

Product Specification

NHD-24064WG-ATFH-VZ#

Graphic Liquid Crystal Display Module

| | |
|---------------|--|
| NHD- | Newhaven Display |
| 24064- | 240 x 64 Pixels |
| WG- | Display: Graphic |
| A- | Model |
| T- | White LED Backlight |
| F- | FSTN (+) |
| H- | Transflective, 6:00 Optimal View, Wide Temperature |
| VZ#- | Built-in Negative Voltage Supply |

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Additional Resources

- **Support Forum:** <https://support.newhavendisplay.com/hc/en-us/community/topics>
- **GitHub:** <https://github.com/newhavendisplay>
- **Example Code:** <https://support.newhavendisplay.com/hc/en-us/categories/4409527834135-Example-Code/>
- **Knowledge Center:** https://www.newhavendisplay.com/knowledge_center.html
- **Quality Center:** https://www.newhavendisplay.com/quality_center.html
- **Precautions for using LCDs/LCMs:** <https://www.newhavendisplay.com/specs/precautions.pdf>
- **Warranty / Terms & Conditions:** <https://www.newhavendisplay.com/terms.html>

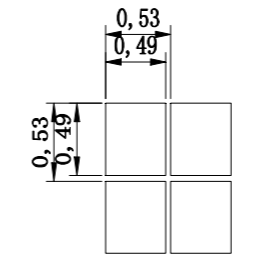
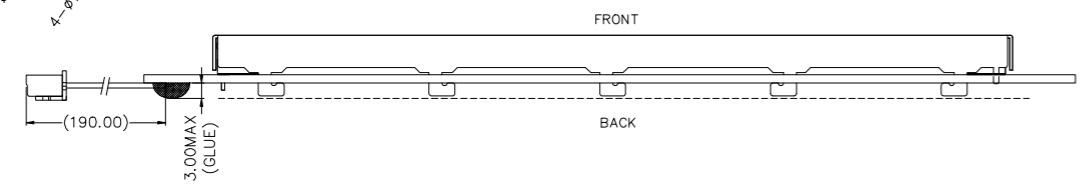
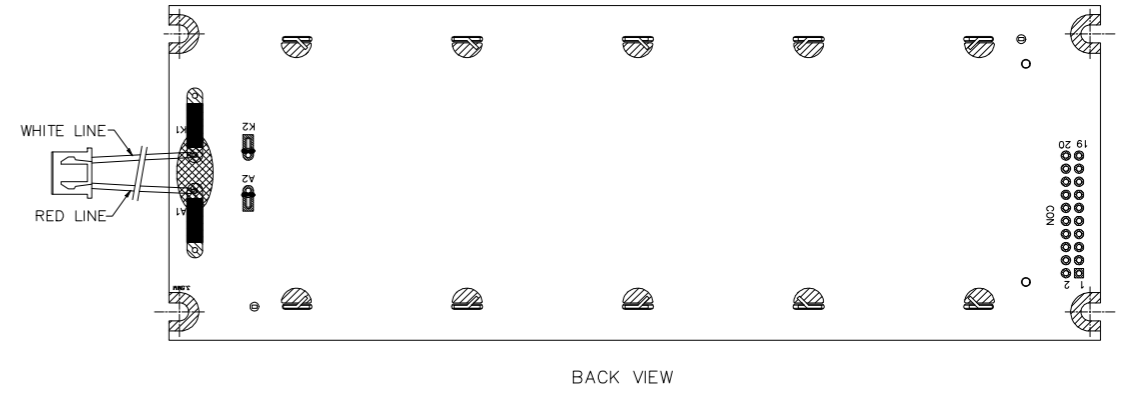
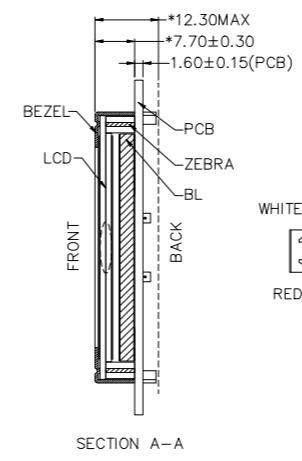
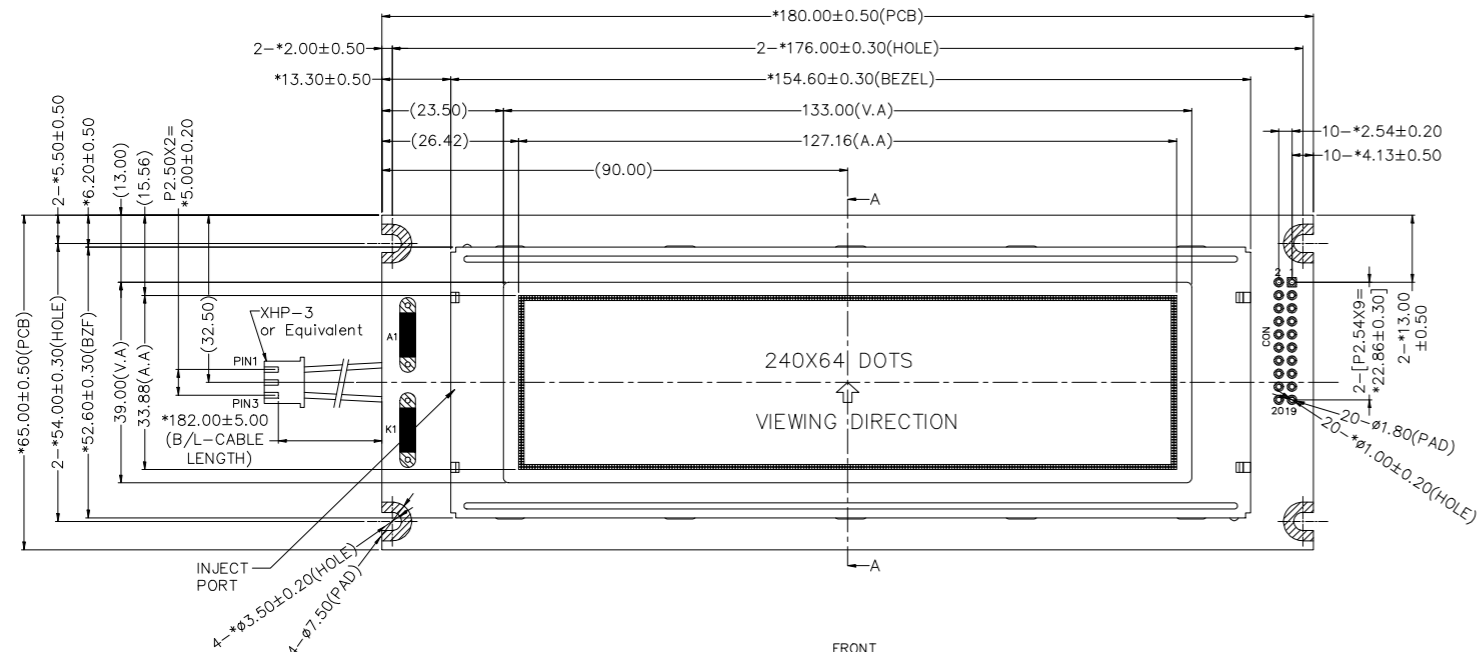


