# AZ DISPLAYS, INC.

*COMPLETE LCD SOLUTIONS*

# SPECIFICATIONS FOR
# LIQUID CRYSTAL DISPLAY

PART NUMBER: AGM1216B Series

REVISED: MAY 14, 2003

# General Specifications

| Item | ☑Standard Value | Unit |
|---|---|---|
| Display Pattern | ☑Graphic ☐Character ☐Segment ☐_____ ☐with ICON | |
| Color | ☐Mono. ☐Grayscale ☑ 65K | |
| Module Dimension (W x H x T) | 33.54 (W) × 44.9 (H) ×1.46 (T) | mm |
| Viewing Area (W x H) | 30.54(W)X36.04(H) | mm |
| Active Area (W x H) | 28.02(W)X35.028(H) | mm |
| Character Size (W x H) | \ | mm |
| Character Pitch (W x H) | \ | mm |
| DOT Size (W x H) | 0.061(W)X0.207(H) | mm |
| DOT Pitch (W x H) | 0.073(W)X0.219(H) | mm |
| LCD Type | ☐TN, Positive ☐TN, Negative ☐HTN, Positive ☐HTN, Negative | |
| | ☐STN, Yellow-Green ☐STN, Gray ☐STN, Blue ☐FSTN, Positive ☐FSTN, Negative | |
| | ☐_____ ☐FM LCD ☑Color STN | |
| Polarizer Type | ☐Transflective ☑Transmissive ☐Reflective ☐Anti-Glare | |
| View Direction | ☑6H ☐12H ☐____ | |
| LCD Controller & Driver | S6B33B2 (or Equivalent) | |
| LCD Driving Method | 1/162duty, 1/5bias | |
| Interface Type | Serial ☐I²C ☐4-line SPI ☐3-line SPI ☐____ | |
| | Parallel ☑6800 ☑8080 ☐4-bit ☐_____ | |
| Backlight Type | ☑LED ☐Bottom ☑Single Side ☐Dual Side | |
| | ☐_____ ☐EL ☐CCFL | |
| Backlight Color | ☐Yellow-Green ☑White ☐Amber ☐Blue ☐Red ☐_____ | |
| EL/CCFL Driver type | ☐Build-in ☐External | |
| DC-DC Converter | ☑Build-in ☐External | |
| Operation Temperature | $T_{OPL}$ = -0<br>$T_{OPH}$ = 50 | °C |
| Storage Temperature | $T_{STL}$ = -10<br>$T_{STH}$ = 60 | °C |

Note:

$T_{OPL}$: Lowest Operation Temperature.

$T_{OPH}$: Highest Operation Temperature.

$T_{STL}$: Lowest Storage Temperature.

$T_{STH}$: Highest Storage Temperature.

# Electro-optical Specifications

## 1 Absolute Maximum Ratings

| No | Item | Symbol | Min. | Max. | Unit |
|---|---|---|---|---|---|
| 1 | Supply Voltage For Logic | $V_{DD}$ -$V_{SS}$ | -0.3 | 4.0 | V |
| 2 | Supply Voltage For LCD Driver | $V_{LCD}$ | -0.3 | 22.0 | V |
| 3 | Input Voltage | $V_I$ | $V_{SS}$-0.3 | $V_{DD}$+0.3 | V |

Note: Operating Temperature and Storage Temperature can be found in *1.General Specifications.*

