

AZ DISPLAYS, INC.

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: <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"/> 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 $T_a \leq 70^\circ\text{C}$: 75%RH max

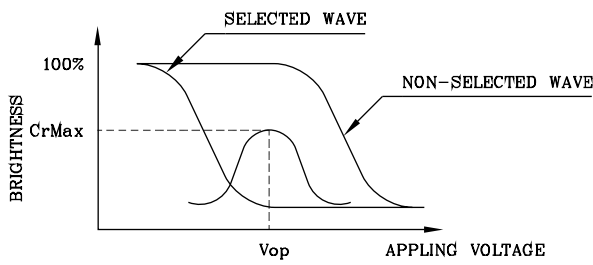
$T_a > 70^\circ\text{C}$: Absolute humidity must be lower than the humidity of 75%RH at 70°C

Note 2 T_a at -30°C will be < 48hrs, at 80°C will be < 120hrs

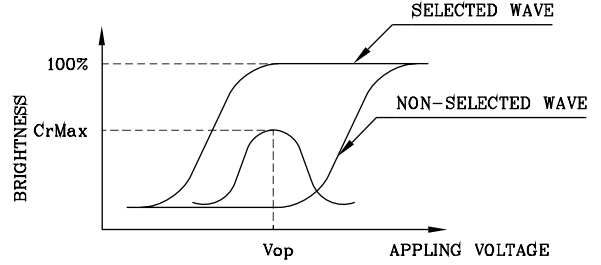
Note 3 Background color changes slightly depending on ambient temperature. This phenomenon is reversible.

(FIG 1)

Definition of Operation Voltage(Vop)



(positive type)



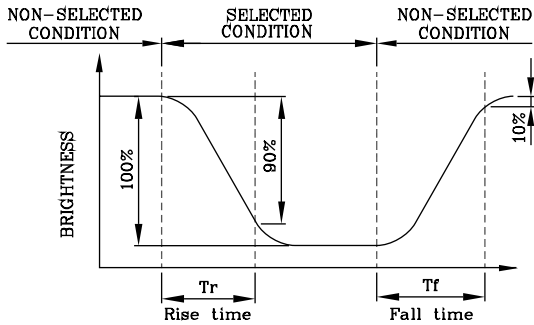
(negative type)

*Conditions

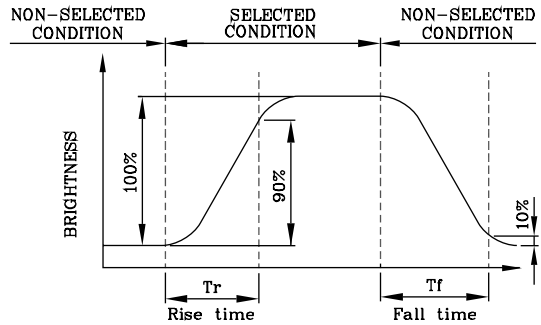
Viewing Angle : 0
 Frame Frequency : 70Hz
 Applying Waveform : I/N duty 1/a bias

(FIG 2)

Definition of Response Time(Tr,Tf)



(positive type)



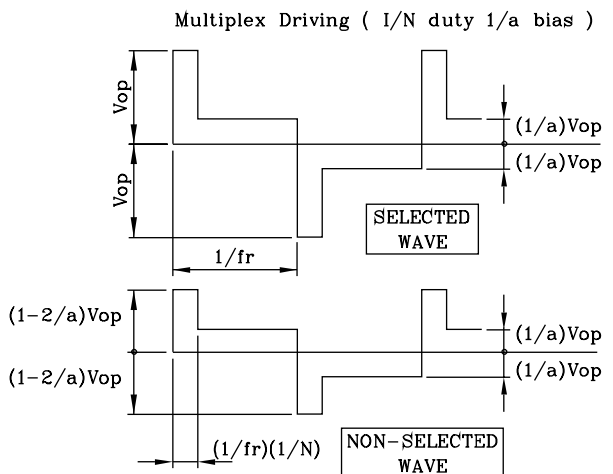
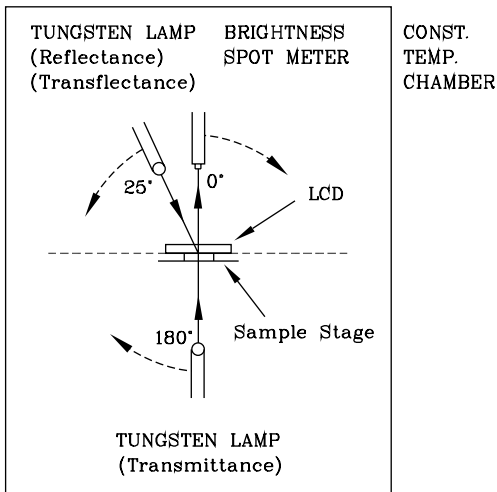
(negative type)

