

AZ DISPLAYS, INC.

1. MECHANICAL DATA

| | |
|-----------------------|--|
| (1) Part Name | AGM1264B |
| (2) Module Size | 93.0(W)mm X 70.0(H)mm X MAX8.5(D)mm (W/O,EL B/L) 93.0(W)mm X 70.0(H)mm X MAX14.0(D)mm (W/ LED B/L) |
| (3) Dot Size | 0.48 (W)mm x 0.48 (H)mm |
| (4) Dot Pitch | 0.52 (W)mm x 0.52 (H)mm |
| (5) Number of Dots | 128 (W) x 64 (H)Dots |
| (6) Duty | 1/64 |
| (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(High Transparency) |
| (8) Viewing Direction | <input type="checkbox"/> 6 O'clock <input type="checkbox"/> 12 O'clock |
| (9) Backlight | <input type="checkbox"/> LED B/L <input type="checkbox"/> EL B/L <input type="checkbox"/> W/O B/L |
| (10) Weight | W/O B/L: 54.5 g (APPROX.) EL B/L: 56.5 g (APPROX.) LED B/L: 76.5 g (APPROX.) |

Revised: January 6, 2003

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 | |
| Input Voltage | VI | -0.3 | VDD | V | |
| Static Electricity | - | - | - | - | Note 1 |

Note 1 LCM should be grounded during handling

(2) ENVIRONMENTAL ABSOLUTE MAXIMUM RATINGS

| ITEM | NORMAL TEMP. | | | | WIDE TEMP. | | | |
|---------------------------------|--------------|------|----------|------|------------|------|----------|------|
| | OPERATING | | STORAGE | | OPERATING | | STORAGE | |
| | MIN. | MAX. | MIN. | MAX. | MIN. | MAX. | MIN. | MAX. |
| Ambient Temperature | 0 | 50 | -20 | 70 | -20 | 70 | -30 | 80 |
| Humidity (Without Condensation) | Note 2,4 | | Note 3,4 | | Note 4,5 | | Note 4,6 | |

Note 2 Ta \leq 50°C : 85%RH max
 Ta > 50°C : Absolute humidity must be lower
 than the humidity of 85%RH at 50°C

Note 3 Ta at -20°C will be < 48hrs, at 70°C will be < 120hrs

Note 4 Background color changes slightly depending on ambient temperature.
 This phenomenon is reversible.

Note 5 Ta \leq 70°C : 75%RH max
 Ta > 70°C : Absolute humidity must be lower
 than the humidity of 75%RH at 70°C

Note 6 Ta at -30°C will be < 48hrs, at 80°C will be < 120hrs

3-2.ELECTRICAL CHARACTERISTICS OF LED BACKLIGHT

Temp.=25°C

| ITEM | SYMBOL | MIN. | TYP. | MAX. | UNIT | REMARK |
|-------------------------|--------|------|-------|------|------|---------------------------|
| Peak forward current | I_P | — | — | 540 | mA | — |
| Maximum reverse voltage | V_R | — | — | 8 | V | — |
| Applied forward current | I_F | — | 250 | 540 | mA | at $V_F = 4.2$ V |
| Applied forward voltage | V_F | — | 4.2 | — | V | at $I_F = 250$ mA |
| LED power consumption | P_F | — | 1.1 | — | W | — |
| LED lifetime | L_L | — | 40000 | — | hrs | at $I_F = 250$ mA (*1) |

(*1) LED lifetime is defined as the time taken for the brightness to reduce to 50% of original value.

3-3.ELECTRICAL CHARACTERISTICS OF EL BACKLIGHT

Temp.=25°C

| ITEM | SYMBOL | MIN. | TYP. | MAX. | UNIT | REMARK |
|---------------------------|----------------|------|------|------|-------|----------------------------|
| Maximum applied voltage | V _L | — | — | 150 | Vrms | — |
| Maximum applied frequency | F _L | — | — | 1000 | Hz | — |
| EL current | I _L | — | 5.0 | 8.0 | mArms | at 110 Vrms 400 Hz |
| EL power consumption | P _L | — | 0.55 | — | W | (*1) |
| EL lifetime | L _L | — | 1000 | — | hrs | at 110 Vrms 400 Hz (*2) |

(*1) Power consumption excludes inverter loss .

(*2) EL lifetime is defined as the time taken for the brightness to reduce to 50% of original value.