Document Revision History

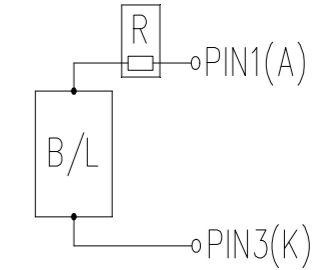
| Revision | Date | Description | Changed By |
|----------|------------|--|------------|
| 0 | 02/28/2008 | Initial Release | - |
| 1 | 04/19/2010 | User Guide Reformat | BE |
| 2 | 05/13/2010 | Updated Backlight Supply Voltage and Current | MC |
| 3 | 11/16/2010 | Pin Description Updated | AK |
| 4 | 05/04/2012 | Optical Characteristics Updated | AK |
| 5 | 05/06/2013 | Electrical and optical characteristics updated. Wiring diagram and mechanical drawing updated. Font table added. | JN |
| 6 | 10/31/2016 | Mechanical Drawing, Electrical & Optical Char. Updated | SB |
| 7 | 01/17/2017 | PCB Redesign | SB |
| 8 | 05/25/2018 | V _{EE} Reset to -10V | SB |
| 9 | 08/15/2018 | Supply Current & Backlight Voltage Updated | SB |
| 10 | 02/13/2019 | Supply Current Updated | SB |
| 11 | 05/12/2021 | Electrical, Optical & Controller IC Updated | ZP |
| 12 | 08/12/2021 | Updated Mechanical Drawing | ZP |
| 13 | 06/17/2022 | Backlight Drive Method Updated | ZP |
| 14 | 08/02/2022 | Updated Backlight Supply Current | CJ |
| 15 | 12/11/2023 | Backlight Condition Updated to Voltage-driven | KL |
| 16 | 06/04/2024 | Mechanical Drawing Updated Part Revision Upgraded to Rev2A | KL |
| 17 | 07/15/2024 | Mechanical Drawing Updated | KL |
| 18 | 08/27/2024 | Backlight Updated to Current Driven | KL |
| 19 | 09/20/2024 | Updated Minimum Backlight Voltage | KL |

