**DISPLAY Elektronik GmbH**

# DATA SHEET

## LCD MODULE

# DEM 128064F1 ADX-PW-N

***Product Specification*** ***Version: 1***

**15/Jan/2025**

# GENERAL SPECIFICATION

## MODULE NO. :

# DEM 128064F1 ADX-PW-N

| VERSION NO. | CHANGE DESCRIPTION | DATE |
|---|---|---|
| 0 | Original Version | 14.01.2025 |
| 1 | Mark IST3004-TX on page2/page4.<br>Update the dimension 17.25mm on page 3<br>Update the TOP/TST on page 7. | 15.01.2025 |
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PREPARED BY: CC DATE: 15.01.2025

APPROVED BY: WH DATE: 15.01.2025

# CONTENTS

## 1. FUNCTIONS & FEATURES

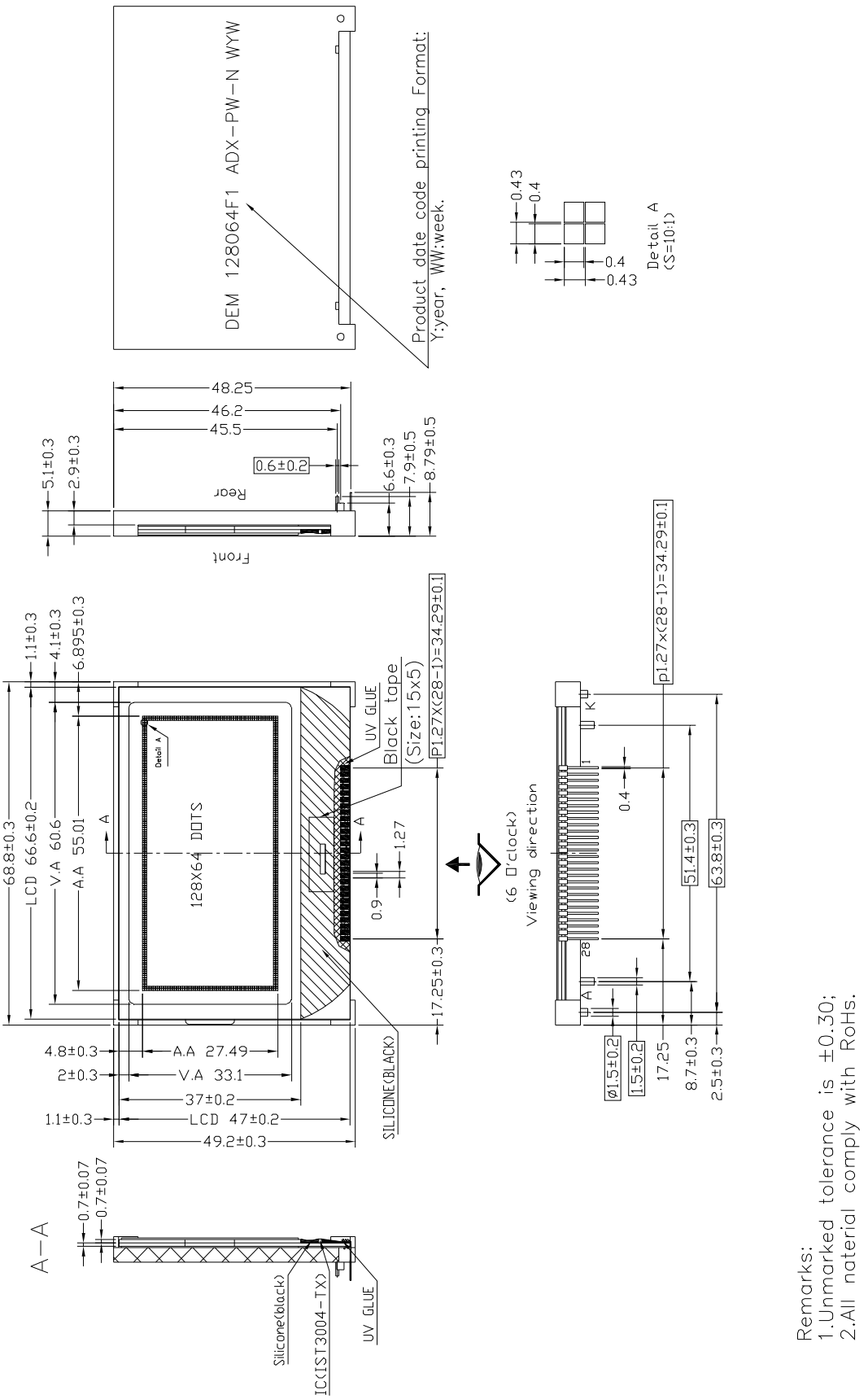
| MODULE NAME | LCD TYPE | REMARKS |
|---|---|---|
| DEM 128064F1 ADX-PW-N | ASTN Transmissive Negative Mode | - |

- Viewing Direction : 6 O'clock
- Driving Scheme : 1/65 Duty Cycle, 1/9 Bias
- Power Supply Voltage(Typ.) : 3.0 Volt (typ.)
- LCD Operation Voltage : 11.0 Volt (typ.)
- Display Contents :128x64 Dots
- Backlight color : White, LED
- Driver IC : IST3004-TX
- Operating temperature : -30°C ～ +80°C
- Storage temperature : -40°C ～ +90°C
- RoHS : Compliant

