

AZ Displays, Inc.

1. MECHANICAL DATA

| | |
|-----------------------|---|
| (1) Product No. | AGM1532A |
| (2) Module Size | 116.50 (W)mm x 42.0 (H)mm x MAX15.0 (D)mm (LED B.L.) 116.50 (W)mm x 42.0 (H)mm x MAX9.5 (D)mm (W/O B.L.) |
| (3) Dot Size | 0.50 (W)mm x 0.55 (H)mm |
| (4) Dot Pitch | 0.55 (W)mm x 0.60 (H)mm |
| (5) Duty | 1/32 |
| (6) 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 |
| (7) Viewing Direction | <input type="checkbox"/> 6 O'clock <input type="checkbox"/> 12 O'clock <input type="checkbox"/> ___O'clock |
| (8) Backlight | <input type="checkbox"/> W/O <input type="checkbox"/> LED <input type="checkbox"/> EL |
| (9) Weight | LED B/L: 70.0 g W/O B/L: 54.5 g |

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2. ABSOLUTE MAXIMUM RATINGS

(1) ELECTRICAL ABSOLUTE RATINGS

V_{SS}=0V

| | SYMBOL | MIN | MAX | UNIT | COMMENT |
|------------------------|----------------|------|-----|------|---------|
| Power Supply for Logic | VDD-VSS | -0.3 | 6.5 | V | |
| Input Voltage | V _I | -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 1,3 | | Note 2,3 | | Note 3,4 | | Note 3,5 | |

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

Note 2 Ta 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.

Note 4 Ta ≤ 70°C : 75%RH max
 Ta > 70°C : Absolute humidity must be lower
 than the humidity of 75%RH at 70°C

Note 5 Ta at -30°C will be < 48hrs, at 80°C will be < 120hrs

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3. ELECTRICAL CHARACTERISTICS

(VDD=5V±10%)

| ITEM | SYMBOL | CONDITION | MIN. | TYP. | MAX. | UNIT |
|---|--------------------|---|--------|------|--------|------|
| Input Voltage | V _{IH} | H level | 0.8VDD | – | VDD | V |
| | V _{IO} | L level | 0 | – | 0.2VDD | V |
| Recommended LC Driving Voltage (NORMAL TEMP. LCM) | VDD–V _O | 0℃ | – | 7.5 | 8.0 | V |
| | | 25℃ | 6.3 | 6.8 | 7.3 | |
| | | 50℃ | 5.6 | 6.1 | – | |
| Recommended LC Driving Voltage (WIDE TEMP. LCM) | VDD–V _O | –20℃ | 8.1 | 8.5 | 8.9 | V |
| | | 0℃ | 7.9 | 8.3 | 8.7 | |
| | | 25℃ | 7.6 | 8.0 | 8.4 | |
| | | 50℃ | 7.3 | 7.7 | 8.1 | |
| | | 70℃ | 6.7 | 7.1 | 7.5 | |
| Power Supply Current | I _{DD} | VDD = 5.0V | – | – | 5.0 | mA |
| LED Power Supply Current | I _{LED} | V _{BL} = 5.0V _{DC} R _{LED} = 5.0Ω | – | 170 | – | mA |

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4.1 OPTICAL CHARACTERISTICS

(FOR NORMAL TEMPERATURE MODE LCM)

AT Vop

| ITEM MODE | | Cr(Contrast Ratio) | | θ (Viewing Angle) | | ϕ (Viewing Angle) | |
|--------------|---|--------------------|------|--------------------------|------|------------------------|------|
| | | 25℃ | | 25℃ | | 25℃ | |
| | | MIN. | TYP. | MIN. | TYP. | MIN. | TYP. |
| R | A | 2.5 | 3.4 | 30 | 40 | 20 | 30 |
| | C | 4.0 | 8.0 | 40 | 60 | 25 | 40 |
| | J | | | | | | |
| S | A | | | | | | |
| | C | 4.0 | 7.0 | 40 | 60 | 25 | 35 |
| | J | | | | | | |
| T | E | | | | | | |
| | C | 3.0 | 6.0 | 40 | 50 | 20 | 35 |
| NOTE | | NOTE6 | | NOTE5 | | | |