Mechanical Drawing

Newhaven Display
 NHD-24064WG-ATFH-VZ#_Rev2A
 Date Code
 Part Label (type/format may vary)



DOTS DETAIL
SCALE: 20/1



BACKLIGHT DRIVER CIRCUIT DIAGRAM

| | | | | | | | | | | |
|------------|------|-----|-----|-----|-----|-----|-----|-----|---------|---------|
| PIN | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| CONNECTION | FGND | Vss | Vdd | Vo | /WR | /RD | /CE | C/D | Vee(NC) | /RESET |
| PIN | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| CONNECTION | DB0 | DB1 | DB2 | DB3 | DB4 | DB5 | DB6 | DB7 | FS | NC(Vee) |

Product Description: 240x64 Graphic LCD

1. Driver IC: RA6963N1
2. Driving Mode: 1/64 Duty, 1/9 Bias
3. Interface: 8-bit 8080 Parallel
4. Power Requirement: 5.0V LCD
5. Optical Features: FSTN (+), Transflective, 6:00 View, White Backlight
6. Recommended Pin Header: 2x10pin 2.54mm pitch

| | | |
|---|---|---------------------------|
| Standard Tolerance: (Unless otherwise specified) Linear: ±0.3mm | | |
| | Drawing/Part Number: NHD-24064WG-ATFH-VZ# | Revision: 2A |
| Unless otherwise specified: • Dimensions are in Millimeters • Third Angle Projection | Drawn By: K. Lewis | Approved By: K. Lewis |
| | Drawn Date: 07/15/2024 | Approved Date: 07/15/2024 |
| This drawing is solely the property of Newhaven Display International, Inc. The information it contains is not to be disclosed, reproduced or copied in whole or part without written approval from Newhaven Display. | | |