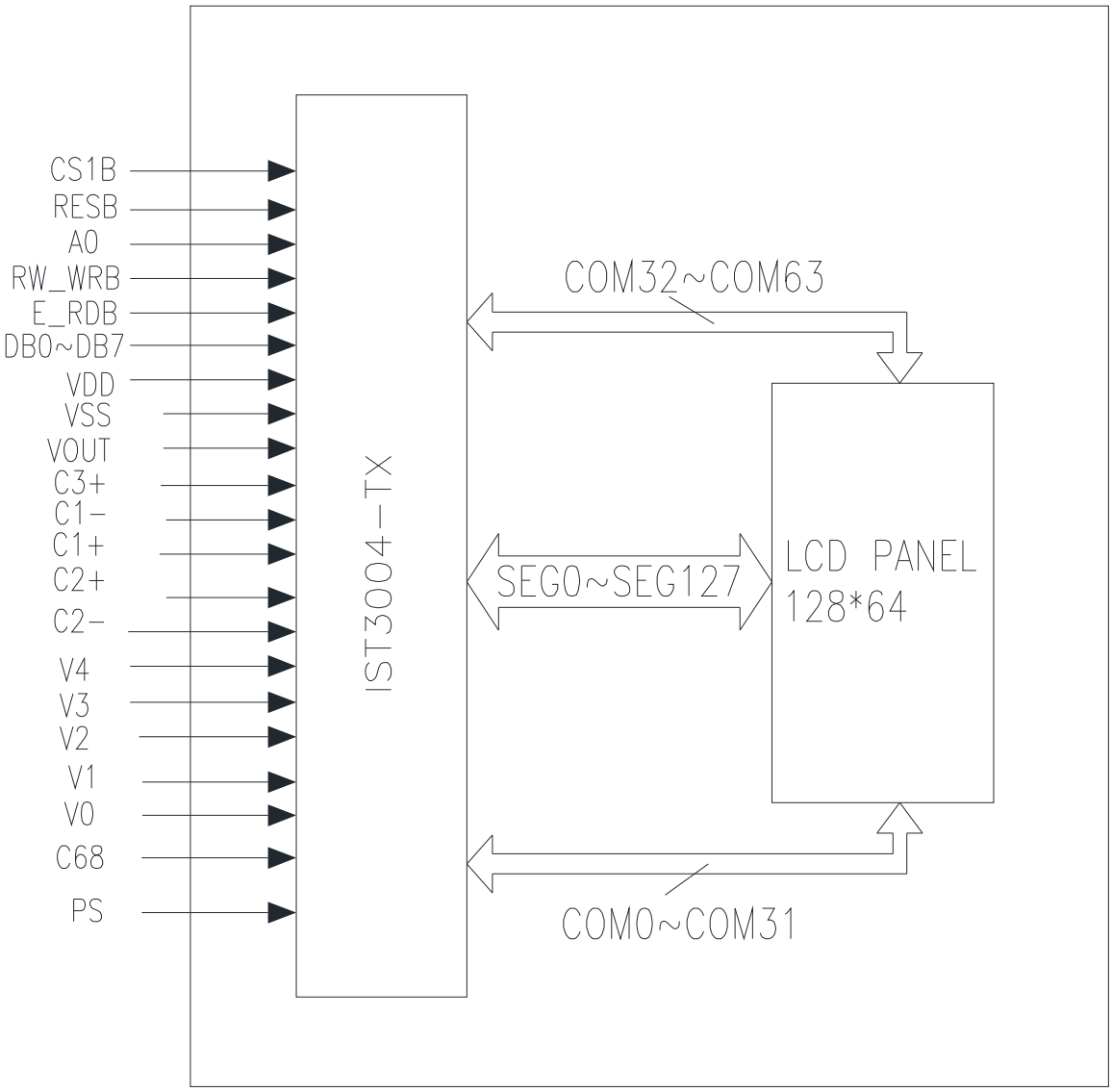
## 2. MECHANICAL SPECIFICATIONS

- Module Size: : 68.80 x 49.20 x 8.50mm
- Viewing Area Size: : 60.60 x 33.10 mm
- Active Area Size : 55.01 x 27.49 mm
- Dot pitch: : 0.43 x 0.43 mm
- Dot Size: : 0.40 x 0.40 mm