## 2 Optical Characteristics

Ta = 25°C

| ITEM | | SYMBOL | CONDITION | | MIN | TYP | MAX | UNIT | DRIVE |
|---|---|---|---|---|---|---|---|---|---|
| LCD driving voltage | | Vop | | 0℃ | (9.3) | (9.8) | (10.3) | V | A *1 |
| | | | | 25℃ | (9.0) | (9.5) | (10.0) | | |
| | | | | 50℃ | (8.6) | (9.1) | (9.6) | | |
| Response time | Rise | Tr | θ=φ =0 ° | 0℃ | - | (530) | (580) | ms | |
| | | | | 25℃ | - | (200) | (250) | | |
| | Down | Td | θ = φ =0 ° | 0℃ | - | (200) | (250) | | |
| | | | | 25℃ | - | (85) | (130) | | |
| Contrast ratio | | CR | θ=φ=0 ° | | (20) | (25) | - | % | |
| Transmittance | | T | - | | (3.6) | (6.0) | - | % | |
| Viewing angle range | | 6H φ=270 ° | CR≧2 | θ 1 | | 50 | | deg. | |
| | | 12H φ=90 ° | | θ 2 | | 25 | | | |
| | | 3H φ=0 ° | | θ 3 | | 45 | | | |
| | | 9H φ=180 ° | | θ 4 | | 60 | | | |
| Chromaticity Coordinates *2 | White | X | θ=φ=0 ° | | (0.20) | (0.25) | (0.30) | - | B*1 |
| | | Y | | | (0.25) | (0.30) | (0.35) | | |
| | Red | X | θ=φ=0 ° | | (0.34) | (0.39) | (0.44) | | |
| | | Y | | | (0.26) | (0.31) | (0.36) | | |
| | Green | X | θ=φ=0 ° | | (0.24) | (0.29) | (0.34) | | |
| | | Y | | | (0.46) | (0.51) | (0.56) | | |
| | Blue | X | θ=φ=0 ° | | (0.15) | (0.18) | (0.21) | | |
| | | Y | | | (0.12) | (0.15) | (0.18) | | |
| Color gamut (NTSC) | | S | | | - | (18) | - | % | |

Note:

*1 Driving A – Duty driving by DMS505 (fFRM = 100Hz, 1/132 duty, 1/6 bias)

Driving B – Duty driving by Actual driver IC

*2 Backlight coordinates (x , y) = (0.31 , 0.32)

## 4.3 Electrical Characteristics

| No | Item | Symbol | Condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|---|
| 1 | Supply Voltage for Logic | $V_{DD}$-$V_{SS}$ | - | 2.8 | 3.0 | 3.3 | V |
| 2 | Supply Voltage for LCD Driver | $V_{LCD}$ | Ta=23±3 °C | | 9.4 | | V |
| 3 | Supply Current for Logic | $I_{DD}$ | -…. | | | 3.0 | mA |
| 5 | Input High Voltage | $V_{IH}$ | - | 0.8xVDD | - | VDD | V |
| 6 | Input Low Voltage | $V_{IL}$ | - | VSS | - | 0.2xVDD | V |
| 7 | Output High Voltage | $V_{OH}$ | $I_{OH}$=0.5mA | 0.8xVDD | - | VDD | V |
| 8 | Output Low Voltage | $V_{OL}$ | $I_{OL}$=0.5mA | VSS | - | 0.2xVDD | V |
| 9 | Supply Current for LED Backlight | $I_{LED}$ | $V_{LED}$ = Typ. Ta=23±3 °C | - | 15 | - | mA |
| 10 | Supply Voltage for LED Backlight | $V_{LED}$ | $I_{LED}$ = Typ. Ta=23±3 °C | - | 9.6 | 10.0 | V |
| 11 | Luminance | Lv | $I_{LED}$ = Typ. Ta=23±3 °C | 3000 | 3300 | - | cd/m² |

## Timing Characteristics

See Data sheet of LCD Driver for detail.

# Programming

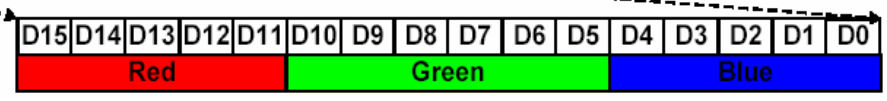
## Instruction Table

See Data sheet of LCD Driver for detail.

## Display Data RAM

Relationship between display pattern and Display Data RAM show as below:

| XA Address | YA Address | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 00H | 01H | 02H | 03H | 04H | 05H | 06H | 07H | 08H | - - - - - - - | 7DH | 7EH | 7FH | 80H | 81H | 82H | 83H |
| 00H | | | | | | | | | | - - - - - - - | | | | | | | |
| 01H | | | | | | | | | | - - - - - - - | | | | | | | |
| 02H | | | | | | | | | | - - - - - - - | | | | | | | |
| 03H | | | | | | | | | | - - - - - - - | | | | | | | |
| 04H | | | | | | | | | | - - - - - - - | | | | | | | |
| 05H | | | | | | | | | | - - - - - - - | | | | | | | |
| 06H | | | | | | | | | | - - - - - - - | | | | | | | |
| 07H | | | | | | | | | | - - - - - - - | | | | | | | |
| 08H | | | | | | | | | | - - - - - - - | | | | | | | |
| 09H | | | | | | | | | | - - - - - - - | | | | | | | |
| 0AH | | | | | | | | | | - - - - - - - | | | | | | | |
| 0BH | | | | | | | | | | - - - - - - - | | | | | | | |
| 0CH | | | | | | | | | | - - - - - - - | | | | | | | |
| 0DH | | | | | | | | | | - - - - - - - | | | | | | | |
| 0EH | | | | | | | | | | - - - - - - - | | | | | | | |
| 0FH | | | | | | | | | | - - - - - - - | | | | | | | |
| ⋮ | ⋮ | | | | | | | | | ⋮ | | | | | | | |
| B2H | | | | | | | | | | - - - - - - - | | | | | | | |
| B3H | | | | | | | | | | - - - - - - - | | | | | | | |
| B4H | | | | | | | | | | - - - - - - - | | | | | | | |
| B5H | | | | | | | | | | - - - - - - - | | | | | | | |
| B6H | | | | | | | | | | - - - - - - - | | | | | | | |
| B7H | | | | | | | | | | - - - - - - - | | | | | | | |
| B8H | | | | | | | | | | - - - - - - - | | | | | | | |
| B9H | | | | | | | | | | - - - - - - - | | | | | | | |
| BAH | | | | | | | | | | - - - - - - - | | | | | | | |
| BBH | | | | | | | | | | - - - - - - - | | | | | | | |
| BCH | | | | | | | | | | - - - - - - - | | | | | | | |
| BDH | | | | | | | | | | - - - - - - - | | | | | | | |
| BEH | | | | | | | | | | - - - - - - - | | | | | | | |
| BFH | | | | | | | | | | - - - - - - - | | | | | | | |
| A0H | | | | | | | | | | - - - - - - - | | | | | | | |
| A1H | | | | | | | | | | - - - - - - - | | | | | | | |




See Data sheet of LCD Driver for detail.