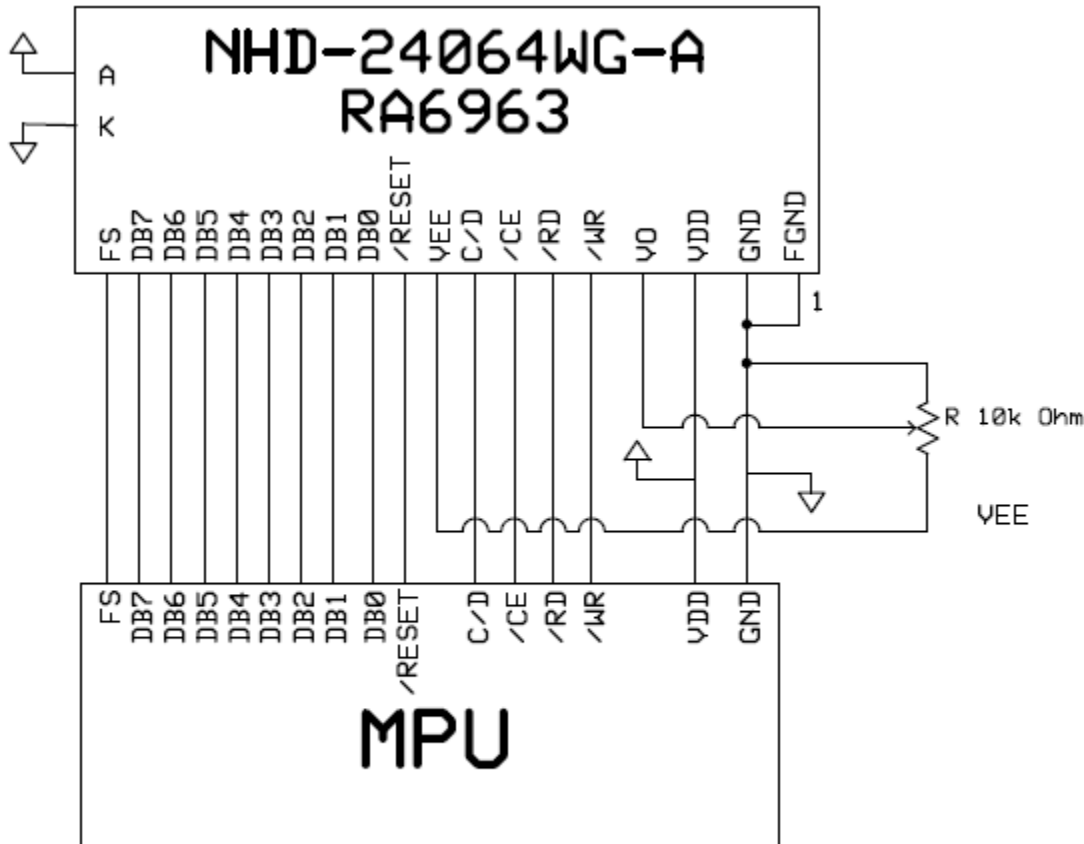
Pin Description

| Pin No. | Symbol | External Connection | Function Description |
|---------|-----------------|---------------------|---|
| 1 | FGND | Power Supply | Frame Ground |
| 2 | V _{SS} | Power Supply | Ground |
| 3 | V _{DD} | Power Supply | Power supply for logic (+5.0V) |
| 4 | V ₀ | Adj. Power Supply | Power supply for contrast (approx. -7V) |
| 5 | /WR | MPU | Active LOW Write signal |
| 6 | /RD | MPU | Active LOW Read signal |
| 7 | /CE | MPU | Active LOW chip enable |
| 8 | C/D | MPU | Register Select signal C/D=0: DATA C/D=1: COMMAND |
| 9 | V _{EE} | Power Supply | Negative voltage output (-10V) |
| 10 | RESET | MPU | Active LOW reset signal |
| 11~18 | DB0~DB7 | MPU | 8-bit Bi-directional data bus |
| 19 | FS | MPU | Font Select: 1=6x8 fonts, 0=8x8 fonts |
| 20 | NC | - | No Connect |
| A | LED+ | Power Supply | Backlight Anode (+3.5V) |
| K | LED- | Power Supply | Backlight Cathode (Ground) |

Recommended LCD connector: 2.54mm pitch pins

Backlight connector: JST-XHP-3 **Mates with:** B 3B-XH-A

Wiring Diagram



Electrical Characteristics

| Item | Symbol | Condition | Min. | Typ. | Max. | Unit |
|-----------------------------|------------------|-------------------------|----------------------|--------|----------------------|------|
| Operating Temperature Range | T _{OP} | Absolute Max | -20 | - | +70 | °C |
| Storage Temperature Range | T _{ST} | Absolute Max | -30 | - | +80 | °C |
| Supply Voltage | V _{DD} | - | 4.5 | 5.0 | 5.5 | V |
| Supply Current | I _{DD} | V _{DD} = 5.0V | 8.2 | 16.5 | 33 | mA |
| Supply for LCD (contrast) | V _{LCD} | T _{OP} = 25°C | 12.1 | 12.5 | 12.9 | V |
| "H" Level input | V _{IH} | - | 0.8*V _{DD} | - | V _{DD} | V |
| "L" Level input | V _{IL} | - | V _{SS} | - | 0.15*V _{DD} | V |
| "H" Level output | V _{OH} | - | V _{DD} -0.3 | - | V _{DD} | V |
| "L" Level output | V _{OL} | - | V _{SS} | - | 0.3 | V |
| | | | | | | |
| Backlight Supply Current* | I _{LED} | | 60 | 80 | 100 | mA |
| Backlight Supply Voltage | V _{LED} | I _{LED} = 80mA | 3.3 | 3.5 | 3.7 | V |
| Backlight Lifetime | - | I _{LED} = 80mA | - | 50,000 | - | Hrs. |

*The LED of the backlight is driven by current drain; drive voltage is for reference only. Drive voltage must be selected to ensure backlight current drain is below MAX level stated.