## 3. EXTERNAL DIMENSIONS



## 4. BLOCK DIAGRAM



## 5. PIN DESCRIPTION

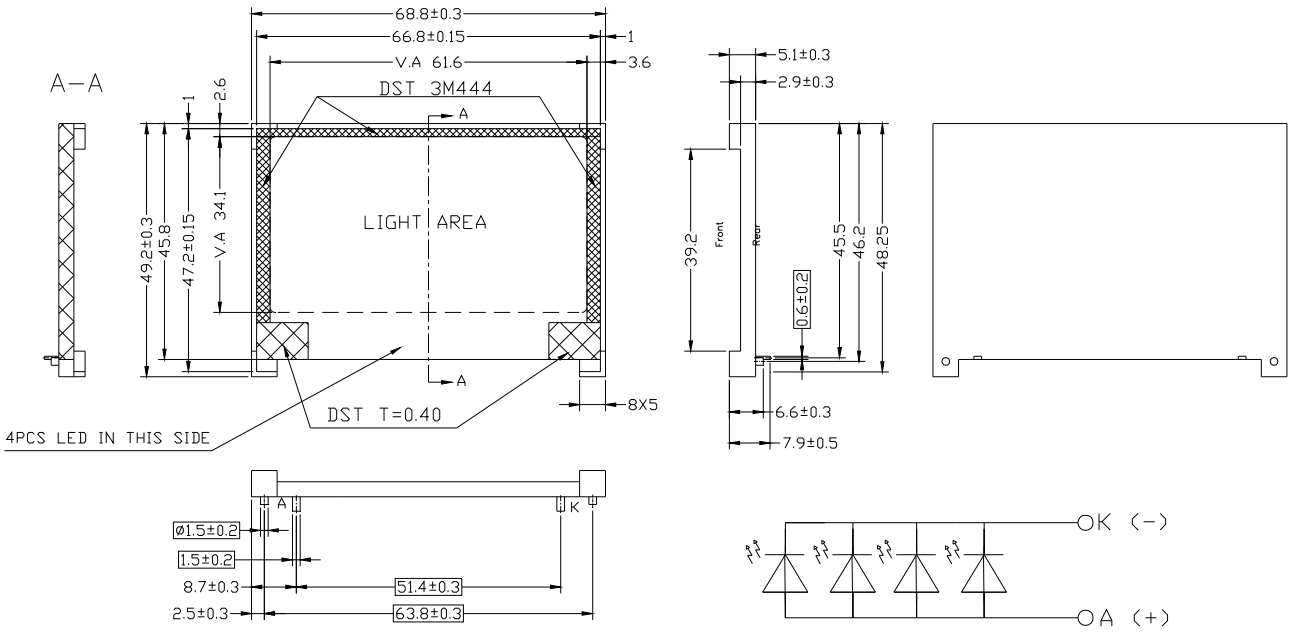
<table>
<tr><th>PIN No.</th><th>Symbol</th><th>I/O</th><th>Description</th></tr>
<tr><td>1</td><td>CS1B</td><td>I</td><td>Chip select input pins<br>Data / instruction I/O is enabled only when CS1B when chip select is non-active, DB0 to DB7 may be high impedance</td></tr>
<tr><td>2</td><td>RESB</td><td>I</td><td>Hardware Reset input pin<br>When RESB is “L”, initialization is executed.</td></tr>
<tr><td>3</td><td>A0</td><td>I</td><td>Register select input pin<br>- A0 = “H” : DB0 to DB7 are display data<br>- A0 = “L” : DB0 to DB7 are control data</td></tr>
<tr><td>4</td><td>RW_WRB</td><td>I</td><td>Read / Write execution control pin
<table>
<tr><th>C86</th><th>MPU Type</th><th>RW_WRB</th><th>Description</th></tr>
<tr><td>H</td><td>6800-series</td><td>WR</td><td>Read / Write control input pin<br>- RW = “H” : read<br>- RW = “L” : write</td></tr>
<tr><td>L</td><td>8080-series</td><td>/WRB</td><td>Write enable clock input pin<br>The data on DB0 to DB7 are latched at the rising<br>edge of the /WRB signal.</td></tr>
</table></td></tr>
<tr><td>5</td><td>E_RDB</td><td>I</td><td>Read / Write execution control pin
<table>
<tr><th>C86</th><th>MPU Type</th><th>E_RDB</th><th>Description</th></tr>
<tr><td>H</td><td>6800-series</td><td>E</td><td>Read / Write control input pin<br>- RW = “H” : When E is “H”, DB0 to DB7 are in an output status.<br>- RW = “L” : The data on DB0 to DB7 are latched at the falling edge 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 DB7 are in an output status.</td></tr>
</table></td></tr>
<tr><td>6~13</td><td>DB0~DB7</td><td>I/O</td><td>8-bit bi-directional data bus that is connected to the standard 8-bit microprocessor data bus.<br>- DB0 to DB5 : high impedance<br>- DB6 : serial input clock (SCL)<br>- DB7 : serial input data (SDI)<br>When chip select is not active, DB0 to DB7 may be high impedance.</td></tr>
<tr><td>14</td><td>VDD</td><td>Power Supply</td><td>Power Supply.</td></tr>
<tr><td>15</td><td>VSS</td><td>Power Supply</td><td>Ground</td></tr>
<tr><td>16</td><td>VOUT</td><td>I/O</td><td>Voltage converter output when the internal DC/DC converter is used<br>If the panel loading too large for the internal DC/DC voltage converter to afford, user can disable internal Voltage Converter circuit & input external power through this pin to drive the remaining Power block (Voltage Regulator & Voltage Follower)</td></tr>
<tr><td>17</td><td>C3+</td><td rowspan="5">O</td><td>Capacitor 3 positive connection pin for voltage converter</td></tr>
<tr><td>18</td><td>C1-</td><td>Capacitor 1 negative connection pin for voltage converter</td></tr>
<tr><td>19</td><td>C1+</td><td>Capacitor 1 positive connection pin for voltage converter</td></tr>
<tr><td>20</td><td>C2+</td><td>Capacitor 2 positive connection pin for voltage converter</td></tr>
<tr><td>21</td><td>C2-</td><td>Capacitor 2 negative connection pin for voltage converter</td></tr>
<tr><td>22</td><td>V4</td><td rowspan="5">I/O</td><td rowspan="5">LCD driver supply voltages<br>The voltage determined by LCD pixel is impedance-converted by an operational amplifier for application.<br>Voltages should have the following relationship;<br>V0 ≥ V1 ≥ V2 ≥ V3 ≥ V4 ≥ VSS<br>When the internal power circuit is active, these voltages are generated as following as following table according to the state of LCD bias.
<table>
<tr><th>LCD bias</th><th>V1</th><th>V2</th><th>V3</th><th>V4</th></tr>
<tr><td>1/9bias</td><td>(8/9) xV0</td><td>(7/9) xV0</td><td>(2/9) xV0</td><td>(1/9) xV0</td></tr>
</table></td></tr>
<tr><td>23</td><td>V3</td></tr>
<tr><td>24</td><td>V2</td></tr>
<tr><td>25</td><td>V1</td></tr>
<tr><td>26</td><td>V0</td></tr>
</table>