4. OPTICAL CHARACTERISTICS

AT V_{OP}

| ITEM MODE | | Cr(Contrast Ratio) | | | | | | | | | | θ (Viewing Angle) | | ϕ (Viewing Angle) | |
|--------------|---|--------------------|------|------|------|------|------|------|------|------|------|--------------------------|-------|------------------------|------|
| | | -20°C | | 0°C | | 25°C | | 50°C | | 70°C | | 25°C | | 25°C | |
| | | MIN. | TYP. | MIN. | TYP. | MIN. | TYP. | MIN. | TYP. | MIN. | TYP. | MIN. | TYP. | MIN. | TYP. |
| H | A | 2.0 | 3.0 | 2.5 | 3.5 | 3.0 | 4.0 | 2.5 | 3.5 | 1.5 | 2.5 | - | 28-20 | - | ±22 |
| H | C | 2.5 | 3.5 | 3.0 | 4.0 | 3.5 | 4.5 | 3.0 | 4.0 | 2.0 | 3.0 | - | 31-23 | - | ±25 |
| Note | | NOTE 6 | | | | | | | | | | NOTE 5 | | | |

Note:

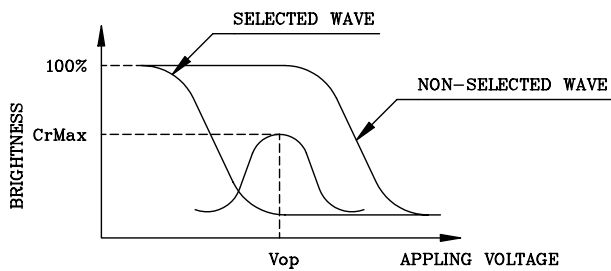
H: Transflective(High Transparency)
 A: Gray , 6 Clock
 C: Yellow , 6 O'clock

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

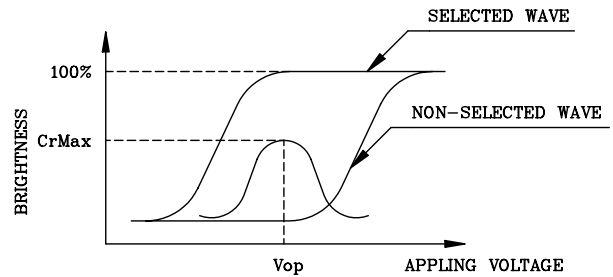
| ITEM | SYMBOL | CONDITION | MIN. | TYP. | MAX. | UNIT | NOTE |
|----------------------|--------|-----------|------|------|------|------|--------|
| Response Time (rise) | Tr | -20°C | 2800 | 3500 | 5200 | ms | Fig. 2 |
| | | 0°C | 680 | 850 | 1270 | | |
| | | 25°C | 160 | 200 | 300 | | |
| | | 50°C | 95 | 120 | 180 | | |
| | | 70°C | 45 | 60 | 90 | | |
| Response Time (fall) | Tf | -20°C | 1900 | 2400 | 3600 | ms | Fig. 2 |
| | | 0°C | 400 | 500 | 600 | | |
| | | 25°C | 95 | 120 | 180 | | |
| | | 50°C | 40 | 50 | 75 | | |
| | | 70°C | 30 | 40 | 60 | | |

(NOTE 1)

Definition of Operation Voltage(Vop)



(positive type)



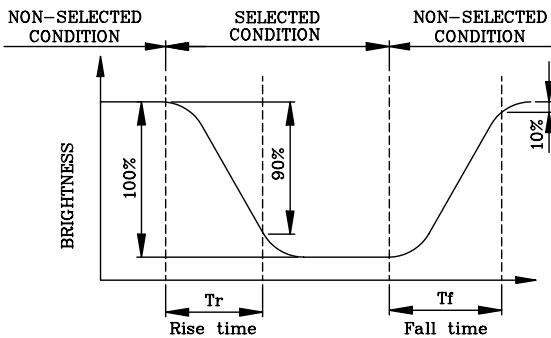
(negative type)

*Conditions

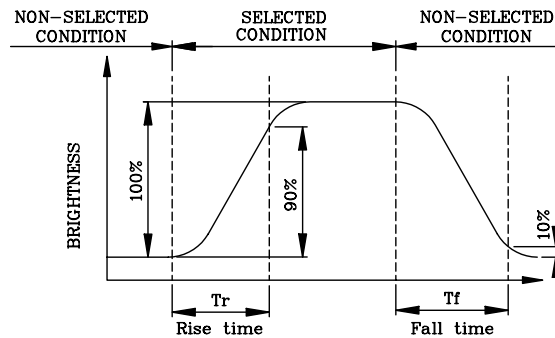
- Viewing Angle : 0
- Frame Frequency : 70Hz
- Applied Waveform : 1/N duty 1/a bias

(NOTE 2)

Definition of Response Time(Tr,Tf)



(positive type)



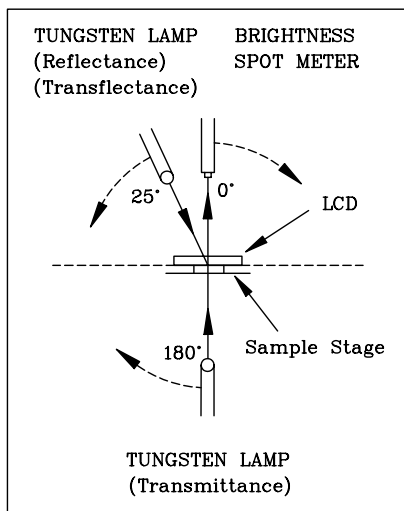
(negative type)