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

| ITEM | SYMBOL | CONDITION | MIN. | TYP. | MAX. | UNIT | NOTE |
|----------------------|--------|-----------|------|------|------|------|--------|
| Response Time (rise) | Tr | 0℃ | — | 470 | 940 | ms | NOTE 2 |
| | | 25℃ | — | 140 | 300 | | |
| | | 50℃ | — | 70 | 150 | | |
| Response Time (fall) | Tf | 0℃ | — | 520 | 1000 | ms | NOTE 2 |
| | | 25℃ | — | 180 | 350 | | |
| | | 50℃ | — | 110 | 220 | | |

NOTE :

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

AZ Displays, Inc.

4.2 OPTICAL CHARACTERISTICS

(FOR WIDE NORMAL TEMPERATURE MODE LCM)

AT V_{op}

| ITEM MODE | | Cr(Contrast Ratio) | | θ (Viewing Angle) | | ϕ (Viewing Angle) | |
|--------------|---|--------------------|------|--------------------------|------|------------------------|------|
| | | 25℃ | | 25℃ | | 25℃ | |
| | | MIN. | TYP. | MIN. | TYP. | MIN. | TYP. |
| R | A | | | | | | |
| | C | | | | | | |
| | J | | | | | | |
| S | A | | | | | | |
| | C | — | 6.5 | — | 60 | — | 90 |
| | J | | | | | | |
| T | E | | | | | | |
| | C | | | | | | |
| NOTE | | NOTE6 | | NOTE5 | | | |

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

| ITEM | SYMBOL | CONDITION | MIN. | TYP. | MAX. | UNIT | NOTE |
|----------------------|--------|-----------|------|------|------|------|--------|
| Response Time (rise) | Tr | -20℃ | — | 1800 | 2700 | ms | NOTE 2 |
| | | 0℃ | — | 400 | 600 | | |
| | | 25℃ | — | 150 | 230 | | |
| | | 50℃ | — | 70 | 110 | | |
| | | 70℃ | — | 70 | 110 | | |
| Response Time (fall) | Tf | -20℃ | — | 1060 | 1590 | ms | NOTE 2 |
| | | 0℃ | — | 250 | 380 | | |
| | | 25℃ | — | 105 | 160 | | |
| | | 50℃ | — | 65 | 100 | | |
| | | 70℃ | — | 60 | 90 | | |

