

# AZ DISPLAYS, INC.

## 1. MECHANICAL DATA

|                       |                                         |               |           |
|-----------------------|-----------------------------------------|---------------|-----------|
| (1) Product No.       | <b>AGM6448T</b>                         |               |           |
| (2) Module Size       | 203.0 (W)mm X                           | 142.5 (H)mm X | 6.0 (D)mm |
| (3) Dot Size          | 0.067 (W)mm X                           | 0.241 (H)mm   |           |
| (4) Dot Pitch         | 0.087 (W)mm X                           | 0.261 (H)mm   |           |
| (5) Number of Dots    | 640 (R.G.B.) (W) X                      | 480 (H) Dots  |           |
| (6) Duty              | 1/240                                   |               |           |
| (7) LCD Display Mode  | FSTN: Color STN module                  |               |           |
|                       | Rear Polarizer: Color Transmission type |               |           |
| (8) Viewing Direction | 12 O'clock                              |               |           |
| (9) Backlight         | CCFL                                    |               |           |
| (10) Controller       | Excluded                                |               |           |
| (11) Weight           | 250 g Approx.                           |               |           |

Date: March 22, 2002

2.ABSOLUTE MAXIMUM RATINGS

(1) ELECTRICAL ABSOLUTE RATINGS

VSS=0V

| ITEM                        | SYMBOL   | MIN  | MAX  | UNIT | COMMENT |
|-----------------------------|----------|------|------|------|---------|
| Power Supply for Logic      | VDD–VSS  | –0.3 | +7.0 | V    |         |
| Contrast Adjustment Voltage | Vcon–VSS | 1.8  | 2.8  | V    |         |
| Input Voltage               | VIN      | 0    | VDD  | V    | Note 1  |
| Static Electricity          | –        | –    | –    | –    | Note 2  |

Note 1  $\overline{\text{DISP.OFF}}$ ,M,CL1,CL2,UD0~UD7,LD0~LD7

Note 2 LCM should be grounded during handling

(2) ENVIRONMENTAL ABSOLUTE MAXIMUM RATINGS

| ITEM                            | NORMAL TEMP. |      |          |      |
|---------------------------------|--------------|------|----------|------|
|                                 | OPERATING    |      | STORAGE  |      |
|                                 | MIN.         | MAX. | MIN.     | MAX. |
| Ambient Temperature             | 0            | 50   | −20      | 70   |
| Humidity (Without Condensation) | Note 1,3     |      | Note 2,3 |      |
| Vibration                       | Note 4       |      |          |      |

Note 1 Ta ≤ 50℃ : 85%RH max  
Ta > 50℃ : Absolute humidity must be lower  
than the humidity of 85%RH at 50℃

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

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

Note 4

|                     |                       |                        |             |                        |
|---------------------|-----------------------|------------------------|-------------|------------------------|
| Frequency           | 5 Hz~13.95 Hz         | 13.95 Hz~33 Hz         | 33 Hz~51 Hz | 51 Hz~500 Hz           |
| Vibration Level     | –                     | 2X9.8 m/s <sup>2</sup> | –           | 5x9.8 m/s <sup>2</sup> |
| Vibration Width     | 0.2 inch              | –                      | 0.036 inch  | –                      |
| Vibration Direction | X/Y/Z                 |                        |             |                        |
| Vibration Time      | 20 min X 3 directions |                        |             |                        |

3.ELECTRICAL CHARACTERISTICS  
3-1.ELECTRICAL CHARACTERISTICS OF LCM

(VDD = 3.3V±5% )

| ITEM                              | SYMBOL | CONDITION                       |     | MIN.   | TYP. | MAX.   | UNIT |
|-----------------------------------|--------|---------------------------------|-----|--------|------|--------|------|
| Input Voltage                     | VIH    | VDD = 3.3V                      |     | 0.7VDD | —    | VDD    | V    |
|                                   | VIL    | VDD = 3.3V                      |     | 0      | —    | 0.3VDD | V    |
| Recommended<br>LC Driving Voltage | Vop    | Duty=<br>1/240<br>Bias=<br>1/13 | 0℃  | 24.2   | 24.5 | 24.8   | V    |
|                                   |        |                                 | 25℃ | 23.0   | 23.3 | 23.6   |      |
|                                   |        |                                 | 50℃ | 21.5   | 21.8 | 22.1   |      |
| Power Supply Current              | IDD    | VDD=3.3V                        |     | —      | 100  | 150    | mA   |

3-2.ELECTRICAL CHARACTERISTICS OF BACKLIGHT

| CCFL Rating            |                |      |       |      |                   | Temp.=25℃                  |
|------------------------|----------------|------|-------|------|-------------------|----------------------------|
| ITEM                   | SYMBOL         | MIN. | TYP.  | MAX. | UNIT              | REMARK                     |
| Lamp voltage           | V <sub>L</sub> | —    | 360   | —    | Vrms              | —                          |
| Lamp current           | I <sub>L</sub> | 2.9  | 3.0   | 3.1  | mA <sub>rms</sub> | (*1)                       |
| Lamp power consumption | P <sub>L</sub> | —    | 1.1   | —    | W                 | (*2)                       |
| Starting voltage       | V <sub>S</sub> | —    | —     | 580  | Vrms              | —                          |
| Lamp frequency         | F <sub>L</sub> | 36   | 44    | 52   | KHz               | —                          |
| Lamp life time         | L <sub>L</sub> | —    | 20000 | —    | hrs               | IL = 3.0 mA <sub>rms</sub> |

(\*1) It is recommended that IL be not more than 3.1 mA<sub>rms</sub> so that heat radiation of CCFT backlight may least affect the display quality .