Optical Characteristics

| Item | | Symbol | Condition | Min. | Typ. | Max. | Unit |
|------------------------|--------|----------------|------------------------|------|------|------|------|
| Optimal Viewing Angles | Top | φY+ | CR ≥ 2 | 0 | - | 30 | ° |
| | Bottom | φY- | | 0 | - | 60 | ° |
| | Left | θX- | | 0 | - | 45 | ° |
| | Right | θX+ | | 0 | - | 45 | ° |
| Contrast Ratio | | CR | - | 2 | 5 | - | - |
| Response Time | Rise | T _R | T _{OP} = 25°C | - | 200 | 300 | ms |
| | Fall | T _F | | - | 250 | 350 | ms |

Controller Information

Built-in RA6963N1 Controller: <https://support.newhavendisplay.com/hc/en-us/articles/4414786723479-RA6963>



Table of Commands

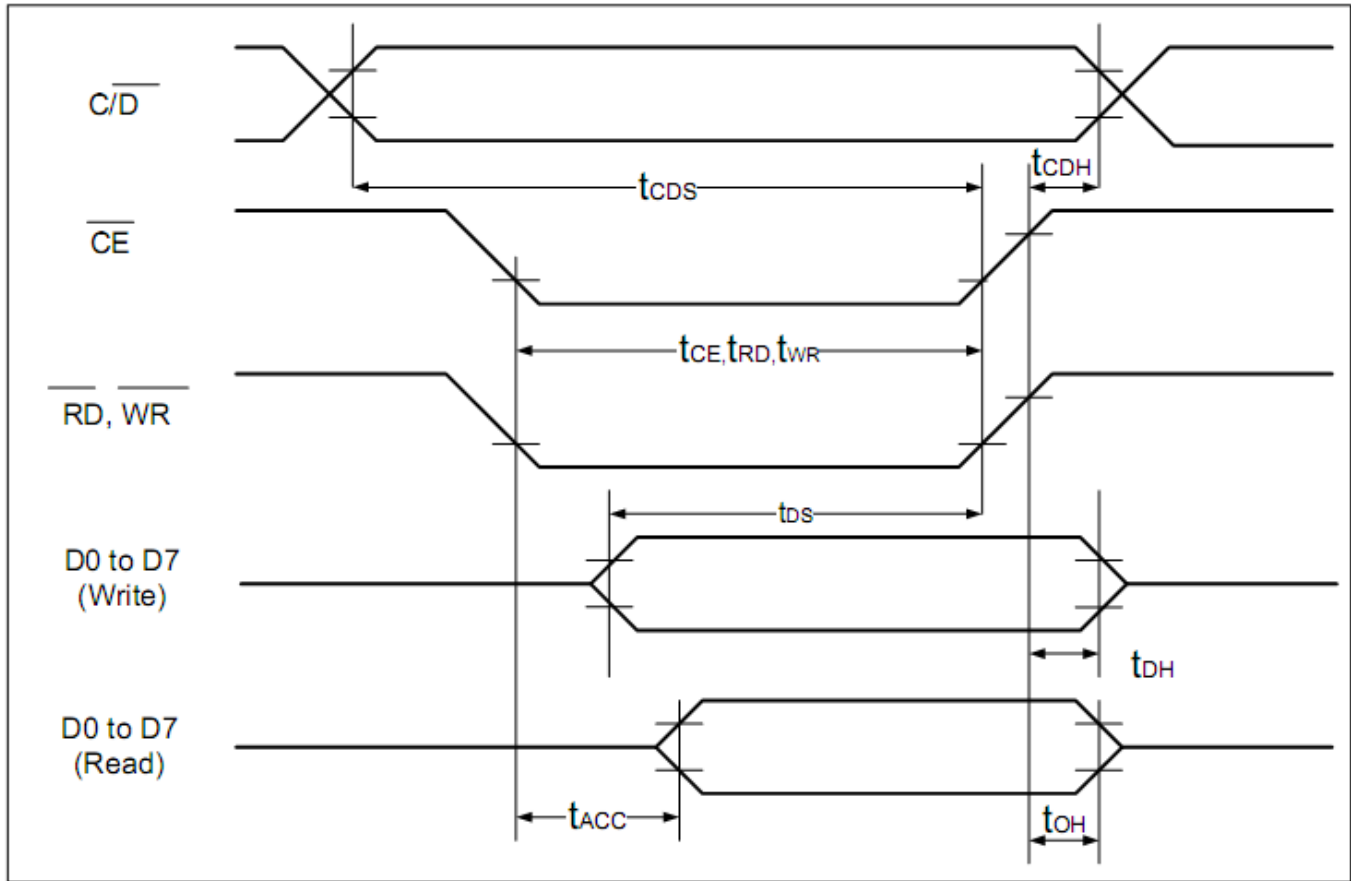
| Command | Code | D1 | D2 | Function |
|------------------------------|----------|-------------|--------------|---------------------------------|
| Registers Setting | 00100001 | X address | Y address | Set cursor pointer |
| | 00100010 | Data | 00h | Set Offset Register |
| | 00100100 | Low address | High address | Set Address pointer |
| Set Control Word | 01000000 | Low address | High address | Set Text Home Address |
| | 01000001 | Columns | 00h | Set Text Area |
| | 01000010 | Low address | High address | Set Graphic Home Address |
| | 01000011 | Columns | 00h | Set Graphic Area |
| Mode Set | 1000X000 | -- | -- | OR mode |
| | 1000X001 | -- | -- | EXOR mode |
| | 1000X011 | -- | -- | AND mode |
| | 1000X100 | -- | -- | Text Attribute mode |
| | 10000XXX | -- | -- | Internal CG ROM mode |
| | 10001XXX | -- | -- | External CG RAM mode |