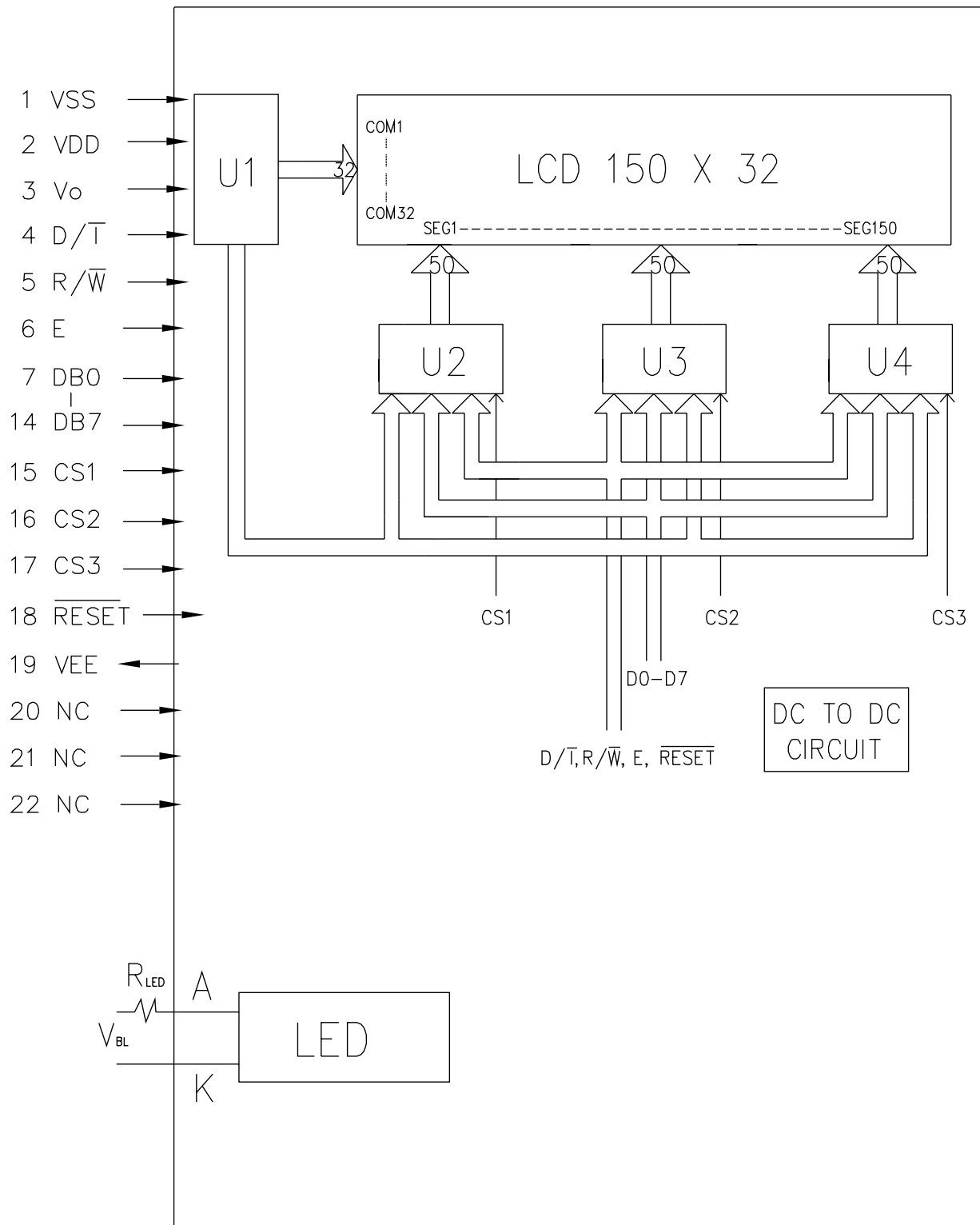
NOTE :