(\*2) Power consumption excluded inverter loss .

4.OPTICAL CHARACTERISTICS

4-1.OPTICAL CHARACTERISTICS OF LCM

AT Vop

| ITEM<br><br>MODE |   | Cr(Contrast Ratio) |      |      |      |      |      | $\theta$ (Viewing Angle) |       | $\phi$ (Viewing Angle) |      |
|------------------|---|--------------------|------|------|------|------|------|--------------------------|-------|------------------------|------|
|                  |   | 0℃                 |      | 25℃  |      | 50℃  |      | 25℃                      |       | 25℃                    |      |
|                  |   | MIN.               | TYP. | MIN. | TYP. | MIN. | TYP. | MIN.                     | TYP.  | MIN.                   | TYP. |
| T                | Y | 13                 | 15   | 35   | 40   | 5    | 6    | —                        | 45-50 | —                      | ±40  |
| Note             |   | NOTE 6             |      |      |      |      |      | NOTE 5                   |       |                        |      |

Note:

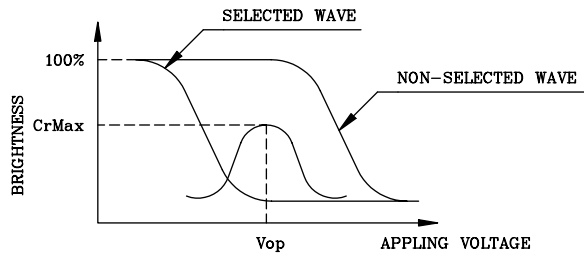
- T: Transmission
- Y: Special Polarizer, 12 O'clock

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

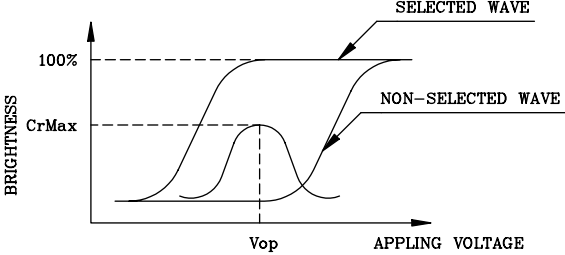
| ITEM                 | SYMBOL | CONDITION | MIN. | TYP. | MAX. | UNIT | NOTE   |
|----------------------|--------|-----------|------|------|------|------|--------|
| Response Time (rise) | Tr     | 0℃        | 280  | 350  | 420  | ms   | NOTE 2 |
|                      |        | 25℃       | 160  | 210  | 260  |      |        |
|                      |        | 50℃       | 70   | 85   | 100  |      |        |
| Response Time (fall) | Tf     | 0℃        | 400  | 520  | 630  | ms   | NOTE 2 |
|                      |        | 25℃       | 80   | 100  | 150  |      |        |
|                      |        | 50℃       | 40   | 55   | 70   |      |        |

(NOTE 1)

Definition of Operation Voltage(Vop)



(positive type)



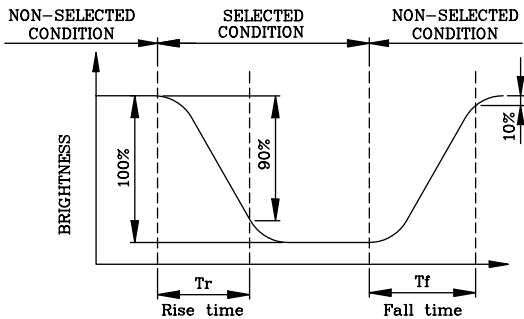
(negative type)

\*Conditions

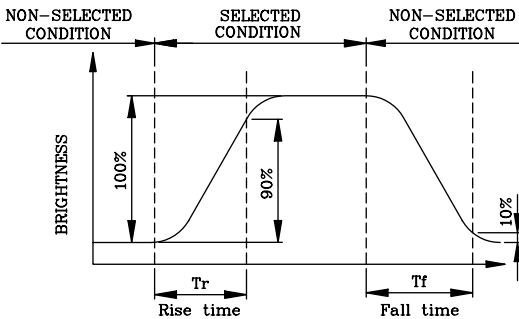
Viewing Angle : 0  
Frame Frequency : 70Hz  
Applying Waveform : 1/N duty 1/a bias

(NOTE 2)

Definition of Response Time(Tr,Tf)



(positive type)