<table>
<tr><td>27</td><td>C68</td><td>I</td><td>Microprocessor Interface Select input pin in parallel mode<br>- C68 = “H” : 6800-series MPU interface<br>- C68 = “L” : 8080-series MPU interface</td></tr>
<tr><td>28</td><td>PS</td><td>I</td><td>Parallel / serial data input select input
<table>
<tr><th>PS</th><th>Interface Mode</th><th>Chip Select</th><th>Data / instruction</th><th>Data</th><th>Read / Write</th><th>Serial clock</th></tr>
<tr><td>“H”</td><td>Parallel</td><td>CS1B</td><td>A0</td><td>DB0 to DB7</td><td>E_RDB<br>RW_WRB</td><td>--</td></tr>
<tr><td>“L”</td><td>Serial</td><td>CS1B</td><td>A0</td><td>SDI (DB7)</td><td>Write only</td><td>SCL (DB6)</td></tr>
</table>
<NOTE> In serial mode, it is impossible to read data from the on-chip RAM. And DB0 to DB5 and E_RDB and<br>RW_WRB must be fixed to either “H” or “L”.</td></tr>
</table>

| | |
|---|---|
| A | Supply voltage for backlight LED+ |
| K | Supply voltage for backlight LED- |

## 6. BACKLIGHT CHARACTERISTICS

| Item | Symbol | min. | typ. | max. | Unit | Condition |
|---|---|---|---|---|---|---|
| Forward Voltage | Vf | 3.0 | 3.2 | 3.4 | V | If= 60 mA |
| Power Dissipation | Pd | – | – | 204 | mW | If= 60 mA |
| Luminous Uniformity | ΔLv | 70 | | | % | MIN/MAX*100% |
| Luminance | Lv | | TBD | | $cd/m^2$ | If= 60 mA T=25°C |
| Color Coordinate | X | 0.240 | | 0.330 | | |
| | Y | 0.240 | | 0.330 | | |
| Peak wave length | λP | – | – | – | nm | |




Remarks:
1.Unmarked tolerance is ±0.20;
2.All naterial comply with RoHs.

## 7. ABSOLUTE MAXIMUM RATINGS

| Parameter | Symbol | Condition | Unit |
|---|---|---|---|
| **Power Supply Voltage** | **$V_{DD}$** | **-0.3 ~ 7.0** | **V** |
| | **V0, VOUT** | **-0.3 ~ 15.0** | **V** |
| **Power Supply Voltage (VDD Standard)** | **V1,V2,V3,V4** | **-0.3 to V0** | **V** |
| **Input Voltage Range** | **VIN** | **-0.3 to VDD + 0.3** | **V** |
| **Operating Temperature** | **TOPR** | **-30 ~ +80** | **℃** |
| **Storage Temperature** | **TSTR** | **-40 ~ +90** | **℃** |