R: REFLECTIVE
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 T: TRANSMISSIVE
 A: GRAY
 C: YELLOW

E: BLUE
 G: NORMALLY BLACK
 J: NORMALLY WHITE

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5. BLOCK DIAGRAM



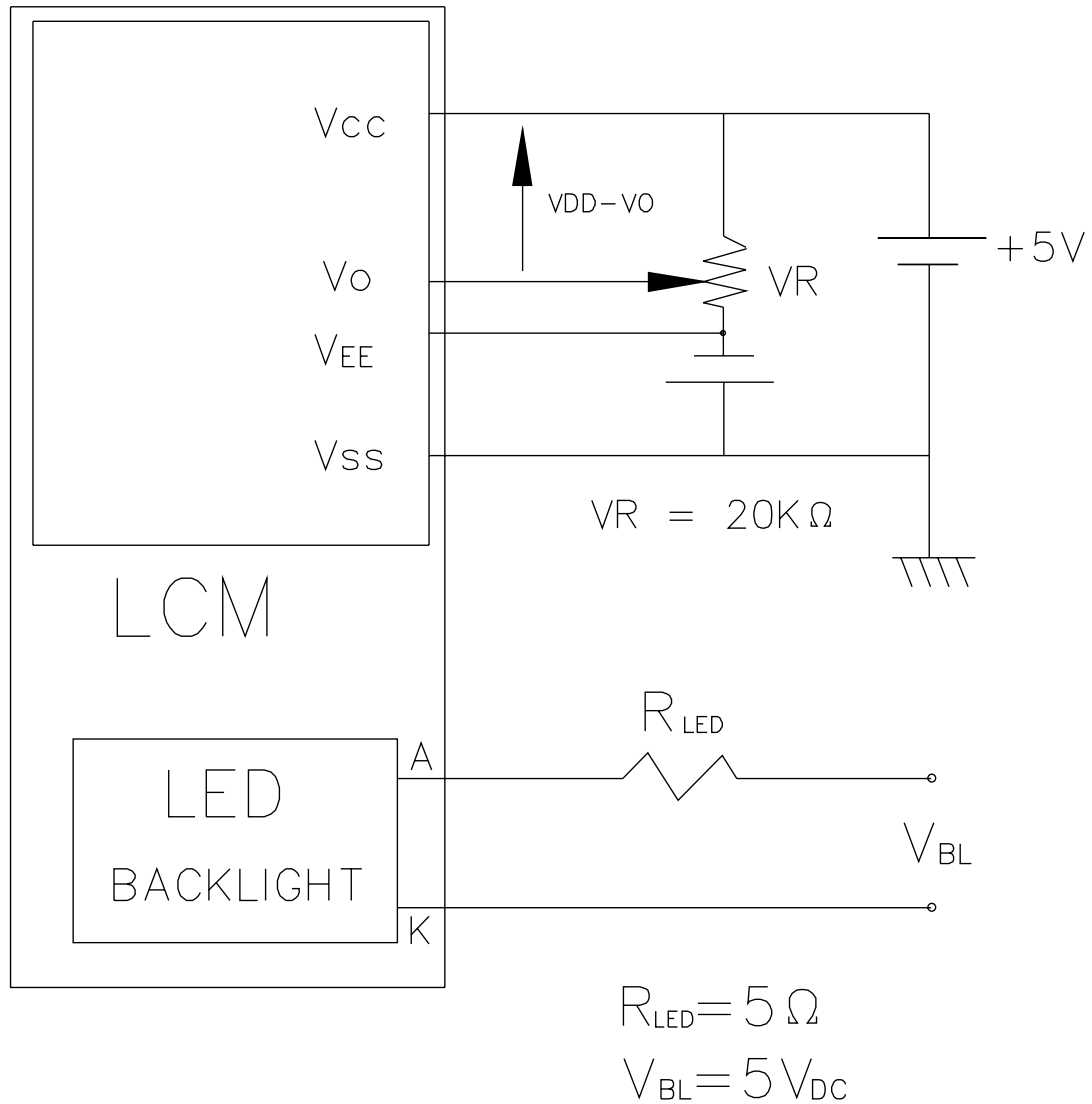
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6. INTERNAL PIN CONNECTION

| Pin No. | Symbol | Level | Function | |
|---------|---------------------------|--------|---|--------------|
| 1 | V _{SS} | — | 0V | POWER SUPPLY |
| 2 | V _{DD} | — | +5V | |
| 3 | V ₀ | — | OPERATING VOLTAGE FOR LCD DRIVING | |
| 4 | D/ \bar{T} | H/L | H: DATA INPUT L: INSTRUCTION CODE INPUT | |
| 5 | R/ \bar{W} | H/L | H: DATA READ (FROM LCM TO MPU) L: DATA WRITE (FROM 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 | CS3 | H | CHIP SELECT FOR IC3 | |
| 18 | $\overline{\text{RESET}}$ | L | " L " ACTIVE | |
| 19 | VEE | — | POWER SUPPLY FOR LCD DRIVING | |
| 20 | NC | — | NONE CONNECTION | |
| 21 | NC | — | NONE CONNECTION | |
| 22 | NC | — | NONE CONNECTION | |