*Conditions

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

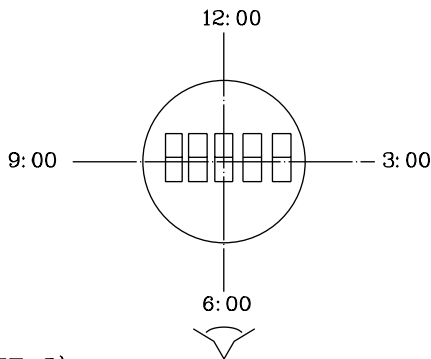
(FIG 3)

Description of Measuring Equipment and Driving Waveforms



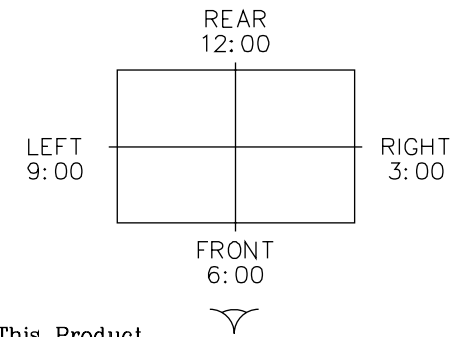
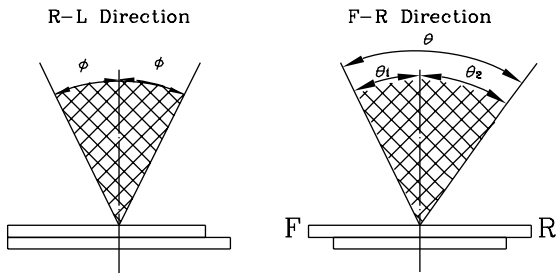
(NOTE 4)

Definition of Viewing Direction



(NOTE 5)

Definition of Viewing Angle



*For This Product
The Viewing Direction Is 6 O'clock
So $\theta_1 > \theta_2$

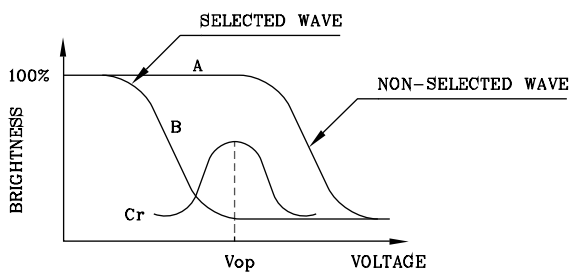
$$\theta = \theta_1 + \theta_2$$

*Conditions

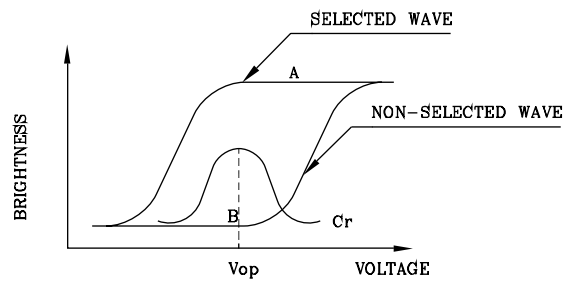
Operating Voltage : V_{op}
Frame Frequency : 70Hz
Applying Waveform : 1/N duty 1/a bias
Contrast Ratio : larger than 2

(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

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 | - | 7.7 | - | mA | |
| | IEE | PATTERN : <div style="display: flex; justify-content: space-around; font-size: 0.8em;"> □ ■ □ ■ □ ■ </div> <div style="display: flex; justify-content: space-around; font-size: 0.8em;"> ■ □ ■ □ ■ □ </div> | - | 3.9 | - | mA | |
| CCFL LAMP | Open Voltage | V _{Open} | Lamp Current = 5 mArms Frequency = 35 KHz | - | 420 | - | V _{rms} |
| | Lamp Voltage | V _L | | - | 260 | - | V _{rms} |
| | Brightness | B | | - | 26000 | - | cd/m ² |
| | Color Degree | X | | - | 0.34 | - | - |
| Y | | - | 0.367 | - | | | |