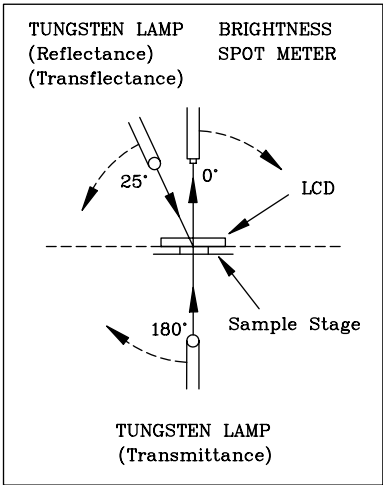
(negative type)

\*Conditions

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

(NOTE 3)

Description of Measuring Equipment and Driving Waveforms

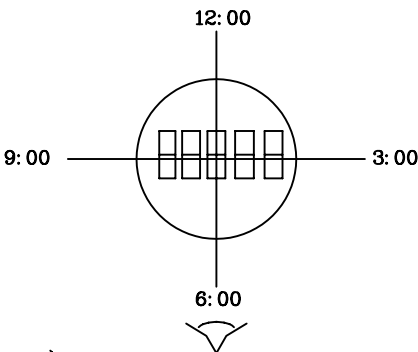


CONST.  
TEMP.  
CHAMBER

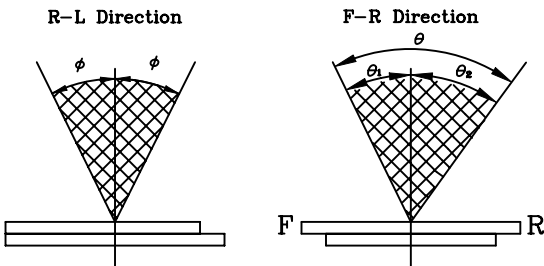
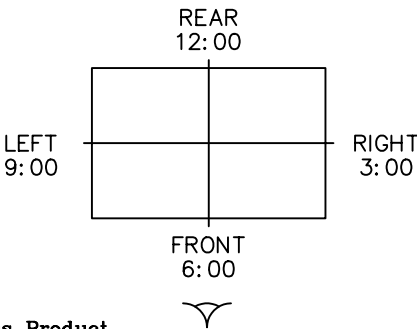
The voltage relationship of each signal is as follow  
Multiplex Driving (1/N duty 1/a bias)

| Segment voltage | Segment Waveform        |                    | Common Waveform         |                    | Common voltage         |
|-----------------|-------------------------|--------------------|-------------------------|--------------------|------------------------|
| V0<br>VM<br>V1  |                         |                    |                         |                    | VH<br><br>VM<br><br>VL |
|                 | Normally display period | Off-display period | Normally display period | Off-display period |                        |

(NOTE 4)  
Definition of Viewing Direction



(NOTE 5)  
Definition of Viewing Angle

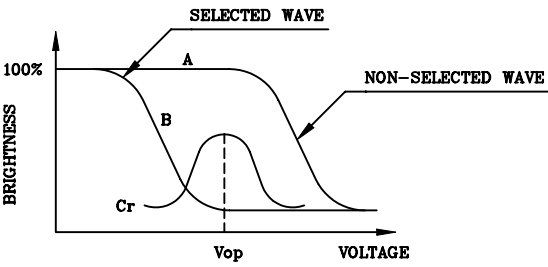


\*For This Product  
The Viewing Direction Is 6 O'clock  
So  $\theta_1 > \theta_2$

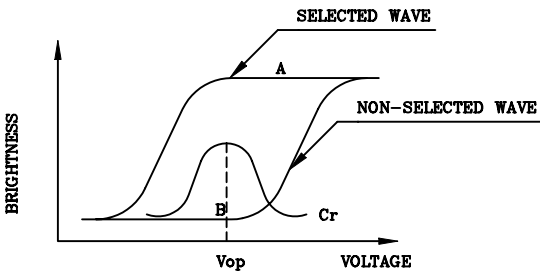
$\theta = \theta_1 + \theta_2$

\*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)

