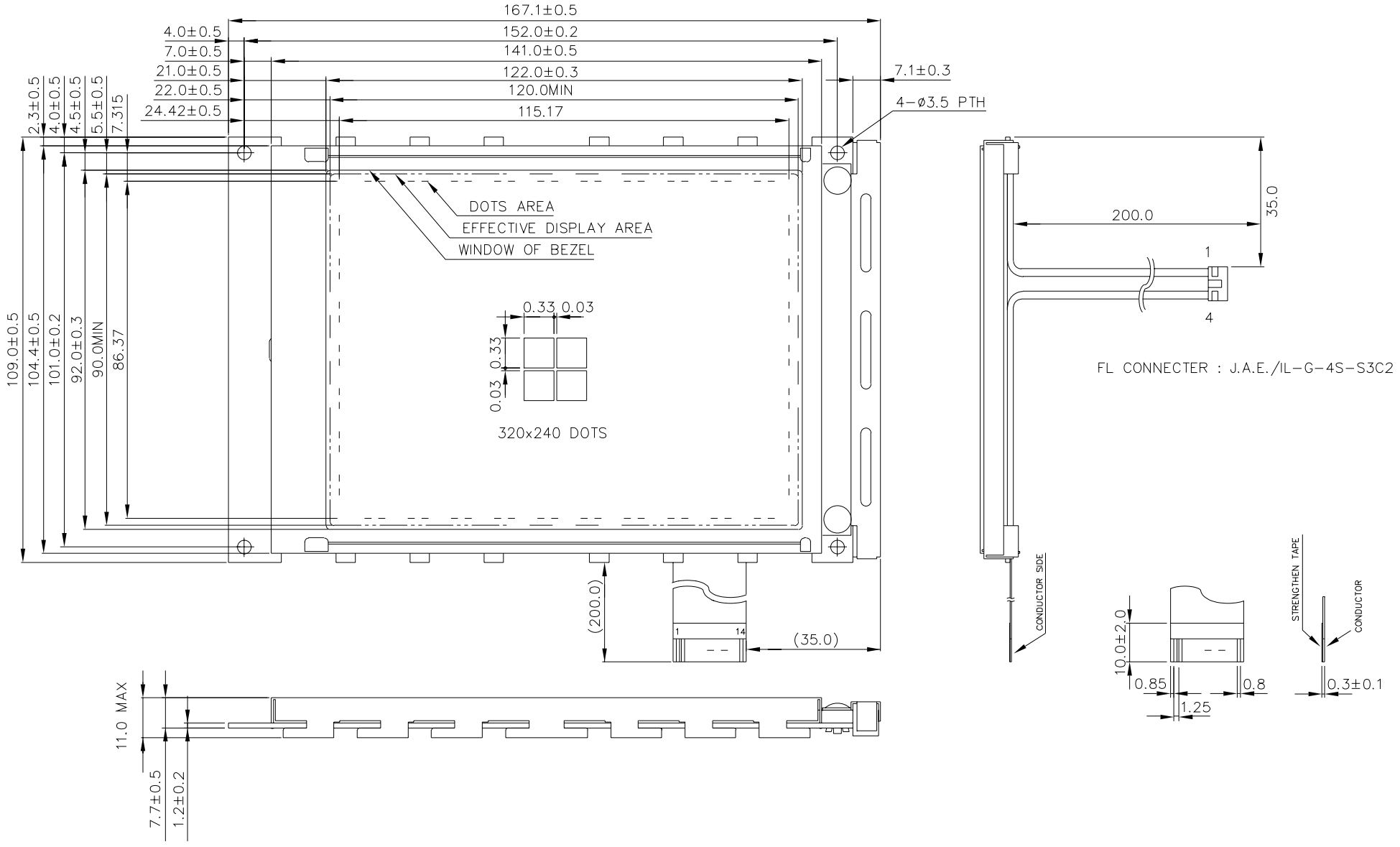
8.4 POWER ON/OFF TIMING



POWER ON

POWER OFF

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



PIN NO.	1	2	3	4	5	6	7
SYMBOL	D0	D1	D2	D3	$\overline{\text{DISPOFF}}$	FRAME	NC
PIN NO.	8	9	10	11	12	13	14
SYMBOL	LOAD	CP	VDD	VSS	VEE	VO	FGND

NOTES :

1. RESOLUTION : 320 X 240 Dots
2. CONTROLLER : WITHOUT
3. DC/DC : WITHOUT
4. BACKLIGHT: CCFL

	NAME	DATE
APPROVE		
CHECK		
DESIGN		
DRAW	MAY PING	86.10.29

AZ DISPLAYS, INC.

TITLE	AGM3224D
DWG-NO	MB-X032XK
THIRD ANGLE PROJECT	UNIT : mm
	SCALE : 1/1