4. OPTICAL CHARACTERISTICS

AT V_{OP}

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

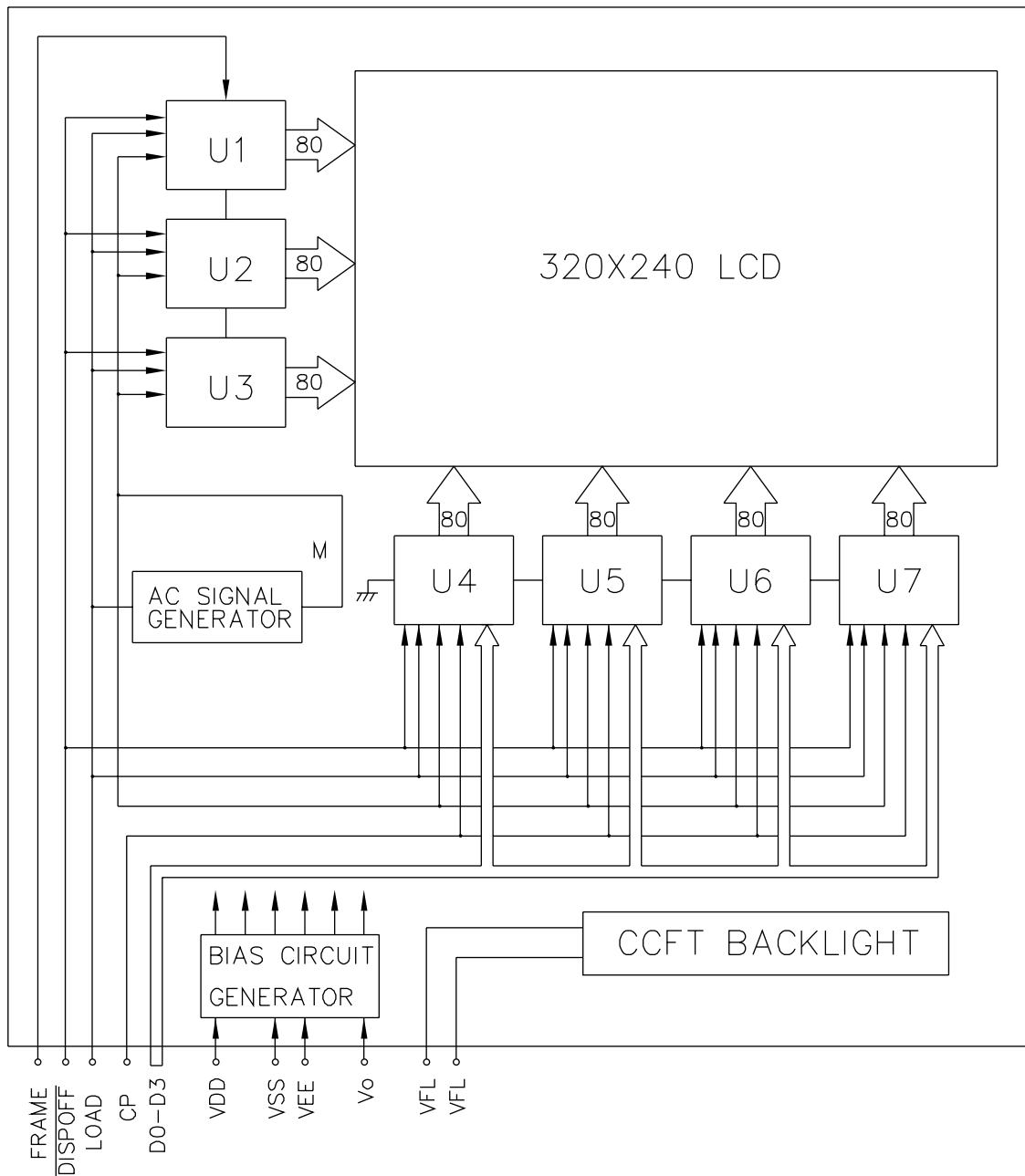
| ITEM | SYMBOL | CONDITION | MIN. | TYP. | MAX. | UNIT | NOTE |
|----------------------|--------|-----------|------|------|------|------|--------|
| Response Time (rise) | Tr | -20℃ | - | 1000 | 2000 | ms | NOTE 2 |
| | | 0℃ | - | 820 | 1640 | | |
| | | 25℃ | - | 200 | 400 | | |
| | | 50℃ | - | 160 | 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: TRANFLECTIVE
 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 |