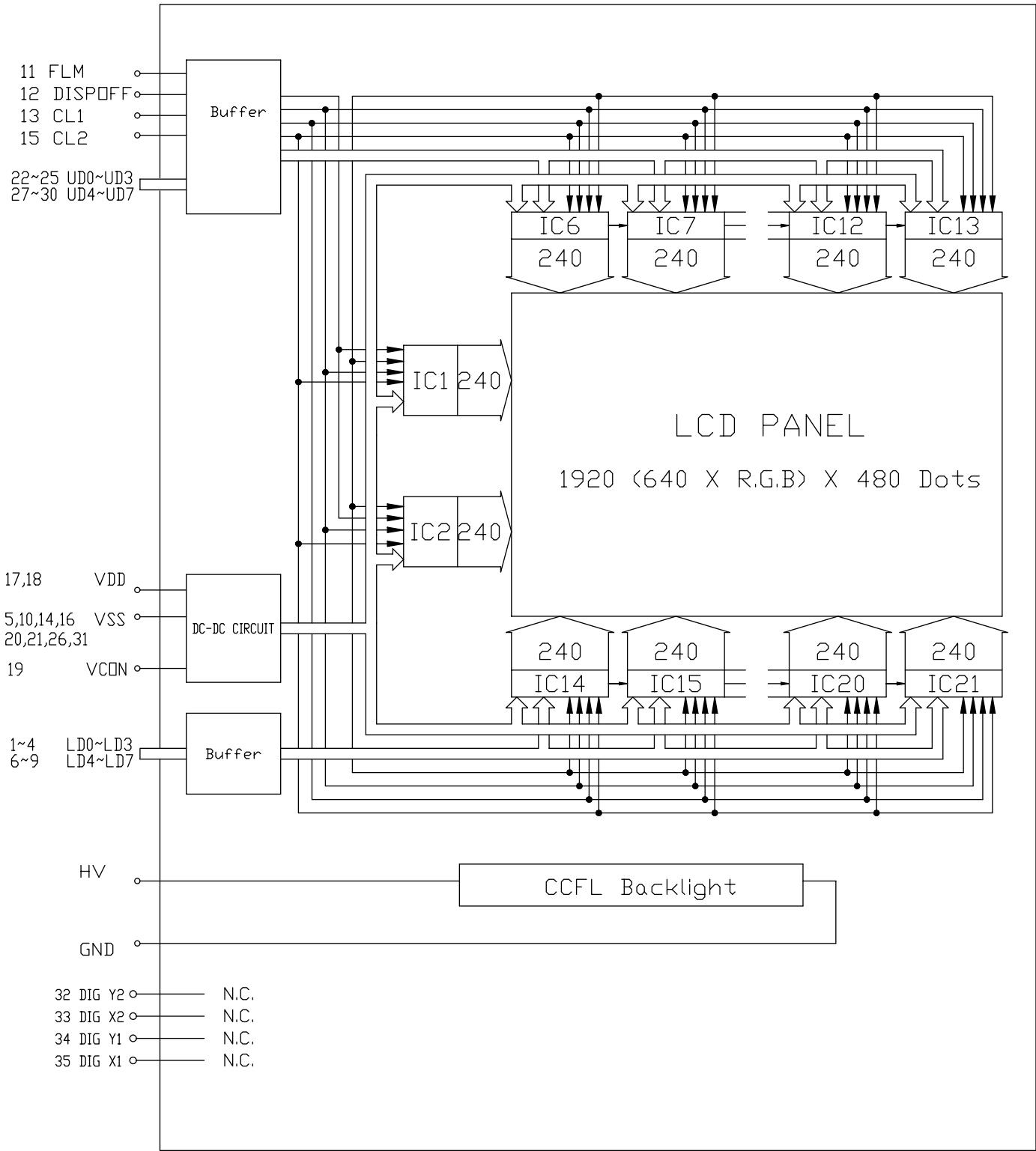


(negative type)