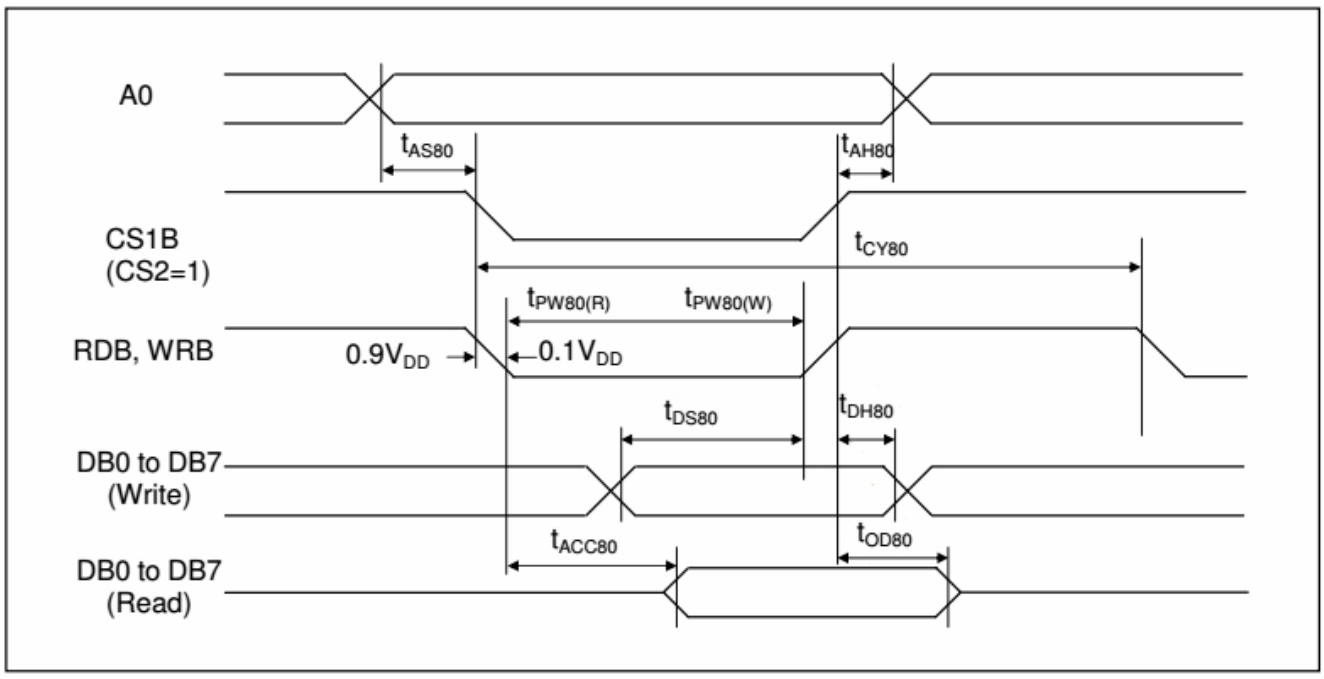
## 8. ELECTRICAL CHARACTERISTICS

### 8.1. DC CHARACTERISTICS

| Item | Symbol | Condition | STANDARD VALUE | | | units |
|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | |
| Operating Voltage | VDD | Relative to VSS | 2.7 | 3.0 | 3.3 | V |
| LCD Driving Voltage | VLCD | Relative to VSS | 10.7 | 11.0 | 11.3 | |
| Consumption Current | IDD | - | - | TBD | - | mA |

### 8.2. AC CHARACTERISTICS

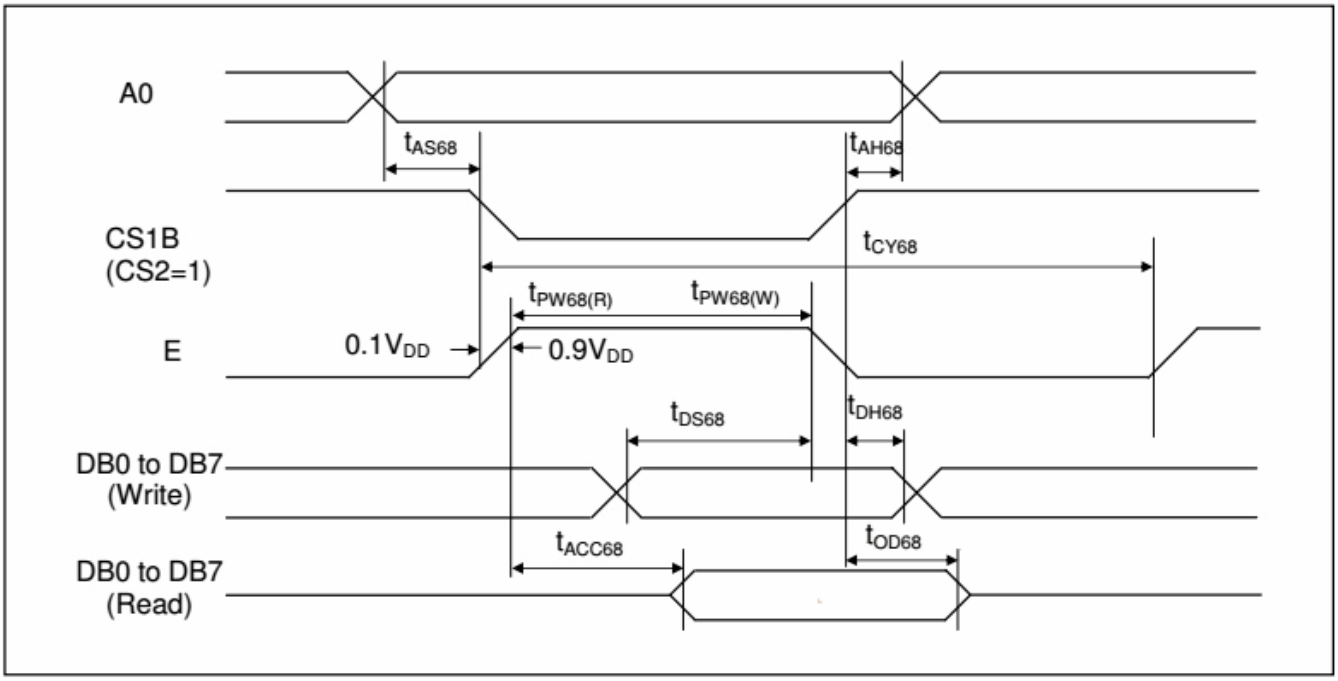
**System Bus Read/Write Characteristics 1 (For the 8080 Series MPU)**