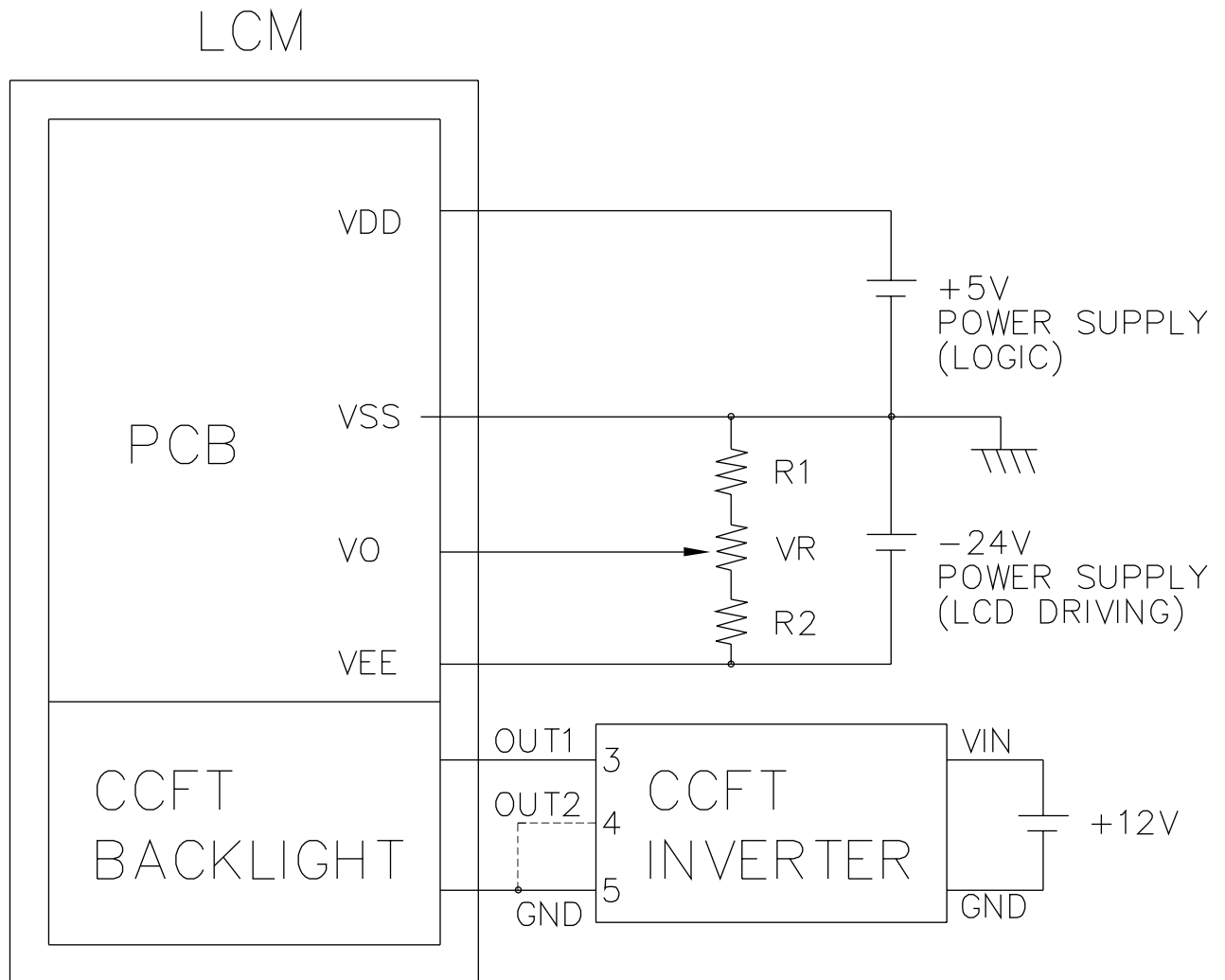
6. INTERNAL PIN CONNECTION

| 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

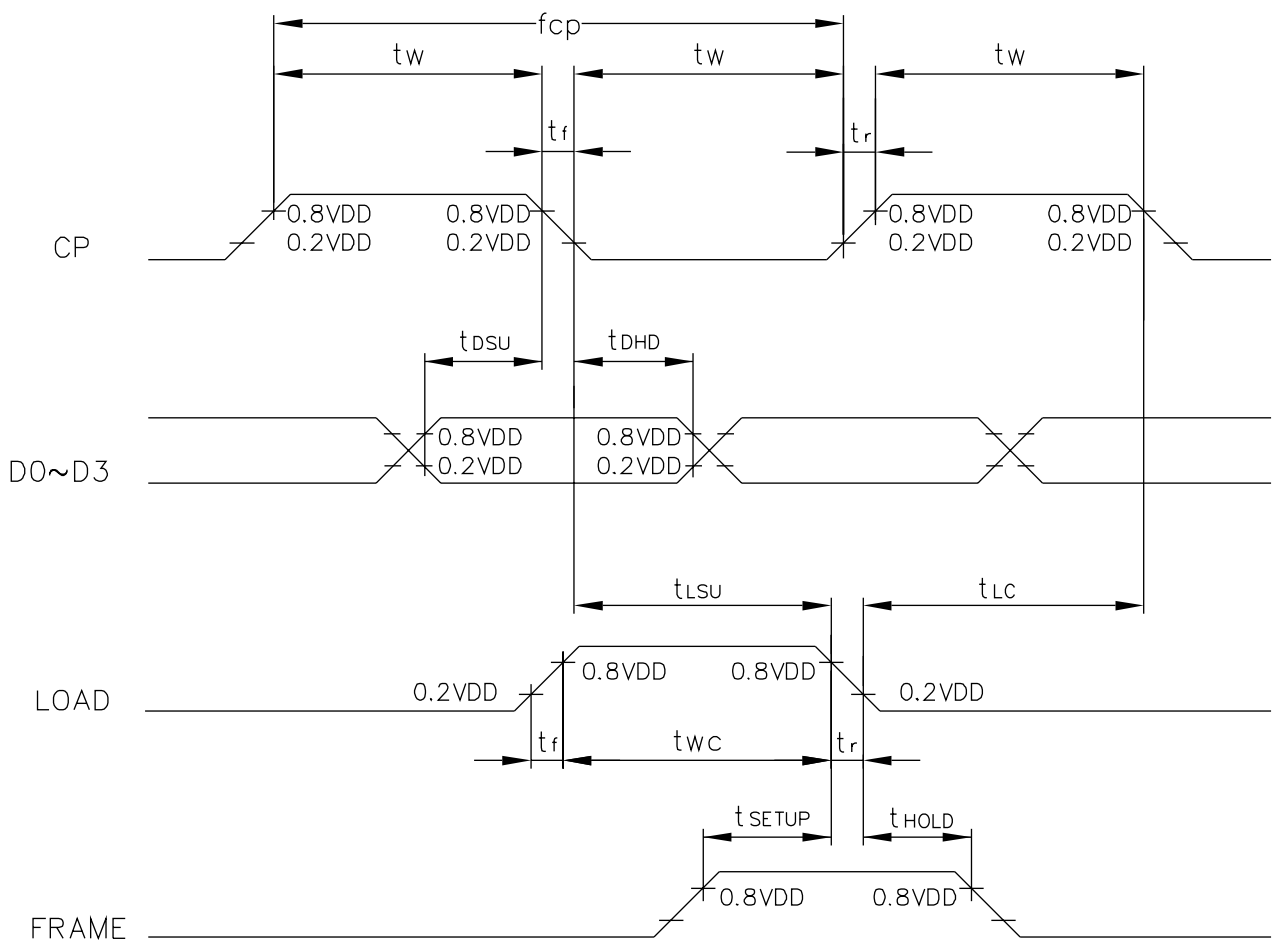