*Conditions

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

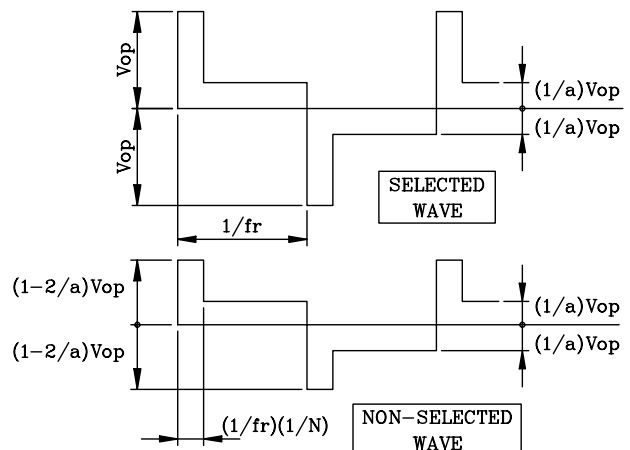
(NOTE 3)

Description of Measuring Equipment and Driving Waveforms



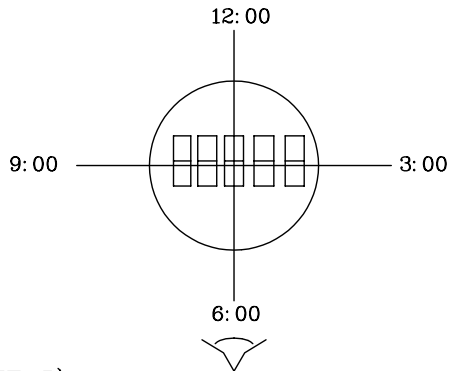
CONST.
TEMP.
CHAMBER

Multiplex Driving (1/N duty 1/a bias)



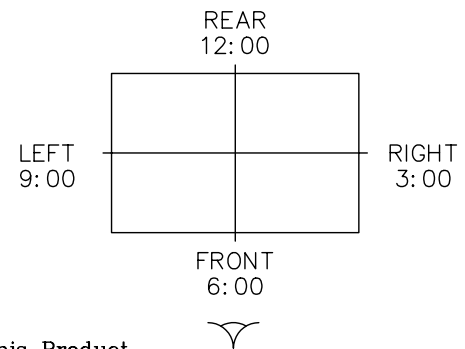
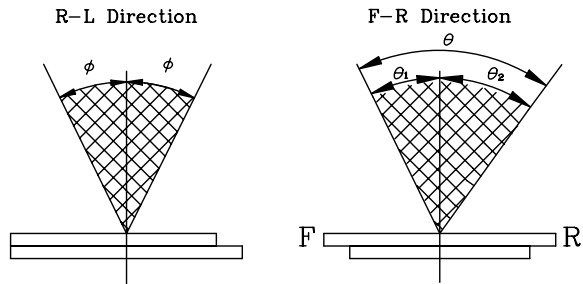
(NOTE 4)

Definition of Viewing Direction



(NOTE 5)

Definition of Viewing Angle



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

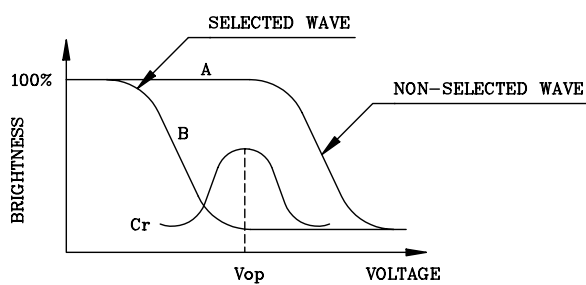
$$\theta = \theta_1 + \theta_2$$

*Conditions

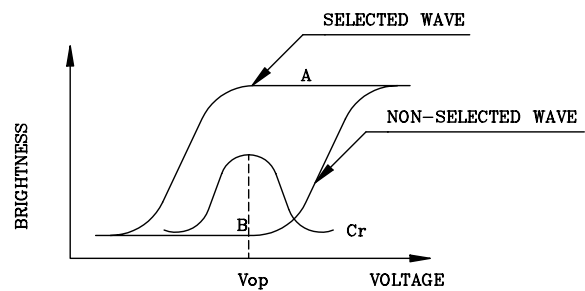
Operating Voltage : V_{op}
Frame Frequency : 70Hz
Applied Waveform : 1/N duty 1/a bias
Contrast Ratio : larger than 2

(NOTE 6)

Definition of Contrast Ratio (Cr)



(positive type)