| Display Mode | 10010000 | -- | -- | Display off |
| | 1001XX10 | -- | -- | Cursor on, blink off |
| | 1001XX11 | -- | -- | Cursor on, blink on |
| | 100101XX | -- | -- | Text on, graphic off |
| | 100110XX | -- | -- | Text off, graphic on |
| | 100111XX | -- | -- | Text on, graphic on |
| Cursor Pattern Select | 10100000 | -- | -- | 1-line cursor |
| | 10100001 | -- | -- | 2-line cursor |
| | 10100010 | -- | -- | 3-line cursor |
| | 10100011 | -- | -- | 4-line cursor |
| | 10100100 | -- | -- | 5-line cursor |
| | 10100101 | -- | -- | 6-line cursor |
| | 10100110 | -- | -- | 7-line cursor |
| | 10100111 | -- | -- | 8-line cursor |
| Data auto Read/Write | 10110000 | -- | -- | Set Data Auto Write |
| | 10110001 | -- | -- | Set Data Auto Read |
| | 10110010 | -- | -- | Auto Reset |
| Data Read/Write | 11000000 | Data | -- | Data Write and Increment ADP |
| | 11000001 | -- | -- | Data Read and Increment ADP |
| | 11000010 | Data | -- | Data Write and Decrement ADP |
| | 11000011 | -- | -- | Data Read and Decrement ADP |
| | 11000100 | Data | -- | Data Write and Non-variable ADP |
| | 11000101 | -- | -- | Data Read and Non-variable ADP |
| Screen Peek | 11100000 | -- | -- | Screen Peek |
| Screen Copy | 11101000 | | | Screen Copy |
| Bit Set/Reset | 11110XXX | -- | -- | Bit Reset |
| | 11111XXX | -- | -- | Bit Set |
| | 1111X000 | -- | -- | Bit 0 (LSB) |
| | 1111X001 | -- | -- | Bit 1 |
| | 1111X010 | -- | -- | Bit 2 |
| | 1111X011 | -- | -- | Bit 3 |
| | 1111X100 | -- | -- | Bit 4 |
| | 1111X101 | -- | -- | Bit 5 |
| | 1111X110 | -- | -- | Bit 6 |
| | 1111X111 | -- | -- | Bit 7 (MSB) |