Contrast Ratio :  $Cr=A/B$

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

5. BLOCK DIAGRAM



## 6. INTERNAL PIN CONNECTION

### INTERNAL PIN CONNECTION

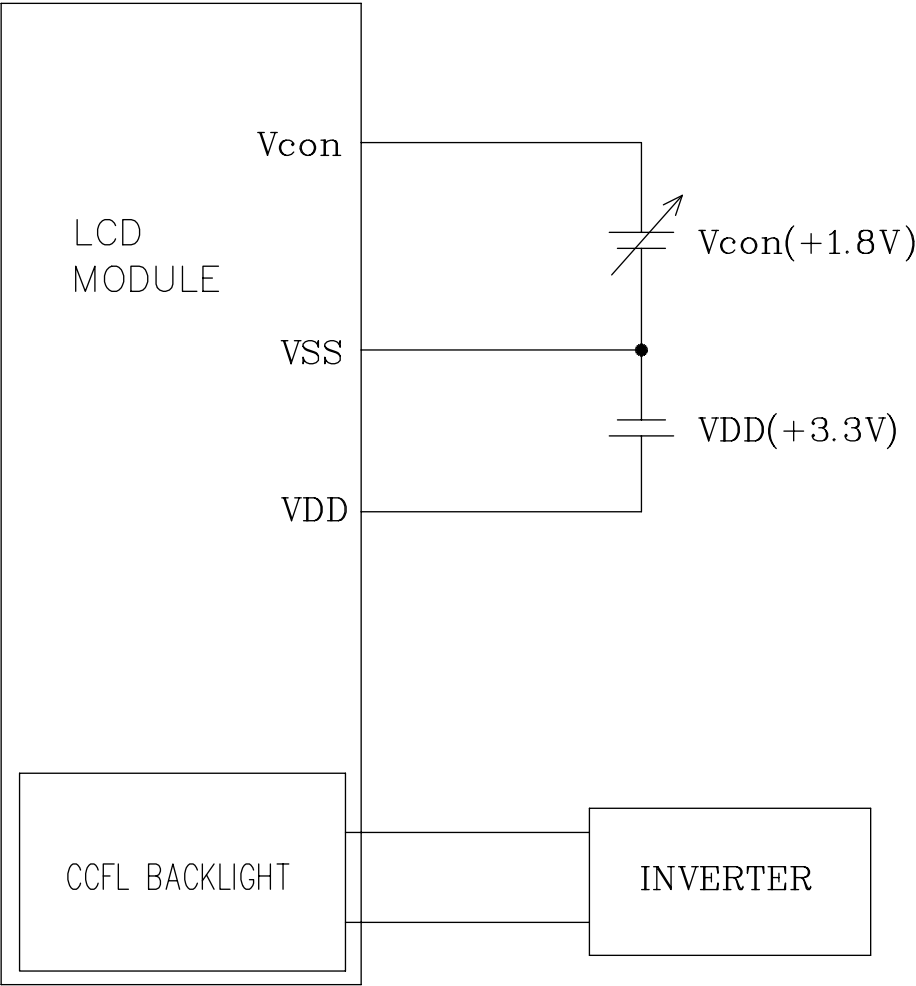
CN1 MOLEX 54104-3511

| PIN NO | SYMBOL          | FUNCTION                    |
|--------|-----------------|-----------------------------|
| 1      | LD0             | Display Data (Lower Column) |
| 2      | LD1             | Display Data (Lower Column) |
| 3      | LD2             | Display Data (Lower Column) |
| 4      | LD3             | Display Data (Lower Column) |
| 5      | VSS             | GND                         |
| 6      | LD4             | Display Data (Lower Column) |
| 7      | LD5             | Display Data (Lower Column) |
| 8      | LD6             | Display Data (Lower Column) |
| 9      | LD7             | Display Data (Lower Column) |
| 10     | VSS             | GND                         |
| 11     | FLM             | First Line Marker           |
| 12     | <u>DISP.OFF</u> | H : ON / L : OFF            |
| 13     | CL1             | Data Latch                  |
| 14     | VSS             | GND                         |
| 15     | CL2             | Data Shift                  |
| 16     | VSS             | GND                         |
| 17     | VDD             | Power Supply for Logic      |
| 18     | VDD             | Power Supply for Logic      |
| 19     | VCON            | Contrast Adjust             |
| 20     | VSS             | GND                         |
| 21     | VSS             | GND                         |
| 22     | UD0             | Display Data (Lower Column) |
| 23     | UD1             | Display Data (Lower Column) |
| 24     | UD2             | Display Data (Lower Column) |
| 25     | UD3             | Display Data (Lower Column) |
| 26     | VSS             | GND                         |
| 27     | UD4             | Display Data (Lower Column) |
| 28     | UD5             | Display Data (Lower Column) |
| 29     | UD6             | Display Data (Lower Column) |
| 30     | UD7             | Display Data (Lower Column) |
| 31     | VSS             | GND                         |
| 32     | DIG Y2          | NC                          |
| 33     | DIG X2          | NC                          |
| 34     | DIG Y1          | NC                          |
| 35     | DIG X1          | NC                          |

CN2 JST: BHSR-02VS-1 / Suitable Connector: SM02B-BHSS-1-TB

| PIN NO | SYMBOL | FUNCTION             |
|--------|--------|----------------------|
| 1      | VCFL   | Power Supply for CFL |
| 2      | VSS    | GND for CFL          |