1. $R1 + VR + R2 = 10K \sim 20K \Omega$

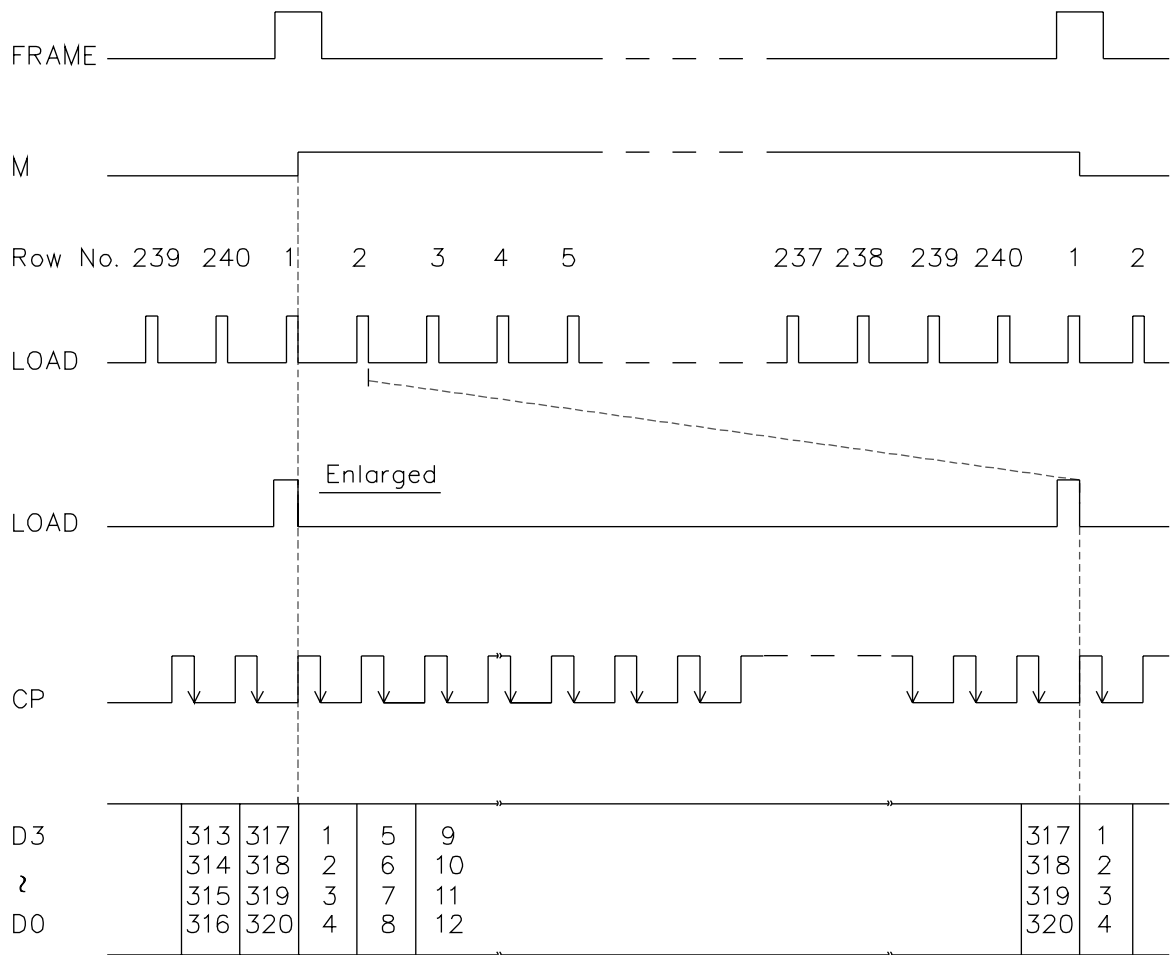
2. RECOMMENDED CCFT INVERTER : CXA-L10L(TDK)