**(VDD=3.0V TA=25℃)**

| Item | Signal | Symbol | Min. | Typ. | Max. | Unit | Remark |
|---|---|---|---|---|---|---|---|
| Address setup time<br>Address hold time | A0 | $t_{AS80}$<br>$t_{AH80}$ | 0<br>0 | - | - | ns | |
| System cycle time | | $t_{CY80}$ | 300 | - | - | ns | |
| Pulse width (WRB) | RW_WRB | $t_{PW80}$(W) | 150 | - | - | ns | |
| Pulse width (RDB) | E_RDB | $t_{PW80}$(R) | 150 | - | - | ns | |
| Data setup time<br>Data hold time | DB7<br>to<br>DB0 | $t_{DS80}$<br>$t_{DH80}$ | 60<br>0 | - | - | ns | |
| Read access time<br>Output disable time | | $t_{ACC80}$<br>$t_{OD80}$ | 140<br>- | - | -<br>10 | ns | (No load) |

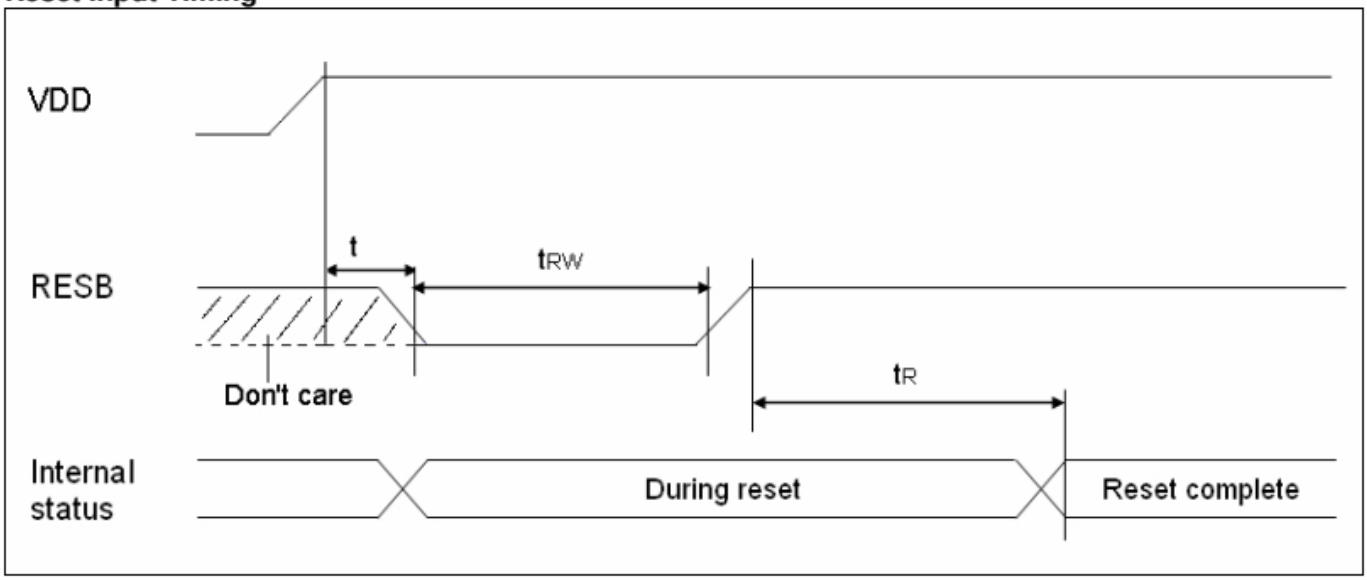
**Read / Write Characteristics (6800-series Microprocessor)**




**(VDD=3.0V TA=25℃)**

| Item | Signal | Symbol | Min. | Typ. | Max. | Unit | Remark |
|---|---|---|---|---|---|---|---|
| Address setup time<br>Address hold time | A0 | $t_{AH68}$ | 0<br>0 | - | - | ns | |
| System cycle time | | $t_{CY68}$ | 300 | - | - | ns | |
| Pulse width (E) | RW_WRB | $t_{PW68}$(W) | 150 | - | - | ns | |
| Pulse width (E) | E_RDB | $t_{PW68}$(R) | 150 | - | - | ns | |
| Data setup time<br>Data hold time | DB7<br>to<br>DB0 | $t_{DS68}$<br>$t_{DH68}$ | 60<br>0 | - | - | ns | |
| Read access time<br>Output disable time | | $t_{ACC68}$<br>$t_{OD68}$ | 140<br>- | - | -<br>10 | ns | (No load) |

