

Product Specification

NHD-240128WG-ATMI-VZ#

Graphic Liquid Crystal Display Module

| | |
|----------------|---|
| NHD- | Newhaven Display |
| 240128- | 240 x 128 Pixels |
| WG- | Display Type: Graphic |
| A- | Model |
| T- | White LED Backlight |
| M- | STN (-), Blue |
| I- | Transmissive, 6:00 Optimal View, Wide Temperature |
| VZ#- | Built-in Negative Voltage |

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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>

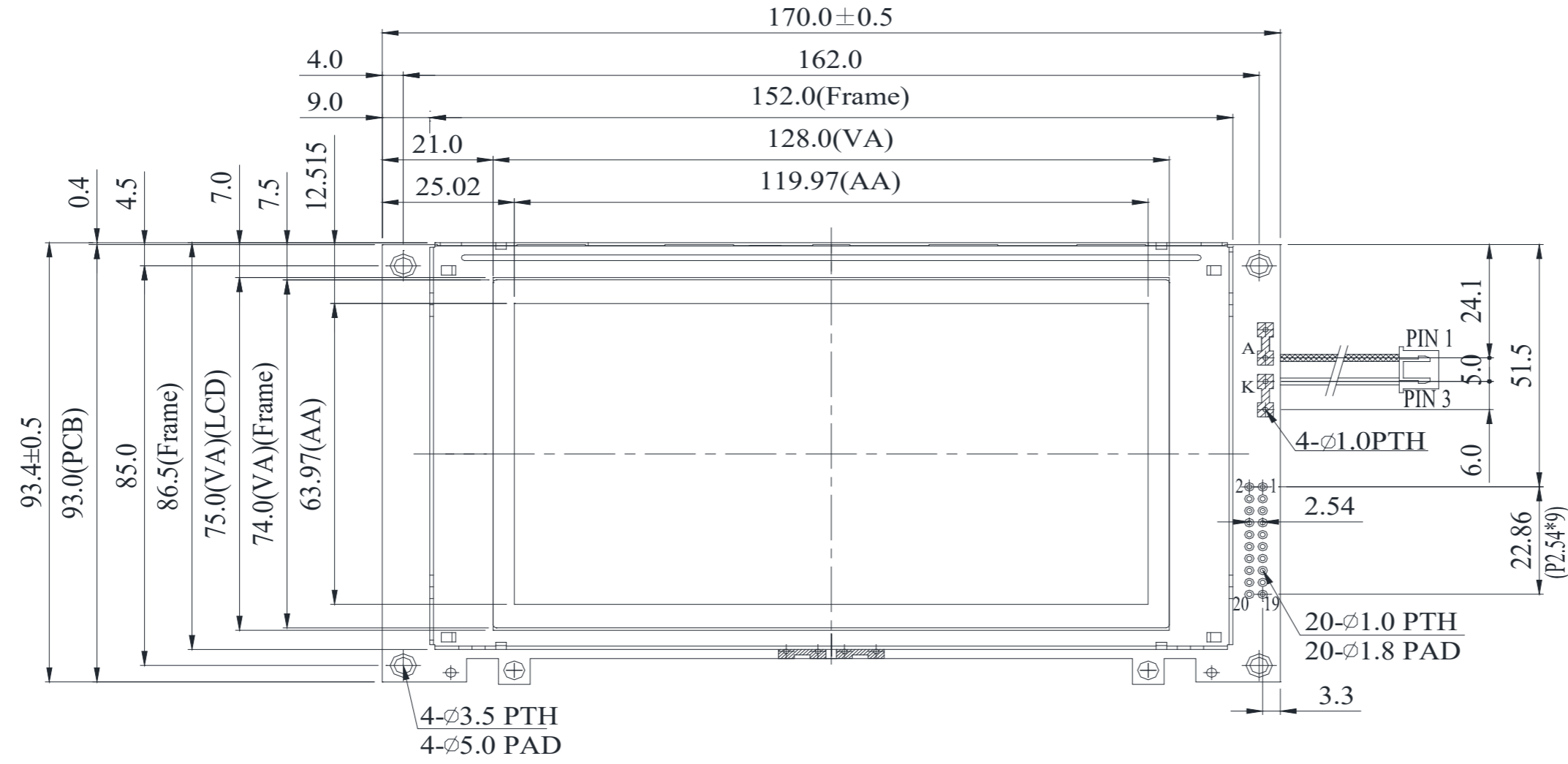


Document Revision History

| Revision | Date | Description | Changed By |
|----------|----------|--|------------|
| 0 | 04/28/10 | User guide reformat | MC |
| 1 | 07/01/10 | Pin description update | MP |
| 2 | 04/13/12 | Mechanical drawing updated | AK |
| 3 | 05/14/14 | Electrical characteristics, Mechanical drawing updated | ML |
| 4 | 12/21/16 | Mechanical Drawing & Electrical Characteristics Updated | SB |
| 5 | 02/13/19 | Backlight Supply Current Updated | SB |
| 6 | 07/16/20 | Updated Response Times & Quality Information | AS |
| 7 | 10/07/20 | Implemented Improvement in LCD Glass; Part Revision Upgraded to Rev1A | AS |