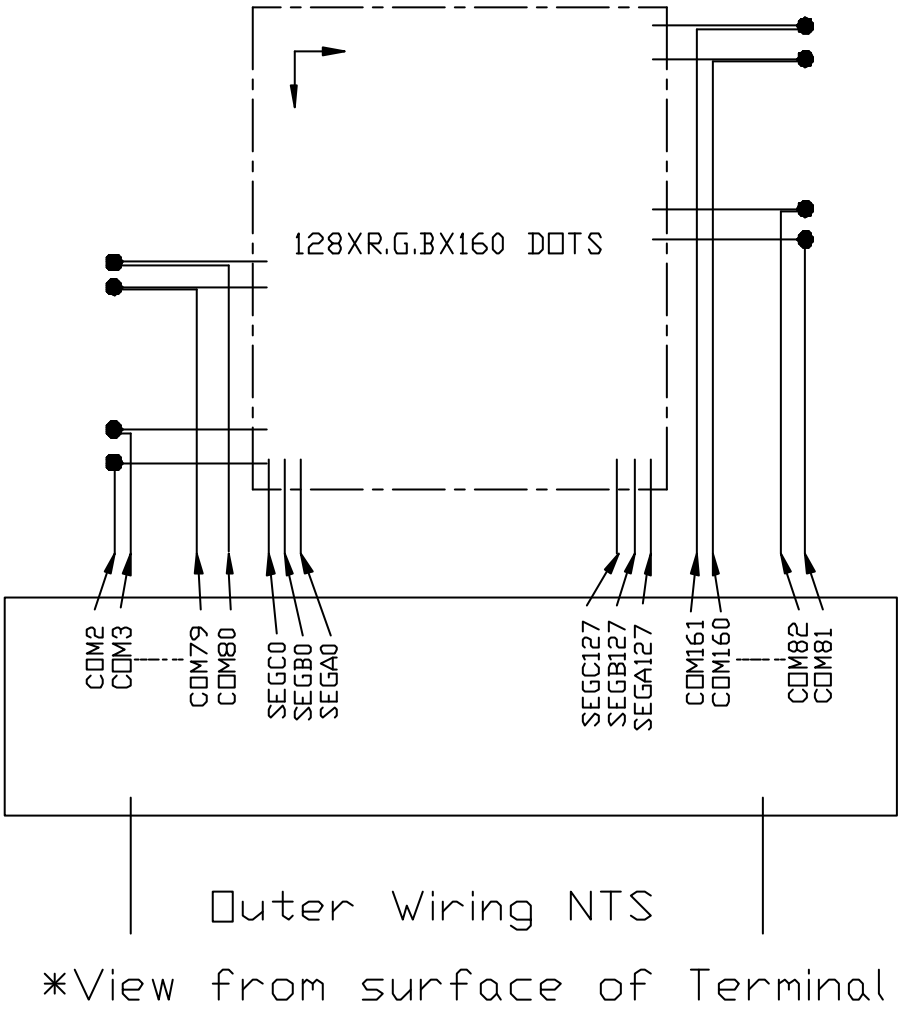
# I/O Terminal

## 1 Pin Description(See Datasheet of LCD Driver for detail)

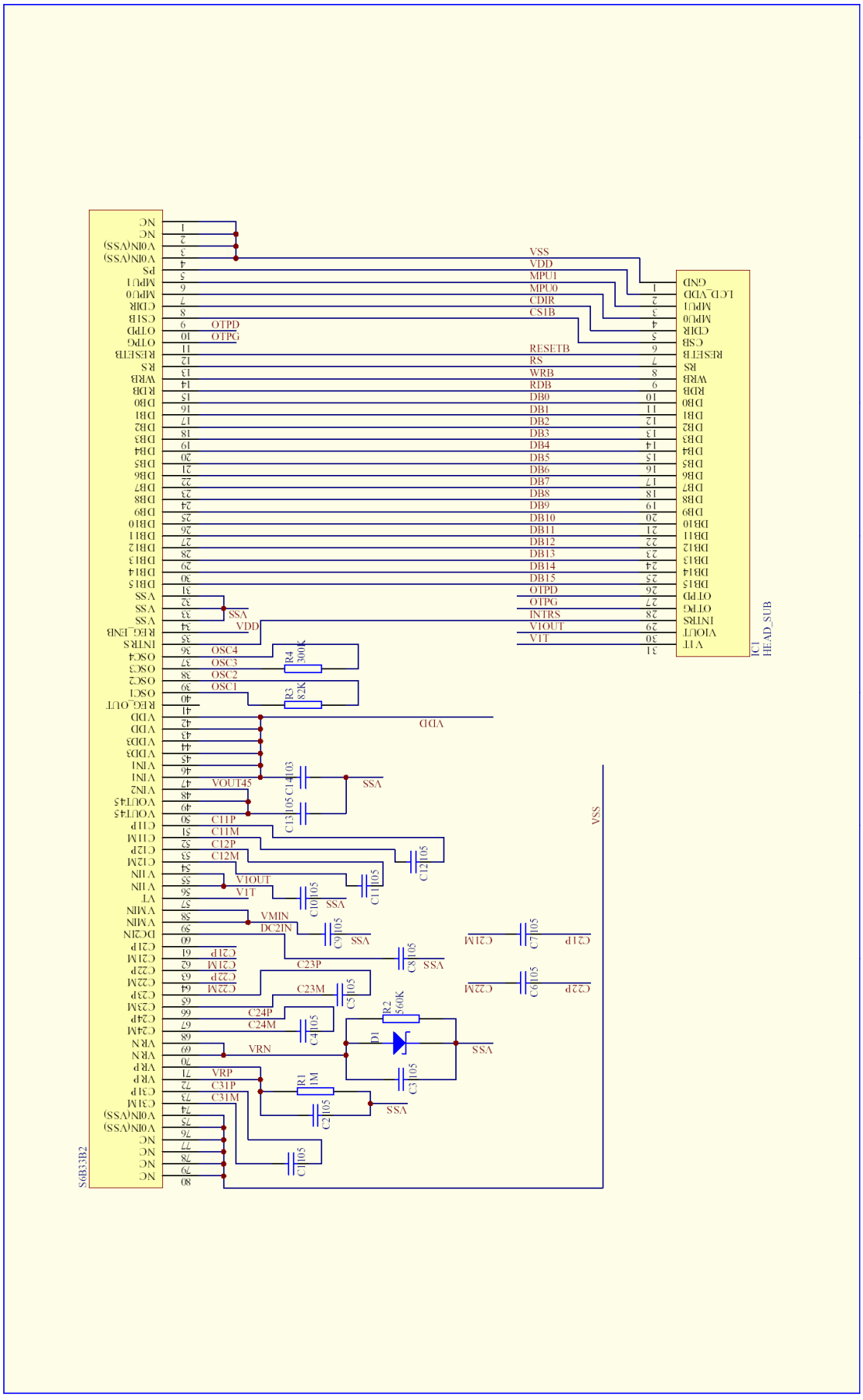
<table>
<tr><th>Pin NO.</th><th>Symbol</th><th>Function Description</th></tr>
<tr><td>1</td><td>OTPD</td><td>Drain Voltage for OTP programming.</td></tr>
<tr><td>2</td><td>OTPG</td><td>Gate Voltage for OTP programming.</td></tr>
<tr><td>3</td><td>PS</td><td></td></tr>
<tr><td>4~5</td><td>MPU1~MPU0</td><td>
<table>
<tr><td colspan="4">MPU interface select pin</td></tr>
<tr><td>PS</td><td>MPU[1]</td><td>MPU[0]</td><td>Description</td></tr>
<tr><td>H</td><td>L</td><td>L</td><td>8080-series 8bit interface</td></tr>
<tr><td>H</td><td>L</td><td>H</td><td>8080-series 16bit interface</td></tr>
<tr><td>H</td><td>H</td><td>L</td><td>6800-series 8bit interface</td></tr>
<tr><td>H</td><td>H</td><td>H</td><td>6800-series 16bit interface</td></tr>
<tr><td>L</td><td>L</td><td>X</td><td>3 pin SPI(Write only)</td></tr>
<tr><td>L</td><td>H</td><td>X</td><td>4 pin SPI(Write only)</td></tr>
</table>
</td></tr>
<tr><td>6</td><td>CSB</td><td>Chip select input pins Data / instruction I/O is enabled only when CSB is “L”. When chip select is non-active, DB0 to DB15 may be high impedance.</td></tr>
<tr><td>7</td><td>RESETB</td><td>Reset input pin. When RESETB is “L”, initialization is executed.</td></tr>
<tr><td>8</td><td>RS</td><td>Data / Instruction select input pin . RS = “H”: DB0 to DB15 are display data . RS = “L”: DB0 to DB7 are instruction data</td></tr>