**Reset Input Timing**




**(VDD = 3.0V TA = 25℃)**

| Item | Signal | Symbol | Min. | Typ. | Max. | Unit | Remark |
|---|---|---|---|---|---|---|---|
| Reset low pulse width | RESB | tRW | 2 | - | - | us | |
| Reset time | - | tR | - | - | 2 | us | |
| Reset time | RESB | t | 0 | - | - | us | |

## 9. COMMAND TABLE

**(COMMAND FOR ST7565R)**

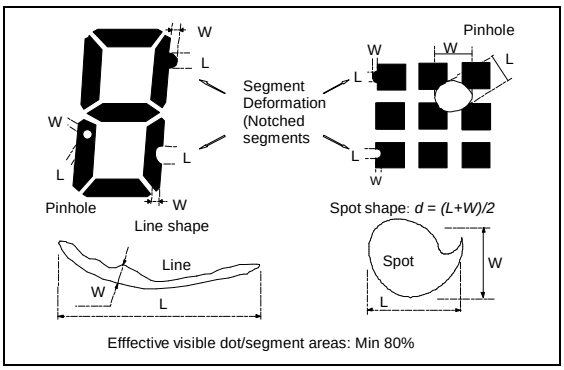
| INSTRUCTION | A0 | RW | DB7 | DB6 | DB5 | DB4 | DB3 | DB2 | DB1 | DB0 | Description |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Display ON / OFF | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 1 | 1 | DON | LCD display On/Off control<br>DON = 0 : display OFF<br>DON = 1 : display On |
| Display starting line | 0 | 0 | 0 | 1 | ST5 | ST4 | ST3 | ST2 | ST1 | ST0 | Specify the line address for the first COM output |
| page address | 0 | 0 | 1 | 0 | 1 | 1 | P3 | P2 | P1 | P0 | Set page address |
| Set column address MSB | 0 | 0 | 0 | 0 | 0 | 1 | Y7 | Y6 | Y5 | Y4 | Set column address MSB |
| Set column address LSB | 0 | 0 | 0 | 0 | 0 | 0 | Y3 | Y2 | Y1 | Y0 | Set column address LSB |
| Read status | 0 | 1 | BUSY | ADC | ON/OFF | RESB | 0 | 0 | 0 | 0 | Read the internal status |
| Write display data | 1 | 0 | Write data | | | | | | | | Write data into Display RAM |
| Read display data | 1 | 1 | Read data | | | | | | | | Read data from Display RAM |
| ADC select | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | ADC | SEG output direction select<br>ADC = 0 : SEG0 → SEG131<br>ADC = 1 : SEG131 → SEG0 |
| Reverse display ON / OFF | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 1 | REV | Normal / Reverse display select<br>REV = 0 : Reverse display off<br>REV = 1 : Reverse display on |
| Entire display ON / OFF | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | EON | Entire display On/Off control<br>EON = 0 : Entire display off<br>EON = 1 : Entire display on |
| LCD bias select | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | BS | Select LCD bias |
| Set Read-modify-write (RMW) | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | Set Read-modify-write mode |
| Clear RMW | 0 | 0 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 0 | Clear Read-modify-write mode |
| S/W Reset | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | S/W Reset |
| SHL select | 0 | 0 | 1 | 1 | 0 | 0 | SHL | × | × | × | COM output direction select<br>SHL = 0 : COM0 → COM63<br>SHL = 1 : COM63 → COM0 |
| Power control | 0 | 0 | 0 | 0 | 1 | 0 | 1 | VC | VR | VF | Control power circuit operation |
| Regulator resistor select | 0 | 0 | 0 | 0 | 1 | 0 | 0 | R2 | R1 | R0 | Select internal resistance ratio of the regulator resistor |
| Set reference voltage mode | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | Set reference voltage mode (double byte command) |
| Set reference voltage register | 0 | 0 | × | × | SV5 | SV4 | SV3 | SV2 | SV1 | SV0 | Set reference voltage register |
| Set static indicator mode | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | SM | Set static indicator mode (double byte command) |
| Set static indicator register | 0 | 0 | × | × | × | × | × | × | S1 | S0 | Set static indicator register |
| Power save | - | - | - | - | - | - | - | - | - | - | Compound Instruction of display OFF and entire display ON |
| NOP | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | No operation (dummy command) |
| Set Booster Ratio select mode | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | Set Booster ration select mode (double byte command) |
| Set Booster Ratio register | 0 | 0 | x | x | x | x | x | x | BT1 | BT0 | Set Booster ration<br>BT[1:0] = 00 : x2, x3, x4<br>BT[1:0] = 01 : x5<br>BT[1:0] = 11 : x6<br>BT[1:0] = 10 : (don't use) |
| Test Instruction | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | Test command (don't use) |

## 10. QUALITY DESCRIPTION

**DEFECT SPECIFICATION:**

**Specific type-related items are covered in this sheet.**

a: Table for Cosmetic defects
(Note: nc = not counted).
Sizes and number of defects
(Max. Qty)