8.1 TIMING CHARACTERISTICS

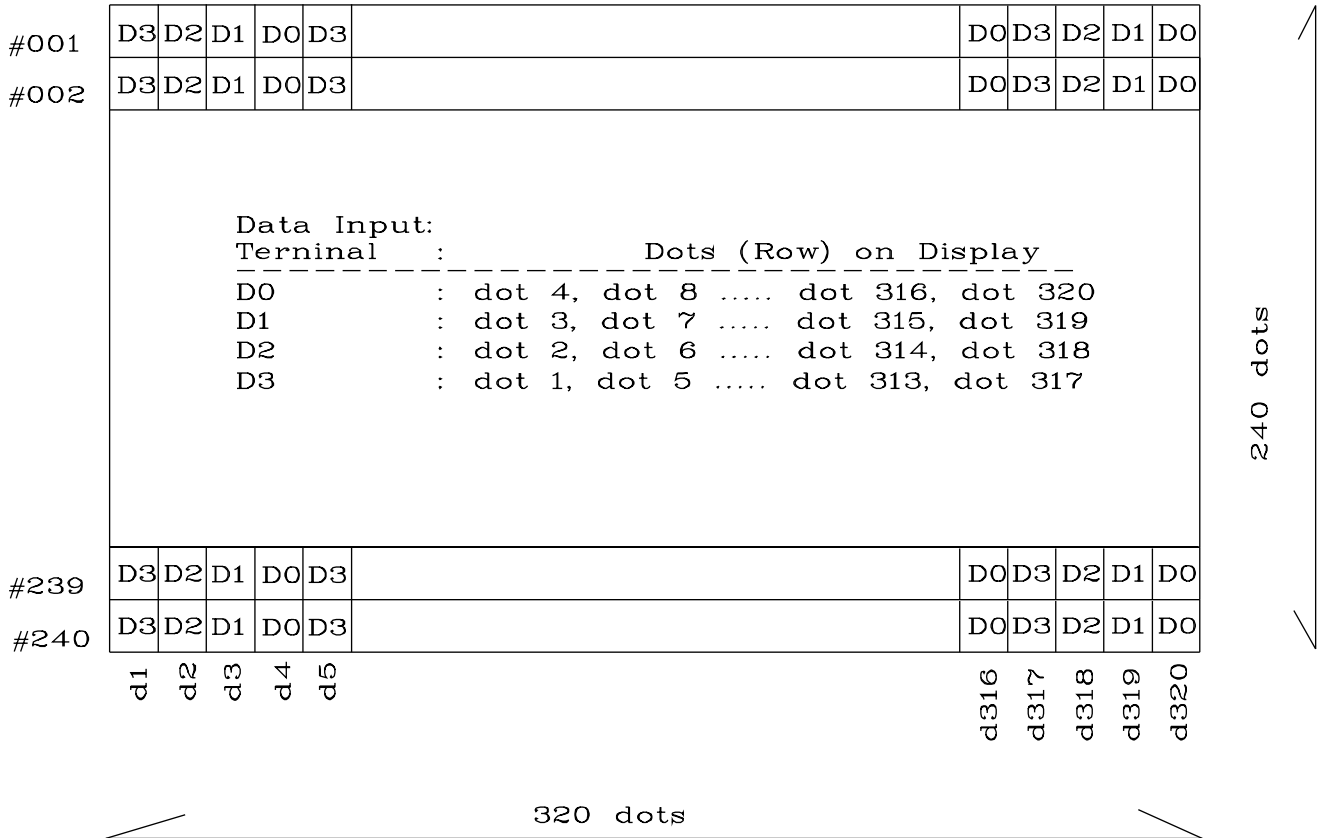
| ITEM | SYMBOL | MIN. | TYP. | MAX. | UNIT |
|----------------------|-------------|------|------|------|------|
| CLOCK FREQUENCY | f_{cp} | - | - | 6.5 | MHZ |
| CLOCK PULSE WIDTH | t_w | 63 | - | - | ns |
| CLOCK RISE,FALL TIME | t_r, t_f | - | - | 20 | ns |
| DATA SET UP TIME | t_{dsu} | 50 | - | - | ns |
| DATA HOLD TIME | t_{dhd} | 50 | - | - | ns |
| LOAD SET UP TIME | t_{lsu} | 80 | - | - | ns |
| LOAD → CLOCK TIME | t_{lc} | 80 | - | - | ns |
| "FRAME" SET UP TIME | t_{setup} | 100 | - | - | ns |
| "FRAME" HOLD TIME | t_{hold} | 100 | - | - | ns |
| "LOAD" PULSE WIDTH | t_{wc} | 125 | - | - | ns |