7. POWER SUPPLY

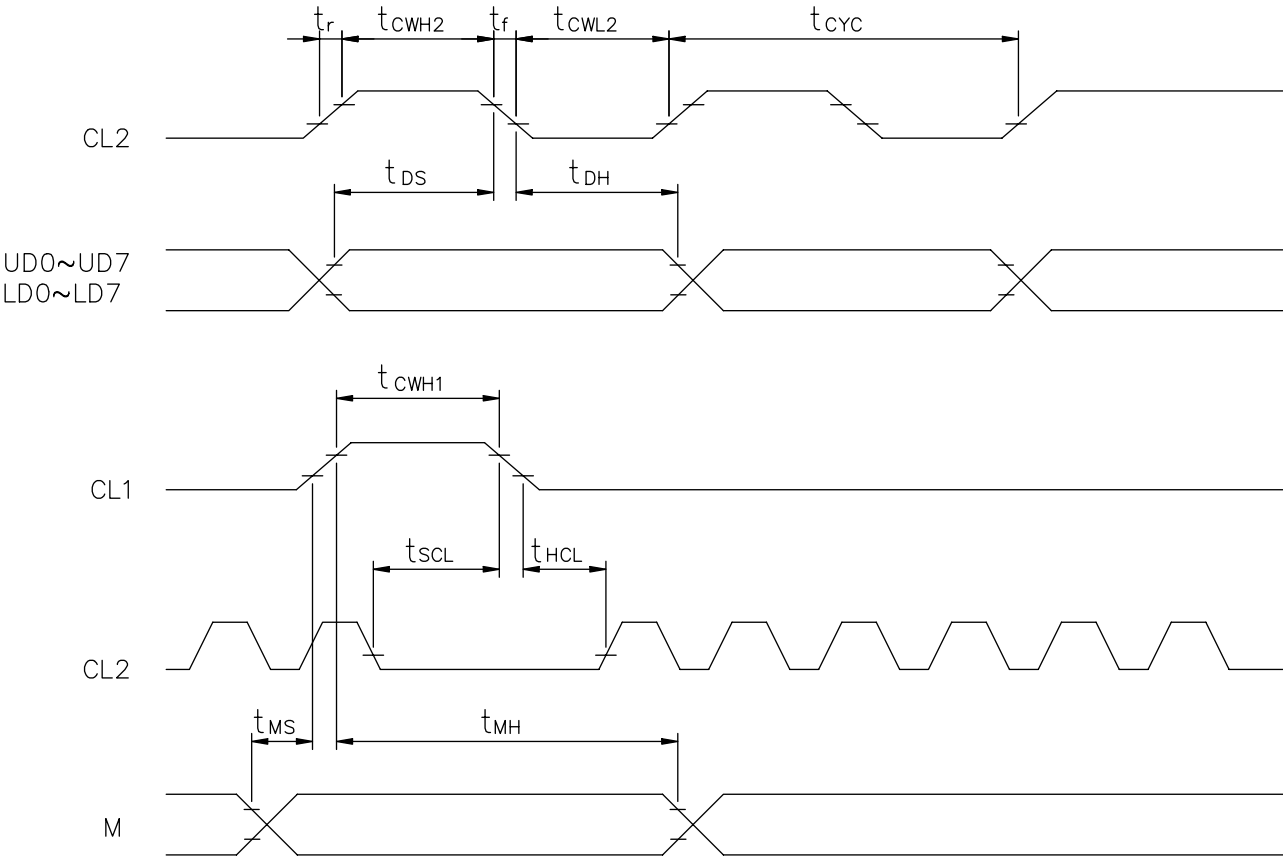


8.TIMING CHARACTERISTICS

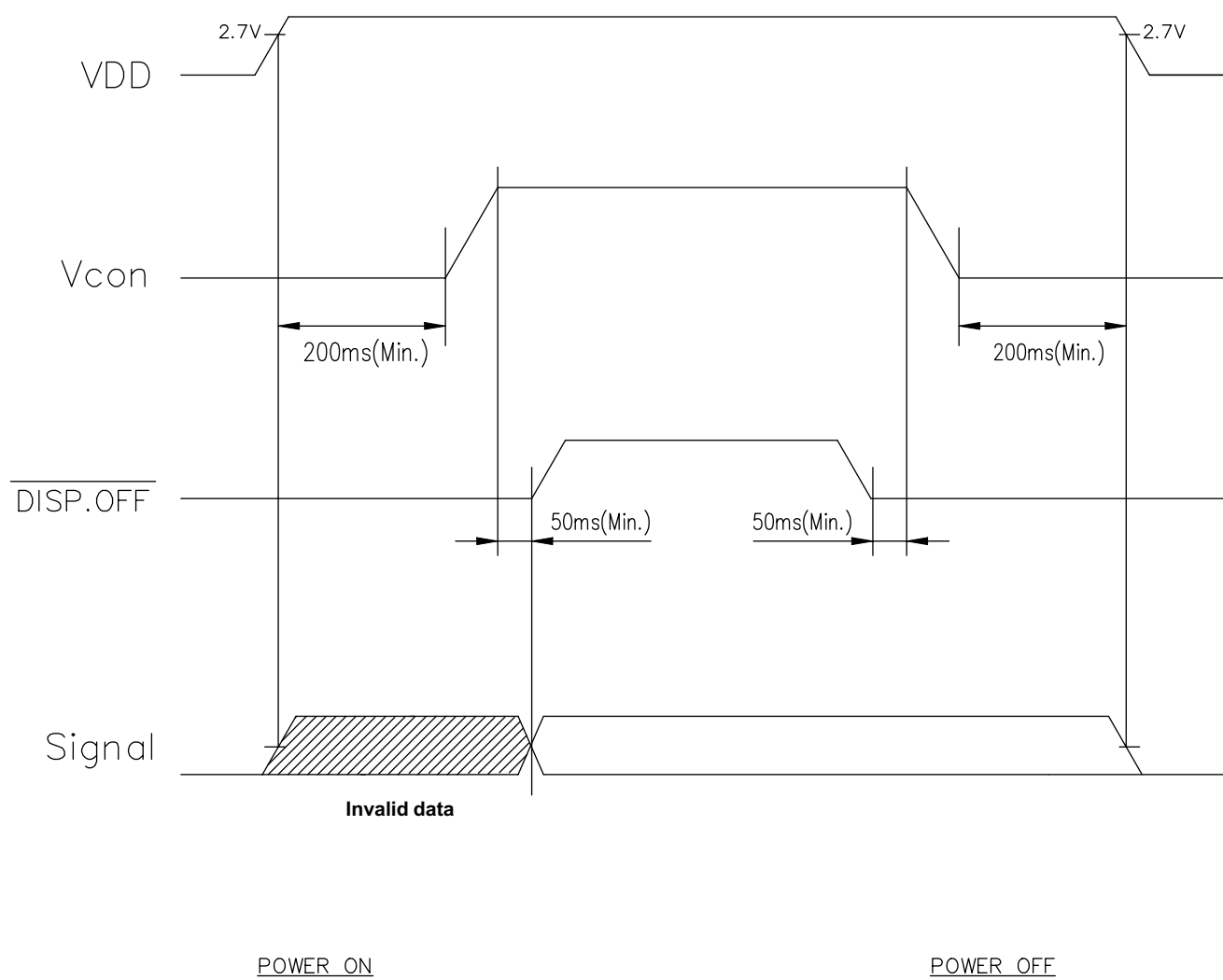
8-1.INTERFACE TIMING

VDD=3.3V

| Parameter                  | SYMBOL     | MIN. | MAX. | UNIT |
|----------------------------|------------|------|------|------|
| CLOCK CYCLE TIME           | $t_{cyc}$  | 40   | —    | ns   |
| CLOCK HIGH LEVEL WIDTH (1) | $t_{cWH2}$ | 15   | —    | ns   |
| CLOCK LOW LEVEL WIDTH (1)  | $t_{cWL2}$ | 15   | —    | ns   |
| CLOCK HIGH LEVEL WIDTH (2) | $t_{cWH1}$ | 30   | —    | ns   |
| CLOCK SETUP TIME           | $t_{sCL}$  | 20   | —    | ns   |
| CLOCK HOLD TIME            | $t_{HCL}$  | 50   | —    | ns   |
| CLOCK RISE TIME            | $t_r$      | —    | 30   | ns   |
| CLOCK FALL TIME            | $t_f$      | —    | 30   | ns   |
| DATA SETUP TIME            | $t_{DS}$   | 10   | —    | ns   |
| DATA HOLD TIME             | $t_{DH}$   | 10   | —    | ns   |
| M SETUP TIME               | $t_{MS}$   | 20   | —    | ns   |