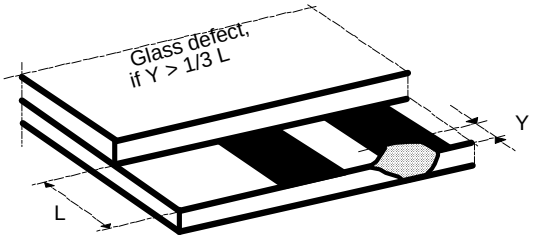



| Defect Type | Max. defect size [µm] d or L | W | Max. Quantity. |
|---|---|---|---|
| Black or White Spots | d ≤ 150 | | nc |
| | 150< d ≤ 300 | | 5 |
| Black or White Lines | -- | W ≤ 10 | nc |
| | L ≤ 5000 | W ≤ 30 | 3 |
| | L ≤ 2000 | W ≤ 50 | 2 |
| Pinhole | d ≤ 150<br>150< d ≤ 300 | | nc<br>1/segment |
| (Total defects) | | | (5) |
| Segment Deformation | | W ≤ 100 | nc |
| Bubble (e.g. under pola) | d ≤ 150 | | nc |
| | 200< d ≤ 400 | | 3 |
| | 400< d ≤ 600 | | 1 |

Examples/ Shapes

b: Glass defects

b1:Glass defects at contact ledge




b2:Glass chipping in other areas shall not be in conflict with the product's function.

## 11. MODULE ACCEPTS QUALITY LEVEL (AQL).

**11.1. AQL Standard Value:** Fatal defect =0.1, Major defect=0.65; Minor defect =2.5.

**11.2. Curtailed Inspection Scheme**

| Type | Batch Qty | inspection Qty | AQL value | pass | Reject |
|---|---|---|---|---|---|
| Module Product | 350PCS＜ 1000PCS | 125pcs | 0.1 | 0 | 1 |
| | | | 0.65 | 2 | 3 |
| | | | 2.5 | 7 | 8 |
| | 200PCS＜ 350PCS | 80pcs | 0.1 | 0 | 1 |
| | | | 0.65 | 1 | 2 |
| | | | 2.5 | 5 | 6 |
| | ＜200PCS | 32pcs | 0.1 | 0 | 1 |
| | | | 0.65 | 0 | 1 |
| | | | 2.5 | 4 | 5 |
| Module Sample | ＜200PCS | All inspected | / | / | The sample will be reject when the fateful defect>2pcs or main defect>5pcs. |
| | ＞200PCS | 125pcs | | | |

**Notes:** 1). Batch QTY is the production amount that production department ship to QA department.
2). All of productions will be inspected if the batch QTY less than inspected QTY.
3). Each batch fixed to be 500pcs.

## 12. RELIABILITY TEST

Operating Lifetime: Longer than 50000 hours (at room temperature without direct irradiation of sunlight)
Reliability characteristics shall meet following requirements.

| TEMPERATURE TESTS | NORMAL GRADE |
|---|---|
| High Temperature Storage | +90°C * 96HR |
| Low Temperature Storage | -40°C * 96HR |
| High Temperature Operation | +80°C * 96HR |
| Low Temperature Operation | -30°C * 96HR |
| High Temperature, High Humidity | +60°C 90%RH 96HR |
| Thermal Shock | -30°C * 30 min<br>10s 5Cycles<br>+80°C * 30 min |
| Vibration Test | Frequency * Swing * Time<br>40Hz * 4mm * 4hrs |
| Drop Test | Drop Height * Times<br>1.0m * 6 times |

## 13. LCD MODULES HANDLING PRECAUTIONS

- The display panel is made of glass. Do not subject it to a mechanical shock by dropping it from a high place, etc.
- If the display panel is damaged and the liquid crystal substance inside it leaks out, do not get any in your mouth. If the substance come into contact with your skin or clothes promptly wash it off using soap and water.
- Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary.
- The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarize carefully.
- To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.
  -Be sure to ground the body when handling the LCD module.
  -Tools required for assembly, such as soldering irons, must be properly grounded.
  -To reduce the amount of static electricity generated, do not conduct assembly and other work under dry conditions.
  -The LCD module is coated with a film to protect the display surface. Exercise care when peeling off this protective film since static electricity may be generated.
- Storage precautions

  When storing the LCD modules, avoid exposure to direct sunlight or to the light of fluorescent lamps. Keep the modules in bags designed to prevent static electricity charging under low temperature / normal humidity conditions (avoid high temperature / high humidity and low temperatures below -20℃). Whenever possible, the LCD modules should be stored in the same conditions in which they were shipped from our company.

## 14. OTHERS

- Liquid crystals solidify at low temperature (below the storage temperature range) leading to defective orientation of liquid crystal or the generation of air bubbles (black or white). Air bubbles may also be generated if the module is subjected to a strong shock at a low temperature.
- If the LCD modules have been operating for a long time showing the same display patterns may remain on the screen as ghost images and a slight contrast irregularity may also appear. Abnormal operating status can be resumed to be normal condition by suspending use for some time. It should be noted that this phenomena does not adversely affect performance reliability.
- To minimize the performance degradation of the LCD modules resulting from caused by static electricity, etc. exercise care to avoid holding the following sections when handling the modules:
  - Exposed area of the printed circuit board
  - Terminal electrode sections