<tr><td>9</td><td>WRB</td><td>
<table>
<tr><td colspan="5">Read / Write execution control pin</td></tr>
<tr><td>PS</td><td>MPU</td><td>MPU Type</td><td>WRB</td><td>Description</td></tr>
<tr><td>H</td><td>H</td><td>6800-series</td><td>R/W</td><td>ReadWRBite control input pin<br>– R/W = “H”: read<br>– R/W = “L”: write</td></tr>
<tr><td>H</td><td>L</td><td>8080-series</td><td>WRB</td><td>Write enable clock input pin<br>The data on DB0 to DB15 are latched at the rising edge of the WRB signal.</td></tr>
</table>
</td></tr>
<tr><td>10</td><td>RDB</td><td>
<table>
<tr><td colspan="4">Read / Write execution control pin</td></tr>
<tr><td>MPU[1]</td><td>MPU type</td><td>RDB</td><td>Description</td></tr>
<tr><td>H</td><td>6800-series</td><td>E</td><td>Read / Write control input pin<br>– R/W = “H”: When E is “H”, DB0 to DB15 are in an output status.<br>– R/W = “L”: The data on DB0 to DB15 are latched at the falling edge of the E signal.</td></tr>
<tr><td>L</td><td>8080-series</td><td>RDB</td><td>Read enable clock input pin<br>When RDB is “L”, DB0 to DB15 are in an output status.</td></tr>
</table>
</td></tr>
<tr><td>11~26</td><td>DB0~DB15</td><td>DB[0:15]: 16-bit bi-directional data bus.</td></tr>
<tr><td>27</td><td>GND</td><td>GND</td></tr>
<tr><td>28</td><td>VDD</td><td>VDD</td></tr>
<tr><td>29</td><td>VRN</td><td>NC</td></tr>
<tr><td>30</td><td>VRP</td><td>NC</td></tr>
<tr><td>31</td><td>VIN</td><td>NC</td></tr>
</table>