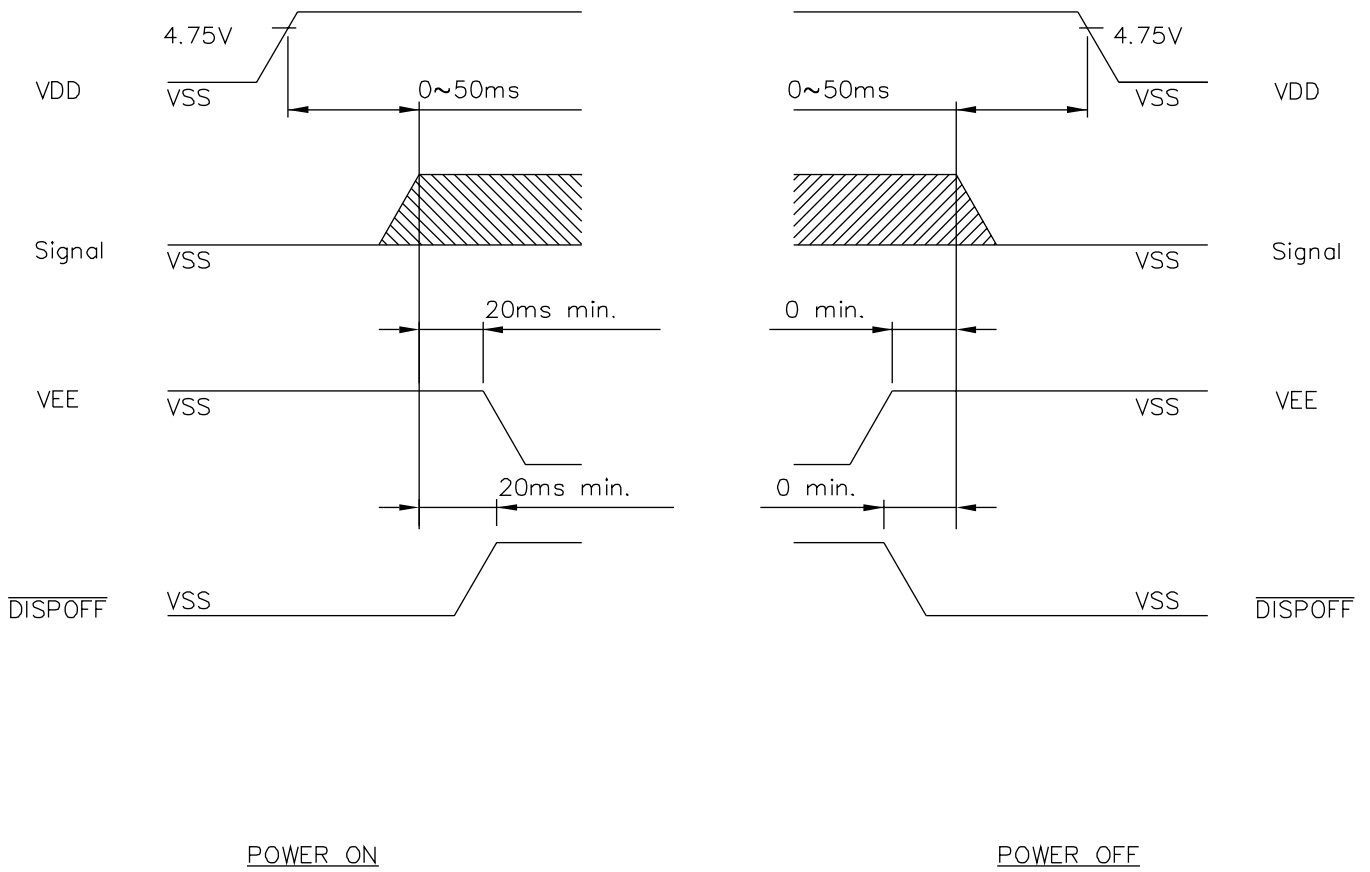
8.2 TIMING CHART OF INPUT SIGNALS



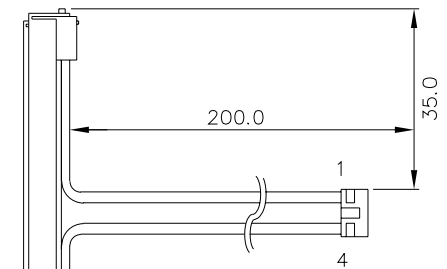
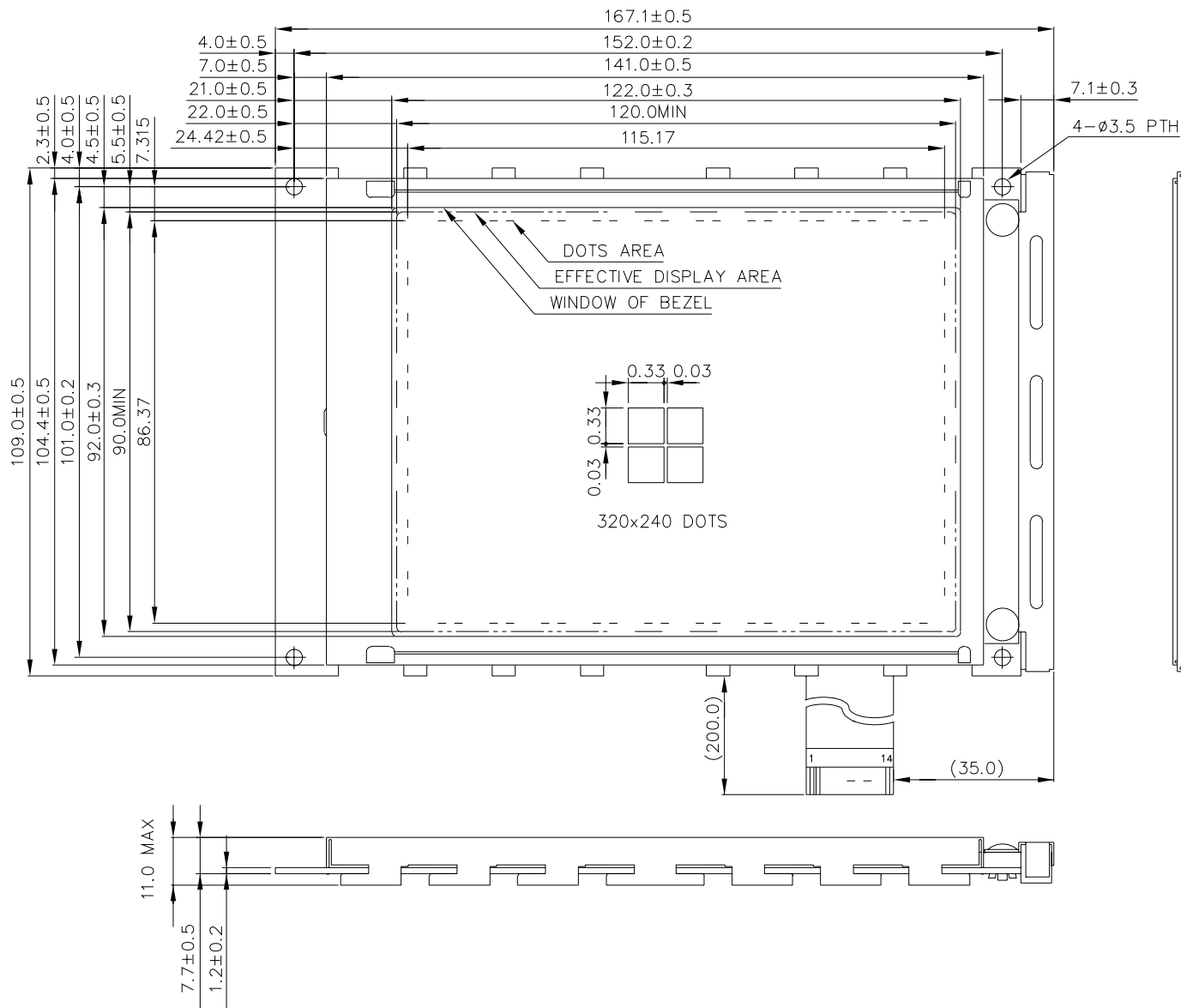
8.3 DISPLAY PATTERN



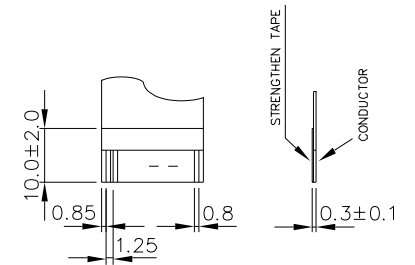
8.4 POWER ON/OFF TIMING



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



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



| | | | | | | | |
|---------|------|----|-----|-----|---------|-------|------|
| PIN NO. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| SYMBOL | D0 | D1 | D2 | D3 | 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

| | | | | |
|---------|----------|----------|--------------------------|--------------------------|
| | | | AZ DISPLAYS, INC. | |
| | NAME | DATE | TITLE | AGM3224D |
| APPROVE | | | DWG-NO | MB-X032XK |
| CHECK | | | | |
| DESIGN | | | | |
| DRAW | MAY PING | 86.10.29 | THIRD ANGLE PROJECT | UNIT : mm SCALE : 1/1 |