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7. POWER SUPPLY



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8. TIMING CHARACTERISTICS

| Item | Symbol | Test condition | Min. | Typ. | Max. | Unit |
|---------------------|------------|----------------|------|------|------|------|
| Enable cycle time | t_{cyc} | Fig a, Fig.b | 500 | — | — | ns |
| E high level width | P_{WEH} | Fig a, Fig.b | 220 | — | — | ns |
| E low level width | P_{WEL} | Fig.a, Fig.b | 220 | — | — | ns |
| E rise/fall time | t_r, t_f | Fig a, Fig.b | — | — | 20 | ns |
| Address set up time | t_{AS} | Fig a, Fig.b | 40 | — | — | ns |
| Address hold time | t_{AH} | Fig a, Fig.b | 10 | — | — | ns |
| Data delay time | t_{DDR} | Fig.b | — | — | 140 | ns |
| Data set up time | t_{DSW} | Fig.a | 60 | — | — | ns |
| Data hold time (WR) | t_{DHW} | Fig.a | 10 | — | — | ns |
| Data hold time (RD) | t_{DHR} | Fig.b | 20 | — | — | ns |

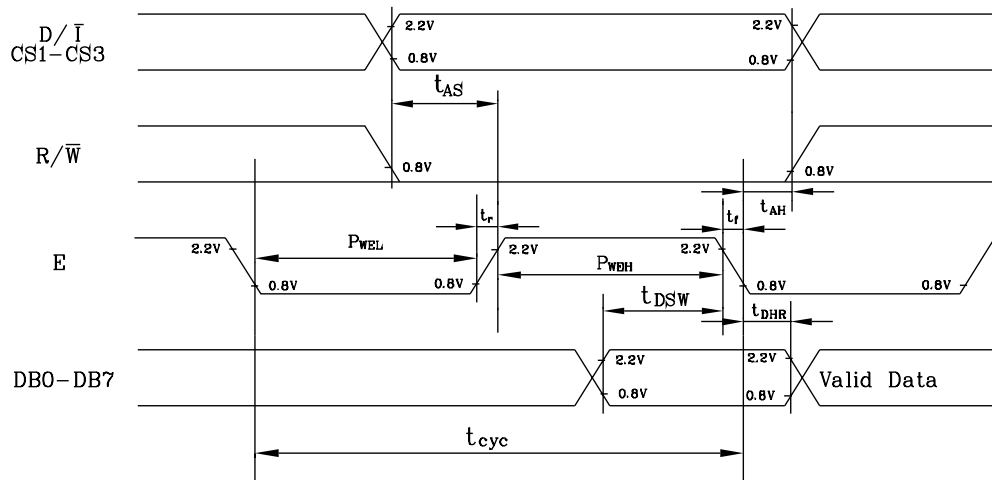


Fig. a Interface timing (data write)

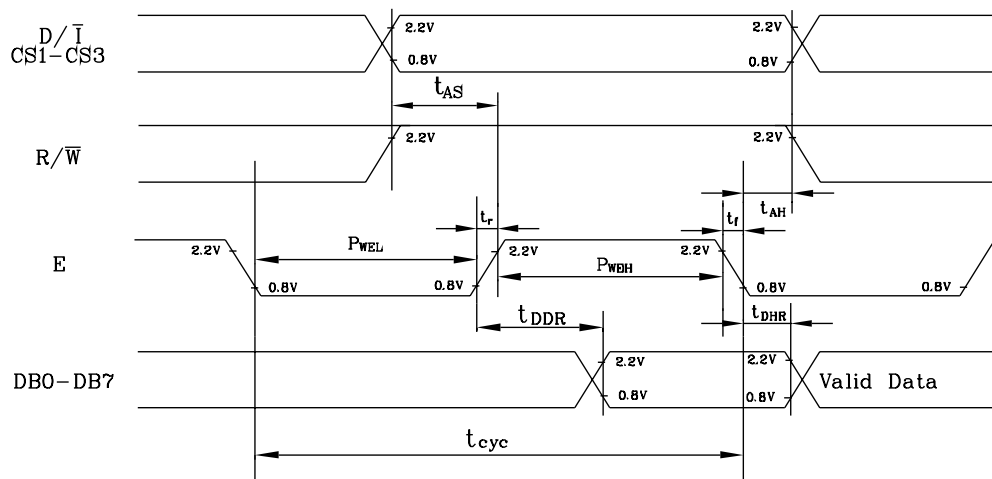
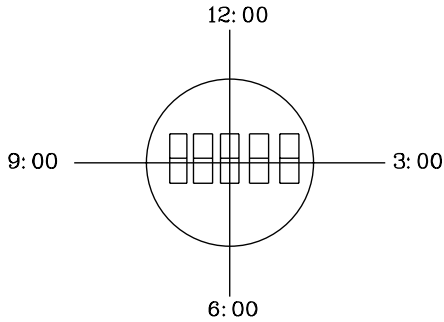