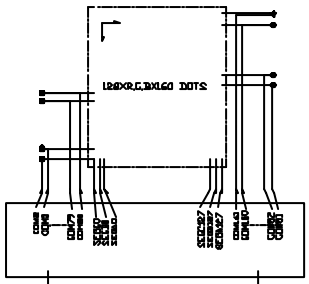
| | | |
|---|---|---|
| 32 | VT | NC |
| 33 | NC | NC |

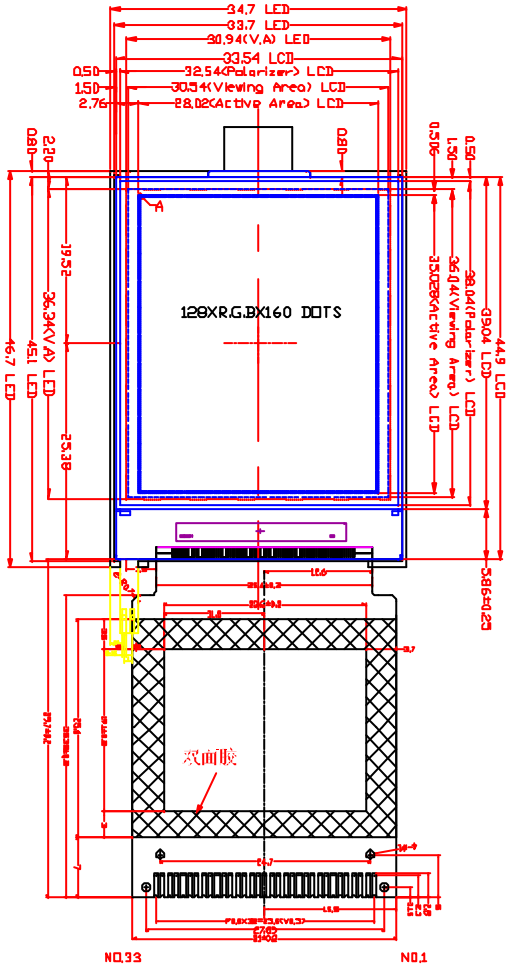
## Block Diagram

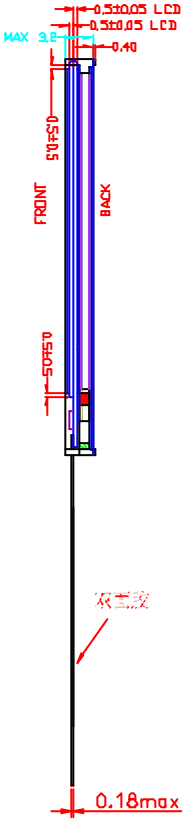


# Application Circuit

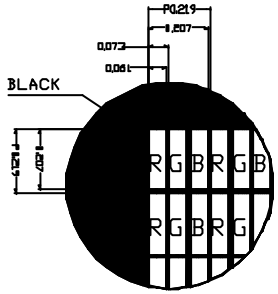





| | | | |
|---|---|---|---|
| | | 17 | DB6 |
| 33 | NC | 16 | DB5 |
| 32 | V1T | 15 | DB4 |
| 31 | V1IN | 14 | DB3 |
| 30 | VRP | 13 | DB2 |
| 29 | VRN | 12 | DB1 |
| 28 | VDD | 11 | DB0 |
| 27 | VSS | 10 | RDB |
| 26 | DB15 | 9 | WRB |
| 25 | DB14 | 8 | RS |
| 24 | DB13 | 7 | RESETB |
| 23 | DB12 | 6 | CS1B |
| 22 | DB11 | 5 | MPU0 |
| 21 | DB10 | 4 | MPU1 |
| 20 | DB9 | 3 | PS |
| 19 | DB8 | 2 | OTPG |
| 18 | DB7 | 1 | OTPD |
| Ð ò Å | ÐÅºÅ | Ð ò Å | ÐÅºÅ |