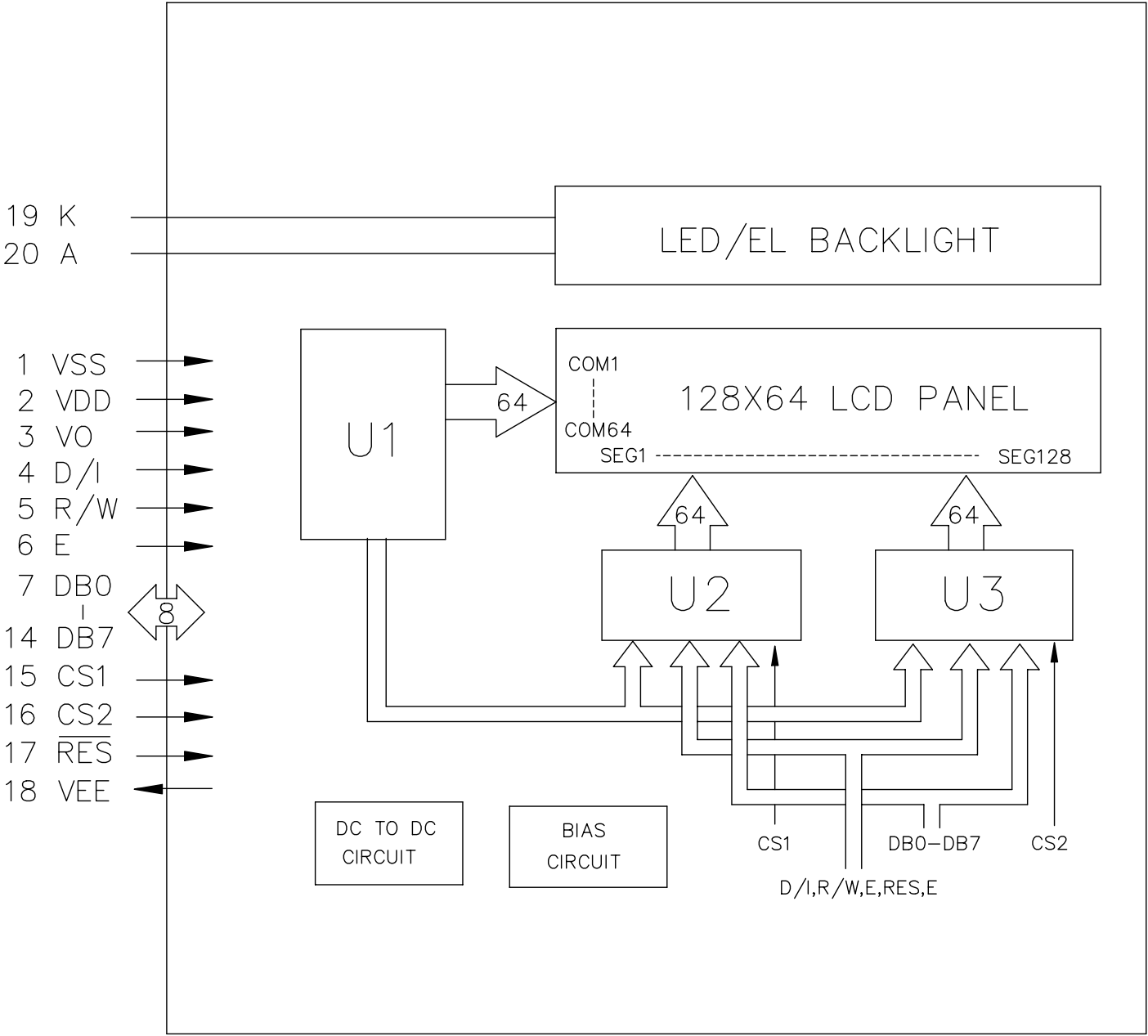
(negative type)