Fig. b Interface timing (data read)

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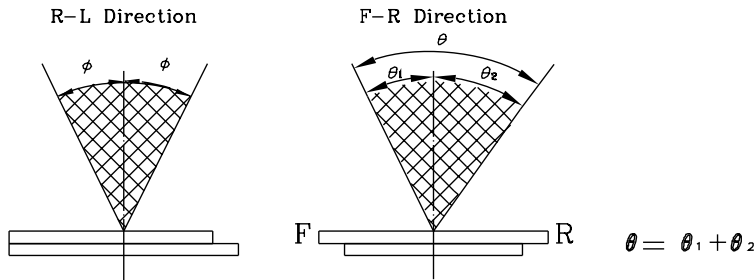
(NOTE 4)

Definition of Viewing Direction



(NOTE 5)

Definition of Viewing Angle

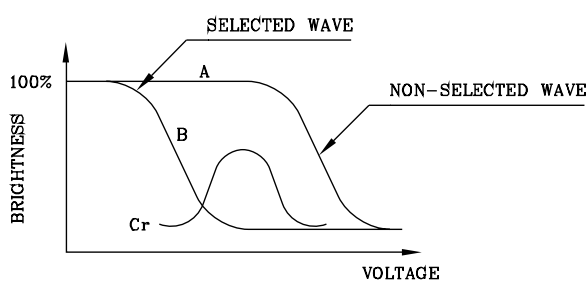


*Conditions

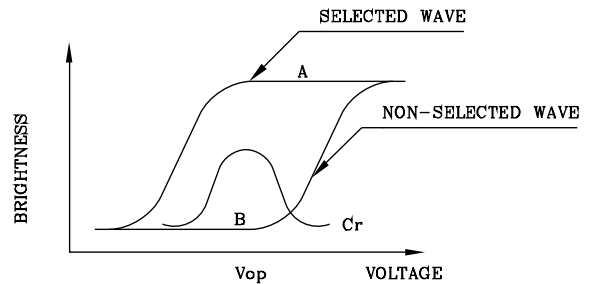
- Operating Voltage : V_{op}
- Frame Frequency : 70Hz
- Applying Waveform : 1/N duty 1/a bias
- Contrast Ratio : larger than 2

(NOTE 6)

Definition of Contrast Ratio (Cr)



(positive type)