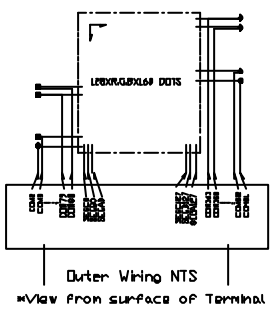


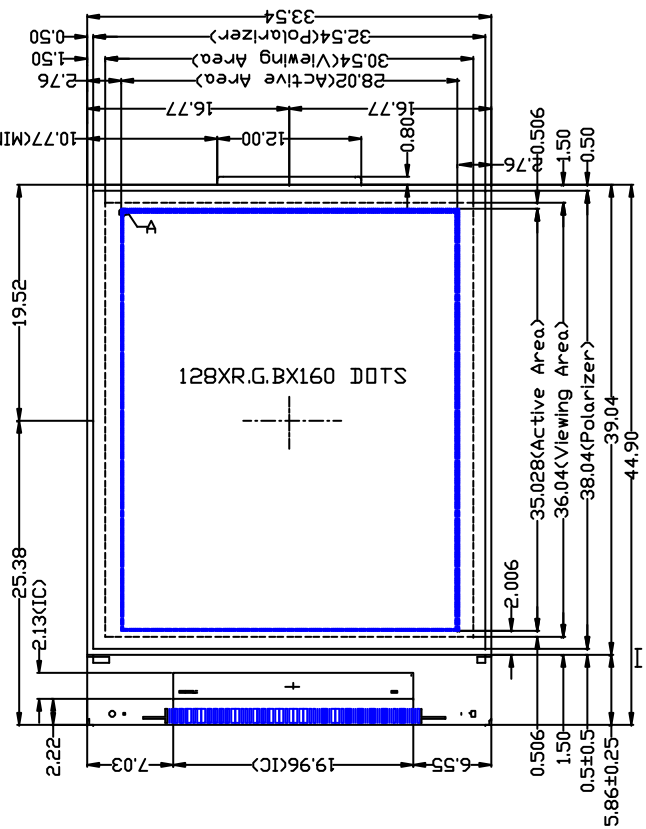

DOT SIZE
DETAIL A UNITS

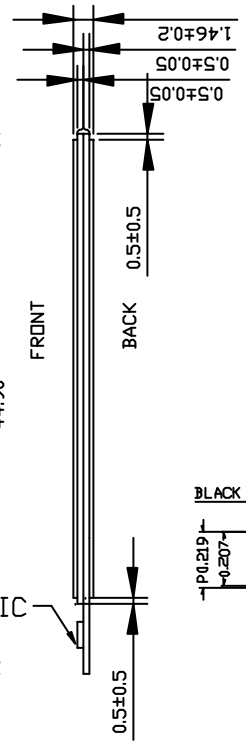
Display Type : CSTN / Transmissive
Viewing Direction : 6:00
Driver IC: S6B33B2
Logic Voltage : 3.0±0.1V
LCD Driver Voltage (VlCd) :9.4
Driving Method : 1/162 DUTY 1/5 BIAS
Operating Temperature : -0°~ +50°C
Storage Temperature : -10°~ +60°C
Interface Connector : FPC
Led color : white
VLED=9.0V Iled(type)=15mA
Luminance : 3000cd/m²(type)
All unmarked tolerances: ±0.2mm

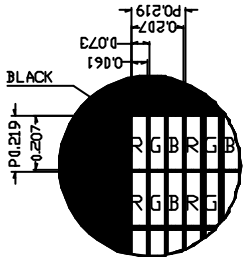
CUSTOMER APPROVAL:

| | | | |
|---|---|---|---|
| AZ Displays, Inc. | | AGM1216B | UNITS: mm |
| | | DWG NO:ED-4772-LCM/A00 | SHEET 1 OF 1 |