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

*Conditions

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

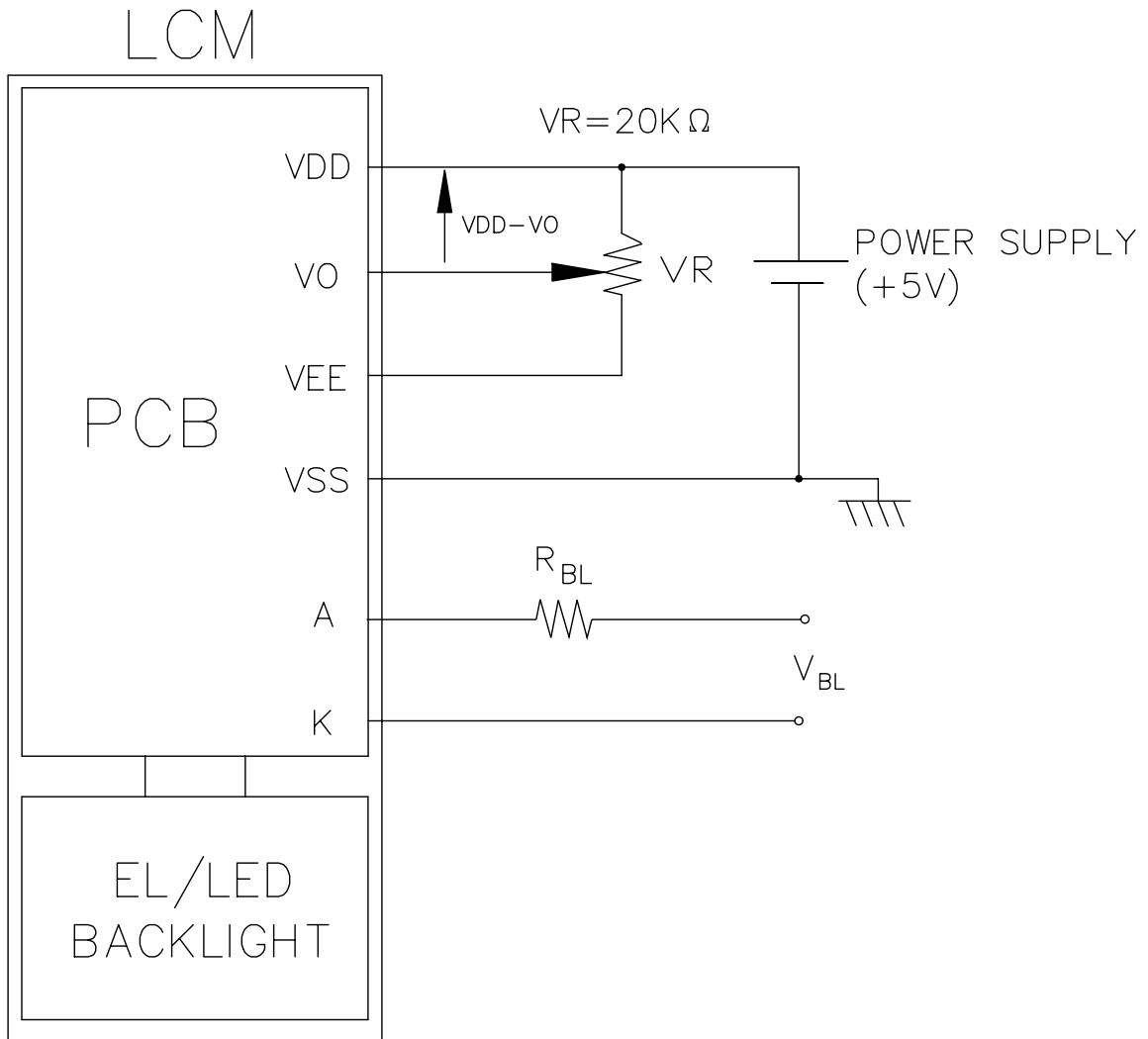
5. BLOCK DIAGRAM



6. INTERNAL PIN CONNECTION

| Pin No. | Symbol | Level | Function |
|---------|-------------------------|--------|---|
| 1 | V _{SS} | — | 0V +5V Power Supply |
| 2 | V _{DD} | — | |
| 3 | V _O | — | OPERATING VOLTAGE FOR LCD DRIVING |
| 4 | D/I | H/L | H: DATA INPUT L: INSTRUCTION CODE INPUT |
| 5 | R/W | H/L | H: DATA READ (LCM TO MPU) L: DATA WRITE (MPU TO LCM) |
| 6 | E | H, H→L | ENABLE SIGNAL |
| 7 | DB0 | H/L | DATA BUS LINE |
| 8 | DB1 | H/L | |
| 9 | DB2 | H/L | |
| 10 | DB3 | H/L | |
| 11 | DB4 | H/L | |
| 12 | DB5 | H/L | |
| 13 | DB6 | H/L | |
| 14 | DB7 | H/L | |
| 15 | CS1 | H | CHIP SELECT FOR IC1 |
| 16 | CS2 | H | CHIP SELECT FOR IC2 |
| 17 | $\overline{\text{RES}}$ | L | RESET ACTIVE "L" |
| 18 | VEE | — | NEGATIVE VOLTAGE OUTPUT |
| 19 | K | — | CATHODE FOR EL/LED BACKLIGHT |
| 20 | A | — | ANODE FOR EL/LED BACKLIGHT |

7. POWER SUPPLY



Recommended Value for R_{BL} and V_{BL}

| ITEM Back Light Interface | R_{BL} | | V_{BL} | |
|------------------------------------|-----------|-----------|------------------------------|------------------|
| | EL | LED | EL | LED |
| 19,20 PIN | 0Ω | 5Ω | 110 V _{Ac} 400Hz | 5V _{Dc} |

8. TIMING CHARACTERISTICS

8-1 INTERFACE TIMING

| Item | Symbol | Test condition | Min. | Typ. | Max. | Unit |
|---------------------|------------|-----------------|------|------|------|------|
| Enable cycle time | t_{cyc} | Fig. a , Fig. b | 1000 | - | - | ns |
| E high level width | P_{WEH} | Fig. a , Fig. b | 450 | - | - | ns |
| E low level width | P_{WEL} | Fig. a , Fig. b | 450 | - | - | ns |
| E rise/fall time | t_r, t_f | Fig. a , Fig. b | - | - | 25 | ns |
| Address set up time | t_{AS} | Fig. a , Fig. b | 140 | - | - | ns |
| Address hold time | t_{AH} | Fig. a , Fig. b | 10 | - | - | ns |
| Data delay time | t_{DDR} | Fig. b | - | - | 320 | ns |
| Data set up time | t_{DSW} | Fig. a | 200 | - | - | ns |
| Data hold time (WR) | t_{DHW} | Fig. a | 10 | - | - | ns |
| Data hold time (RD) | t_{DHR} | Fig. b | 20 | - | - | ns |