| M HOLD TIME                | $t_{MH}$   | 20   | —    | ns   |



8-2 POWER ON/OFF TIMING



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

8-3. DISPLAY SEQUENCE

|    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|
| X1 | Y1 |    |    | Y2 |    |    |
|    | R1 | G1 | B1 | R2 | G2 | B2 |
| X2 | R1 | G1 | B1 | R2 | G2 | B2 |

|      |      |      |      |      |      |
|------|------|------|------|------|------|
| Y639 |      |      | Y640 |      |      |
| R639 | G639 | B639 | R640 | G640 | B640 |
| R639 | G639 | B639 | R640 | G640 | B640 |

|      |    |    |    |    |    |    |
|------|----|----|----|----|----|----|
| X479 | R1 | G1 | B1 | R2 | G2 | B2 |
| X480 | R1 | G1 | B1 | R2 | G2 | B2 |

|      |      |      |      |      |      |
|------|------|------|------|------|------|
| R639 | G639 | B639 | R640 | G640 | B640 |
| R639 | G639 | B639 | R640 | G640 | B640 |

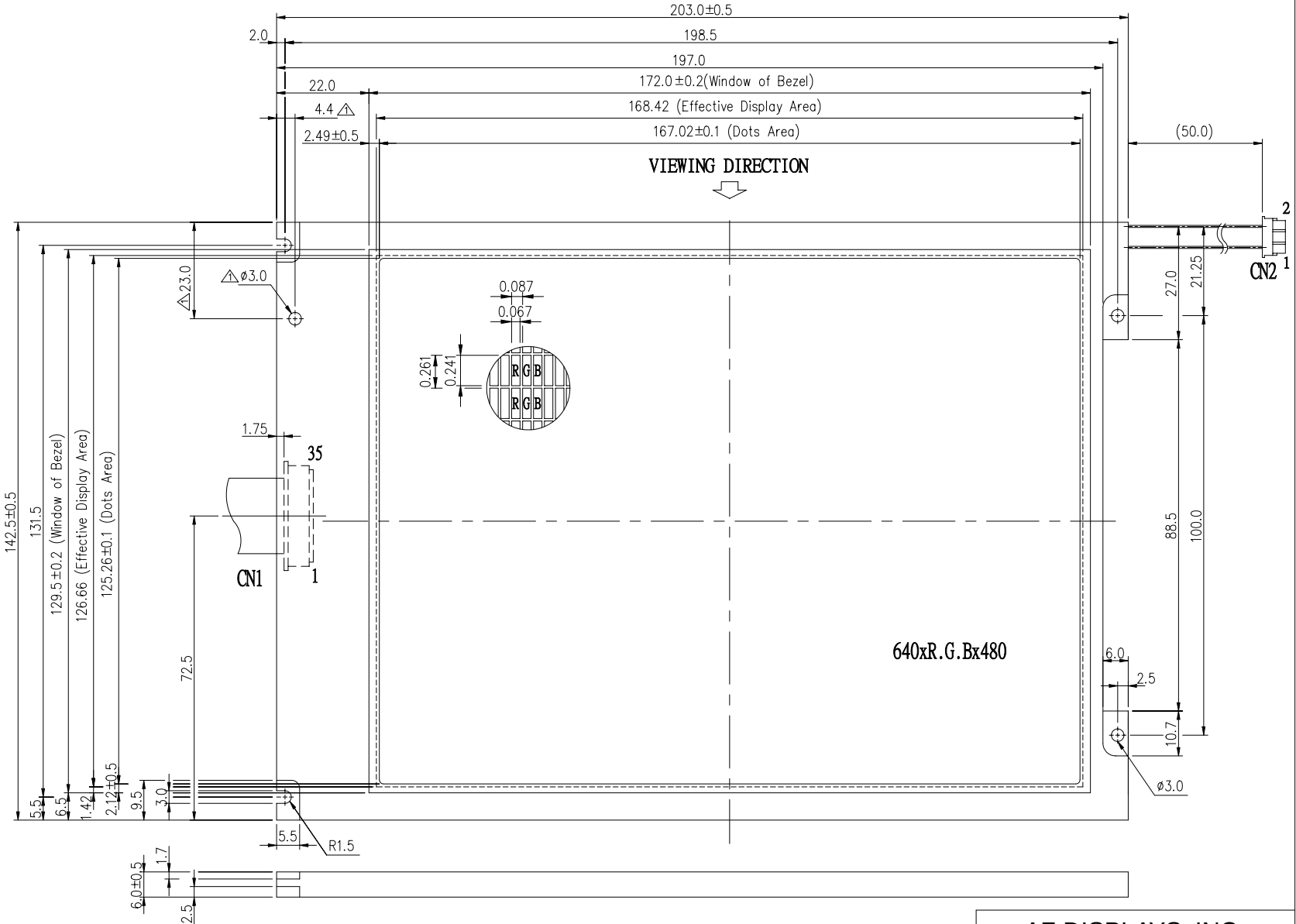
INTERNAL PIN CONNECTION  
CN1 MOLEX 54104-3511