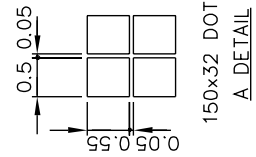
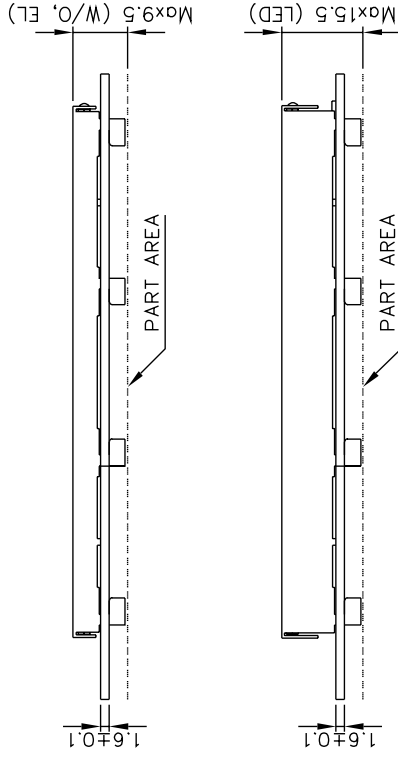
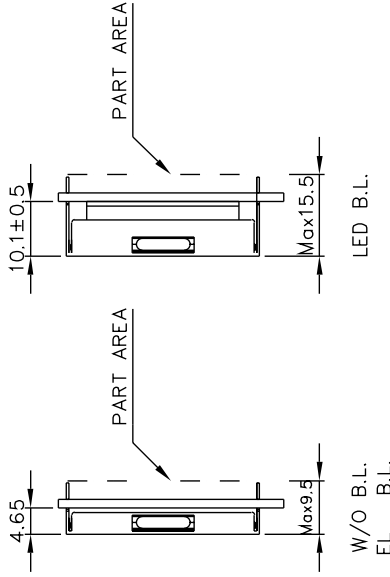
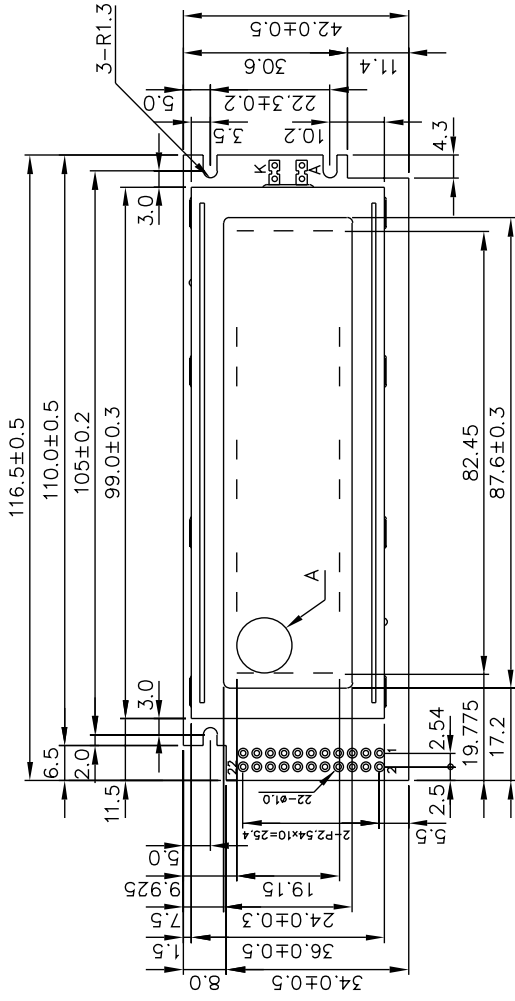


(negative type)

Contrast Ratio : $Cr=A/B$

*Conditions

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



Note :
 1.Resolution : 150X32 Dots
 2.General Tolerance : ±0.5mm

| PinNo. | Symbol | Level | Function | |
|--------|-----------------|----------|----------|------------------------------|
| | | | OV | Power supply |
| 1 | V _{SS} | - | 0V | Power supply |
| 2 | V _{DD} | - | +5V | Power supply |
| 3 | V _O | - | | OPERATING VOLTAGE FOR LCD |
| 4 | D/I | H/L | | DATA INPUT |
| 5 | R/W | H/L | | INSTRUCTION CODE INPUT |
| 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 | CS3 | H | | CHIP SELECT FOR IC3 |
| 18 | RES | L | | RESET |
| 19 | VEE | - | | POWER SUPPLY FOR LCD DRIVING |
| 20 | NC | - | | NO CONNECTION |
| 21 | NC | - | | NONE CONNECTION |
| 22 | NC | - | | NONE CONNECTION |

| | | | |
|----------|----------|-------------------|-------------|
| AGM1532A | | AZ DISPLAYS, INC. | |
| APPROVE | NAME | DATE | TITLE |
| CHECK | | | DWG-NO |
| DESIGN | | | MXB031X |
| DRAW | MAY PING | 87.03.02 | Rev.A |
| | | | UNIT : mm |
| | | | SCALE : 2/3 |