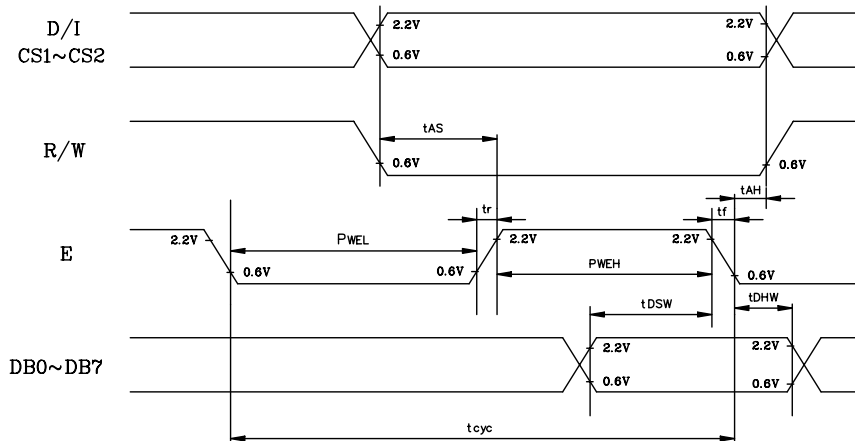


Fig . a Interface timing (data write)

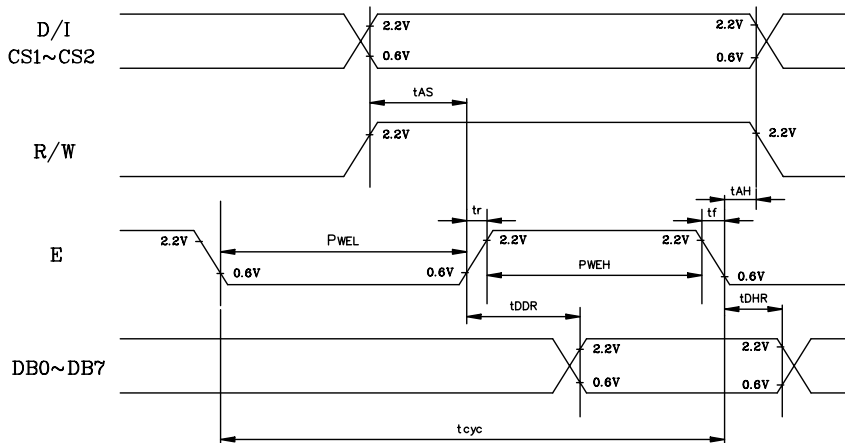
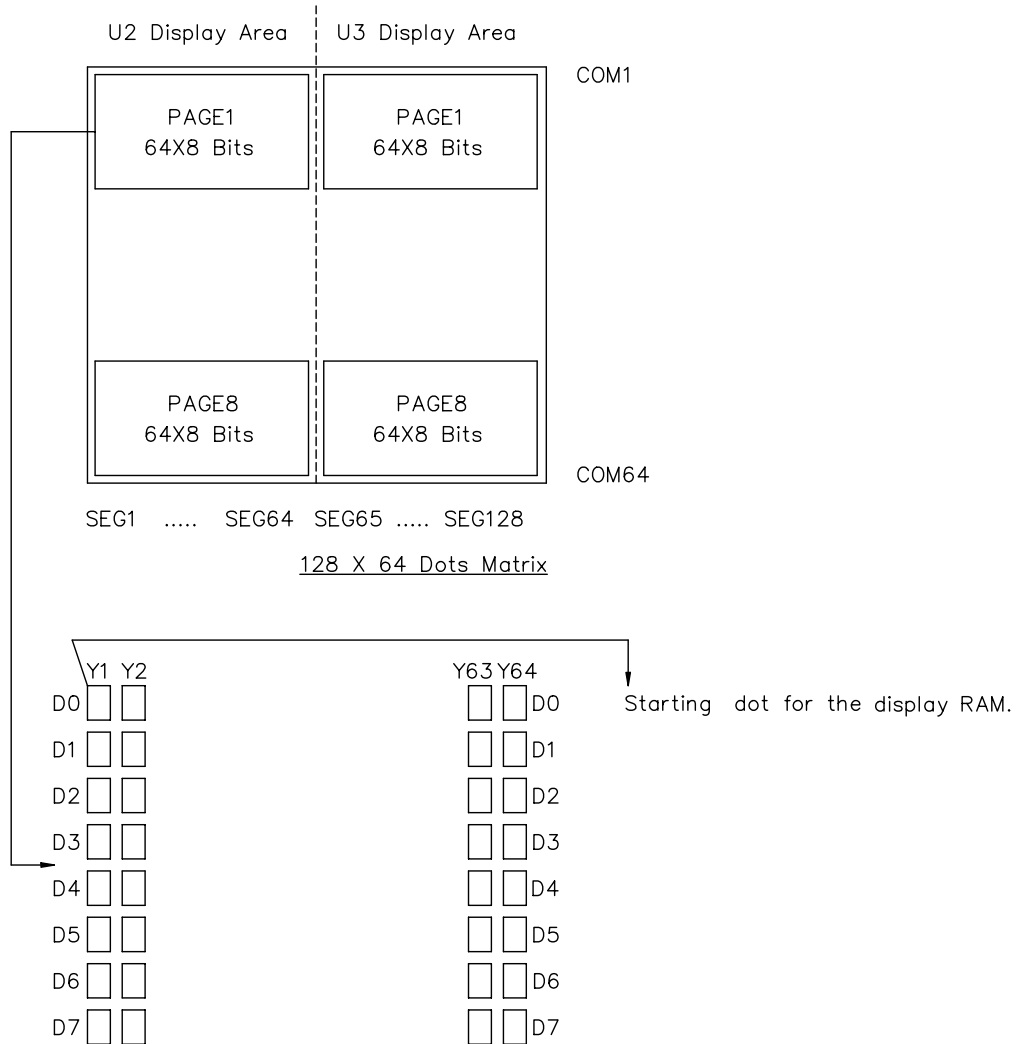