Timing Characteristics

8080 Parallel

($V_{DD}=+5V\pm 5\%$, $GND=0V$, $T_a = -20$ to $+70^\circ C$)

| Item | Symbol | Test Conditions | Min. | Max. | Unit |
|---|--------------------------------|-----------------|------|------|------|
| C/\overline{D} Set Up Time | t_{CDS} | -- | 100 | -- | ns |
| C/\overline{D} Hold Time | t_{CDH} | -- | 10 | -- | ns |
| \overline{CE} , \overline{RD} , \overline{WR} Pulse Width | t_{CE} , t_{RD} , t_{WR} | -- | 80 | -- | ns |
| Data Set Up Time | t_{DS} | -- | 80 | -- | ns |
| Data Hold Time | t_{DH} | -- | 40 | -- | ns |
| Access Time | t_{ACC} | -- | -- | 150 | ns |
| Output Hold Time | t_{OH} | -- | 10 | 50 | ns |



Built-in Font Table

| LSB MSB | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | A | B | C | D | E | F |
|------------|---|---|---|---|----|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | ! | " | # | \$ | % | & | ' | (|) | * | + | , | - | . | / |
| 1 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | : | ; | < | = | > | ? |
| 2 | @ | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O |
| 3 | P | Q | R | S | T | U | V | W | X | Y | Z | [| \ |] | ^ | _ |
| 4 | ` | a | b | c | d | e | f | g | h | i | j | k | l | m | n | o |
| 5 | p | q | r | s | t | u | v | w | x | y | z | { | | } | ~ | |
| 6 | Q | Ü | é | á | ä | å | ö | ø | ë | è | ì | î | ï | ä | å | |
| 7 | É | æ | Æ | ö | ö | ö | ö | ö | ö | ö | ö | ö | ö | ö | ö | ö |

Example Initialization Program

```
void command(int A)
{
    P1 = A;
    ID = 1;           //Command
    CE = 0;
    WRT = 0;
    WRT = 1;
    CE = 1;
}

void data(int A)
{
    P1 = A;
    ID = 0;           //Data
    CE = 0;
    WRT = 0;
    WRT = 1;
    CE = 1;
}

void init()
{
    RST = 1;
    RDD = 1;
    F_S = 1;
    data(0x00);
    data(0x00);
    commnd(0x40);     //Set Text Home Address
    data(0x00);       //Low Address Columns
    data(0x40);       //High Address
    command(0x42);    //Set Graphic Home Address
    data(0x1E);       //Low Address Columns
    data(0x00);       //High Address
    command(0x41);    //Set Text Area
    data(0x1E);       //Low Address Columns
    data(0x00);       //High Address
    command(0x43);    //Set Graphic Area
    command(0x80);    //Mode Set to 'OR' mode
}
```



Quality Information

| Test Item | Content of Test | Test Condition | Note |
|---------------------------------------|---|---|------|
| High Temperature storage | Endurance test applying the high storage temperature for a long time. | +80°C, 96 Hrs. | 2 |
| Low Temperature storage | Endurance test applying the low storage temperature for a long time. | -30°C, 96 Hrs. | 1,2 |
| High Temperature Operation | Endurance test applying the electric stress (voltage & current) and the high thermal stress for a long time. | +70°C, 96 Hrs. | 2 |
| Low Temperature Operation | Endurance test applying the electric stress (voltage & current) and the low thermal stress for a long time. | -20°C, 96 Hrs. | 1,2 |
| High Temperature / Humidity Operation | Endurance test applying the electric stress (voltage & current) and the high thermal with high humidity stress for a long time. | +60°C, 90% RH, 96 Hrs. | 1,2 |
| Thermal Shock resistance | Endurance test applying the electric stress (voltage & current) during a cycle of low and high thermal stress. | -20°C,30min -> 25°C,5min -> 70°C,30min = 1 cycle 10 cycles | |
| Vibration test | Endurance test applying vibration to simulate transportation and use. | 10-55Hz, 1.5mm amplitude. 60 sec in each of 3 directions X,Y,Z For 15 minutes | 3 |
| Static electricity test | Endurance test applying electric static discharge. | V _S =±800V, R _S =330Ω, C _S =150pF 10 Times | |

Note 1: No condensation to be observed.

Note 2: Conducted after 4 hours of storage at 25°C, 0%RH.

Note 3: Test performed on product itself, not inside a container.