| PIN NO | SYMBOL   | FUNCTION                    |
|--------|----------|-----------------------------|
| 1      | LD0      | Display Data (Lower Column) |
| 2      | LD1      | Display Data (Lower Column) |
| 3      | LD2      | Display Data (Lower Column) |
| 4      | LD3      | Display Data (Lower Column) |
| 5      | VSS      | GND                         |
| 6      | LD4      | Display Data (Lower Column) |
| 7      | LD5      | Display Data (Lower Column) |
| 8      | LD6      | Display Data (Lower Column) |
| 9      | LD7      | Display Data (Lower Column) |
| 10     | VSS      | GND                         |
| 11     | FLM      | First Line Marker           |
| 12     | DISP.OFF | H : ON / L : OFF            |
| 13     | CL1      | Data Latch                  |
| 14     | VSS      | GND                         |
| 15     | CL2      | Data Shift                  |
| 16     | VSS      | GND                         |
| 17     | VDD      | Poewr Supply for Logic      |
| 18     | VDD      | Poewr Supply for Logic      |
| 19     | VCON     | Contrast Adjust             |
| 20     | VSS      | GND                         |
| 21     | VSS      | GND                         |
| 22     | UD0      | Display Data (Lower Column) |
| 23     | UD1      | Display Data (Lower Column) |
| 24     | UD2      | Display Data (Lower Column) |
| 25     | UD3      | Display Data (Lower Column) |
| 26     | VSS      | GND                         |
| 27     | UD4      | Display Data (Lower Column) |
| 28     | UD5      | Display Data (Lower Column) |
| 29     | UD6      | Display Data (Lower Column) |
| 30     | UD7      | Display Data (Lower Column) |
| 31     | VSS      | GND                         |
| 32     | DIG Y2   | NC                          |
| 33     | DIG X2   | NC                          |
| 34     | DIG Y1   | NC                          |
| 35     | DIG X1   | NC                          |

CN2 JST: BHSR-02VS-1 / Suitable Connector: SM02B-BHSS-1-TB

| PIN NO | SYMBOL | FUNCTION             |
|--------|--------|----------------------|
| 1      | VCFL   | Power Supply for CFL |
| 2      | VSS    | GND for CFL          |

- NOTE:
1. RESOLUTION:640xR.G.B.x480
  2. BACKLIGHT:CCFL
  3. ALL DIMENSIONAL TOLERANCE  $\pm 0.5$  UNLESS OTHERWISE SPECIFIED



AZ DISPLAYS, INC.

AGM6448T

| REV. NO. | DESCRIPTION | DATE     | DESIGN  | CHECK | APPROVE | DWG. NO. | NAME     | DATE     | THIRD ANGLE P |
|----------|-------------|----------|---------|-------|---------|----------|----------|----------|---------------|
| 5        |             |          |         |       |         | APPROVE  | J.H.SUN  | 89.04.12 |               |
| 4        |             |          |         |       |         | CHECK    | J.H.SUN  | 89.04.11 |               |
| 3        |             |          |         |       |         | DESIGN   | J.H.SUN  | 89.03.27 |               |
| 2        |             |          |         |       |         | DRAWN    | J.H.SUN  | 89.03.27 |               |
| 1        | 增加部份尺寸      | 90.06.11 | J.H.SUN |       |         |          |          |          |               |
| REV. NO. | DESCRIPTION | DATE     | DESIGN  | CHECK | APPROVE | DWG. NO. | M379-D0A |          |               |