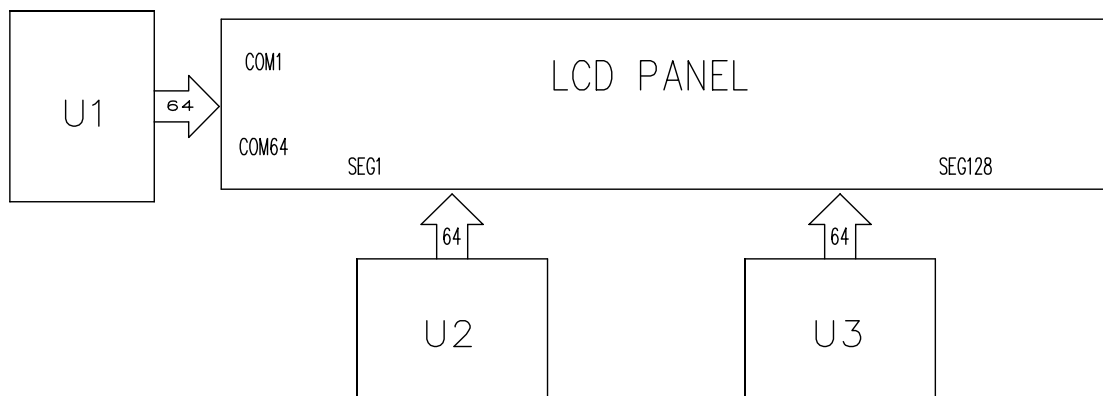
Fig . b Interface timing (data read)

Fig. b Interface timing (data read)

8-2 DISPLAY PATTERN



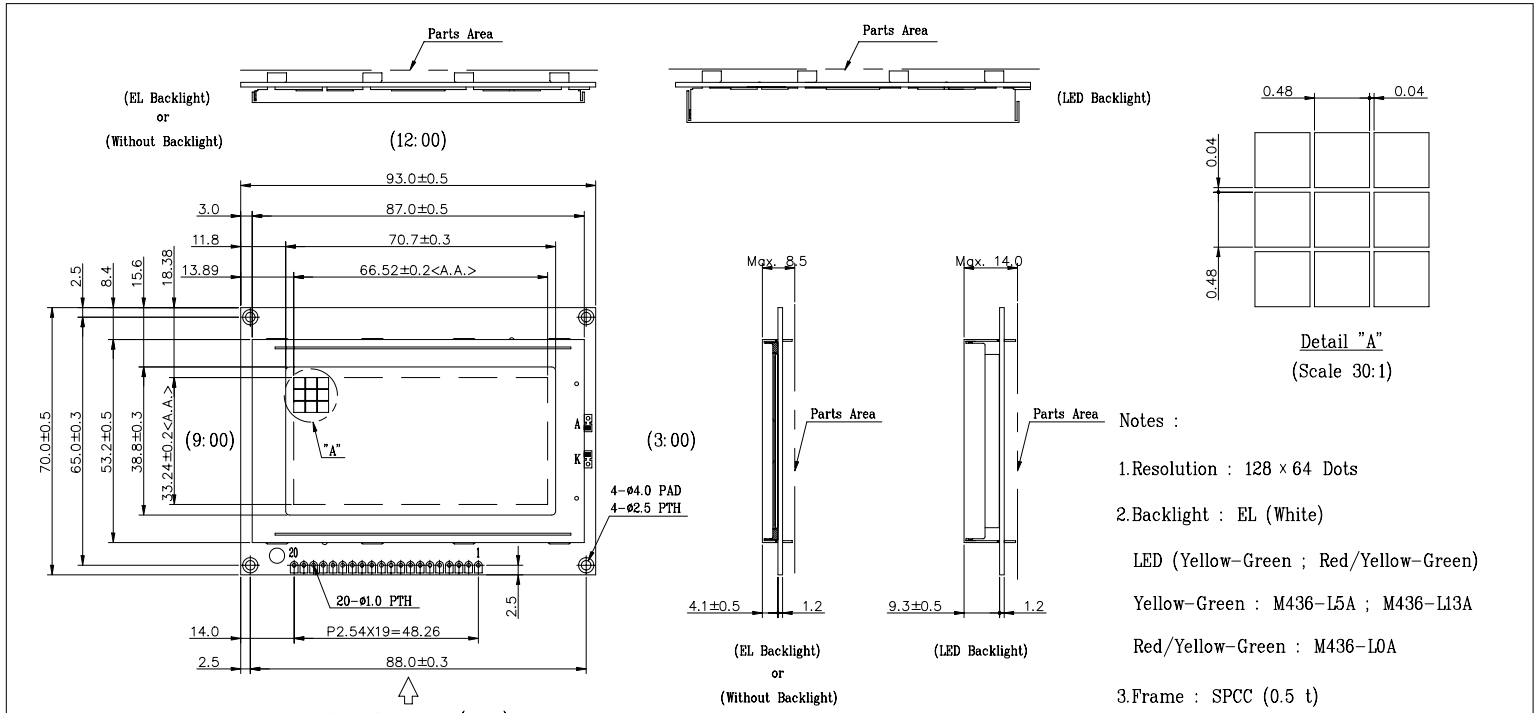
Each segment driver has 8 pages RAM , and each page has 64 x 8 bits RAM .
D0~D7 are 8 bits transmitted data , where D0 is LSB and D7 is MSB .