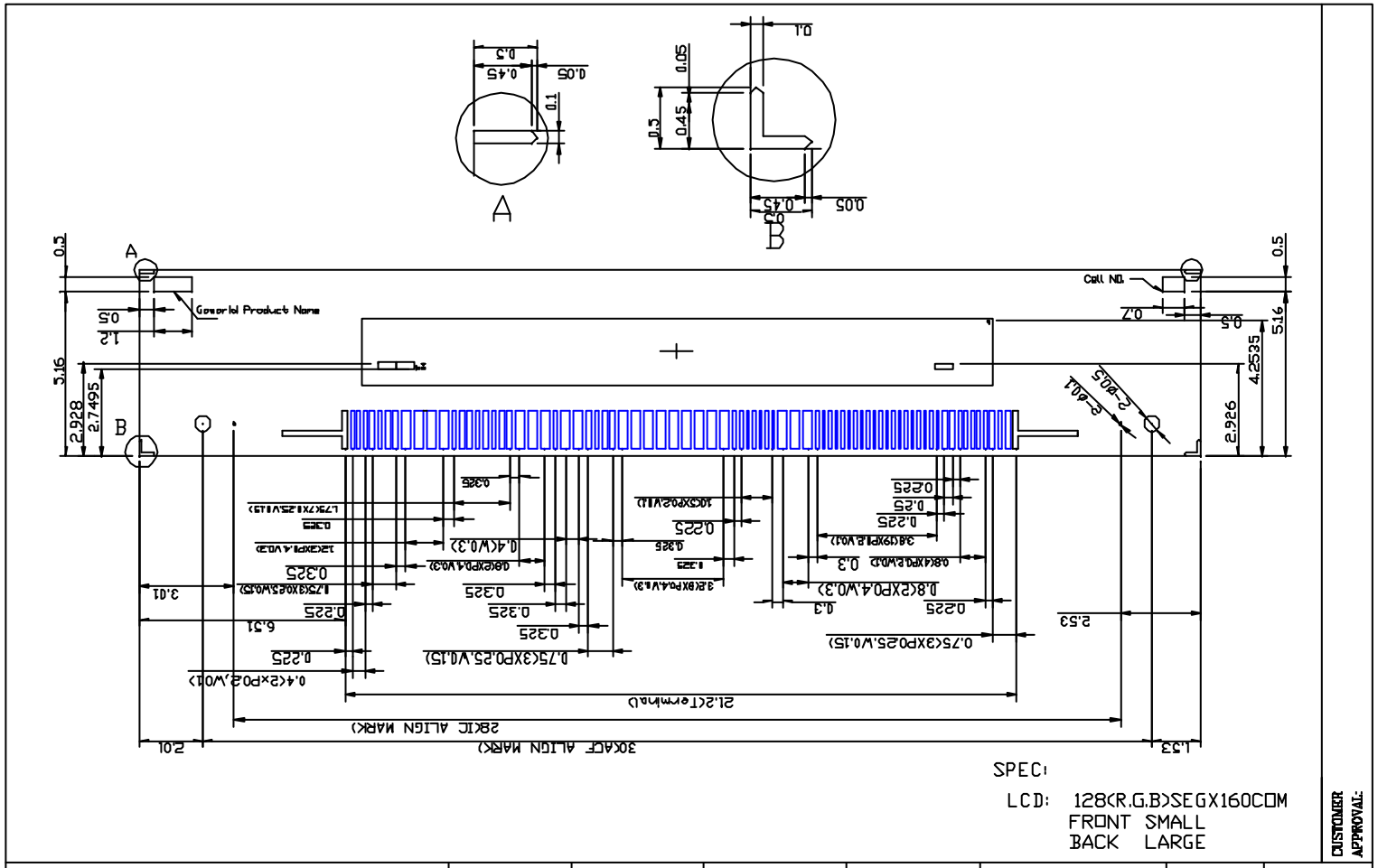




DOT SIZE
DETAIL A UNITS

Display Type : CSTN / Transmissive
Viewing Direction : 6:00
Driver IC: S6B33B2
Logic Voltage : 3.0±0.1V
LCD Driver Voltage (Vlcd) 19.4
Driving Method : 1/162 DUTY 1/9 BIAS
Operating Temperature : -20°~ +70°C
Storage Temperature : -30°~ +80°C
Interface Connector : FPC
All unmarked tolerances: ±0.2mm

CUSTOMER APPROVAL:

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| AZ Displays, Inc. | | | | | AGM1216B | UNITS: mm | |
| | | | | | DWG NO:ED-4772-LCM/A00 | SHEET 1 OF 9 | |




AZ Displays, Inc.

| | | | |
|---|---|---|---|
| AGM1216B | UNITS: mm | | |
| DWG NO:ED-4772-LCM/A00 | SHEET 3 OF 3 | | |