8-3 DISPLAY CONTROL INSTRUCTION

The display control instructions control the internal state of the KS0108B. Instructions are received from MPU to KS0108B for the display control.

| Instruction | D/I | R/W | DB7 | DB6 | DB5 | DB4 | DB3 | DB2 | DB1 | DB0 | FUNCTION | |
|-------------------------|-----|-----|------------|-----|--------------------------|-------|-----|-----------|-----|-----|---|---|
| Display ON/OFF | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 0/1 | Controls the display on or off. Internal status and display RAM data is not affected. 0: OFF , 1: ON | |
| Set Address | 0 | 0 | 0 | 1 | Y address(0~63) | | | | | | Sets the Y address in the Y address counter. | |
| Set Page (X address) | 0 | 0 | 1 | 0 | 1 | 1 | 1 | Page(0~7) | | | Sets the X address at the X address register. | |
| Display Start Line | 0 | 0 | 1 | 1 | Display start line(0~63) | | | | | | Indicates the display data RAM displayed at the top of the the screen. | |
| Status Read | 0 | 1 | BUSY | 0 | ON/OFF | RESET | 0 | 0 | 0 | 0 | Read status. BUSY 0: Ready 1: In operation ON/OFF 0: Display ON 1: Display OFF RESET 0: Normal 1: Reset | |
| Write Display Data | 1 | 0 | Write Data | | | | | | | | | Writes data(DB0:7) into display data RAM. After writing instruction, Y address is increased by 1 automatically. |
| Read Display Data | 1 | 1 | Read Data | | | | | | | | | Reads data(DB0:7) from display data RAM to the data bus. |



- Notes :
- Resolution : 128 × 64 Dots
 - Backlight : EL (White)
LED (Yellow-Green ; Red/Yellow-Green)
Yellow-Green : M436-L5A ; M436-L13A
Red/Yellow-Green : M436-L0A
 - Frame : SPCC (0.5 t)
 - DC/DC Converter : Built-In

| Pin No. | Symbol | Level | Function | Pin No. | Symbol | Level | Function |
|---------|--------|-------|---|---------|--------|-------|------------------------------|
| 1 | VSS | - | 0V | 10 | DB3 | | Data Bus Line |
| 2 | VDD | - | +5V | 11 | DB4 | | |
| 3 | VO | - | Operating Voltage for LCD Driving | 12 | DB5 | H/L | |
| 4 | D/I | H/L | H : Data Input L : Instruction Code Input | 13 | DB6 | | |
| 5 | R/W | H/L | H : Data Read (LCM to MPU) L : Data Write (MPU to LCM) | 14 | DB7 | | Chip Select for IC1 |
| 6 | E | H/L | Enable Signal | 15 | CS1 | H | Chip Select for IC2 |
| 7 | DB0 | | Data Bus Line | 16 | CS2 | H | Reset Active "L" |
| 8 | DB1 | H/L | | 17 | RES | L | Negative Voltage Output |
| 9 | DB2 | | | 18 | VEE | - | Cathode for EL/LED Backlight |
| | | | | 19 | K | - | Anode for EL/LED Backlight |
| | | | | 20 | A | - | |

GENERAL TOLERANCE LIST

| DIMENSION | TOLERANCE |
|--------------|------------|
| L ≤ 6 | ±0.25 (mm) |
| 6 < L ≤ 18 | ±0.3 (mm) |
| 18 < L ≤ 50 | ±0.4 (mm) |
| 50 < L ≤ 125 | ±0.5 (mm) |
| 125 < L | ±0.6 (mm) |
| ANGLE | ±1° (DEG) |

AZ DISPLAYS, INC.

AGM1264B

| APPROVE | DATE | THIRD ANGLE P. |
|---------|--------------------|----------------|
| CHECK | | |
| DESIGN | J.S HUANG 90.07.04 | |
| DRAWN | J.S HUANG 90.07.04 | SCALE UNIT |
| | NAME DATE | 1/1 mm |

DWG NO. M436DD0A

| REV. NO. | DESCRIPTION | DATE | DESIGN | CHECK | APPROVE |
|----------|-------------|------|--------|-------|---------|
| | | | | | |