| 8 | 05/17/21 | Electrical, Optical & IC updated | ZP |
| 9 | 08/18/21 | Updated Mechanical Drawing | ZP |

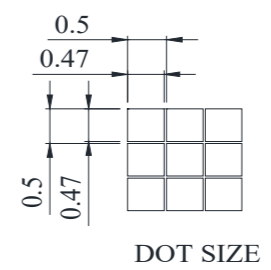
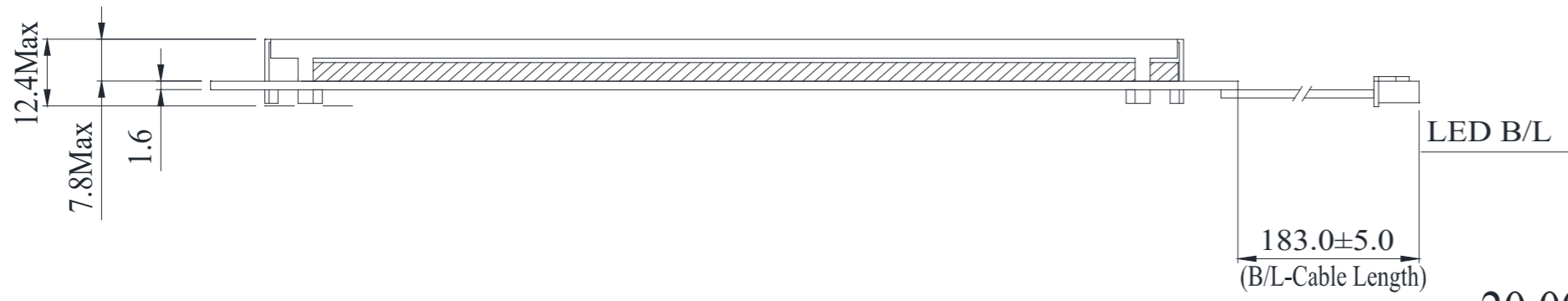
Mechanical Drawing

| SYMBOL | REVISION | DATE |
|--------|----------|------|
| | | |



Pin Assignment

| PIN NO. | SYMBOL |
|---------|-----------------|
| 1 | FGND |
| 2 | V _{SS} |
| 3 | V _{DD} |
| 4 | V _O |
| 5 | WR |
| 6 | RD |
| 7 | CE |
| 8 | C/D |
| 9 | V _{EE} |
| 10 | RESET |
| 11 | DB0 |
| 12 | DB1 |
| 13 | DB2 |
| 14 | DB3 |
| 15 | DB4 |
| 16 | DB5 |
| 17 | DB6 |
| 18 | DB7 |
| 19 | FS |
| 20 | RV |



- Notes:**
- Driver: 1/128 Duty
 - Display Mode: STN Blue Negative / Transmissive
 - Optimal View: 6:00
 - Voltage: 5.0V VDD, 18V VLCD
 - Backlight: White LED
 - Driver IC: RA6963N1

NEWHAVEN DISPLAY
 NHD-240128WG-ATMI-VZ#_Rev1B
www.newhavendisplay.com
 C-PO#-datecode-Serial Number
 Made in china

| | | |
|---|--|---|
| Standard Tolerance: (Unless otherwise specified) | | |
| Linear: ±0.3mm | | |
| Unless otherwise specified: • Dimensions are in Millimeters • Third Angle Projection | Drawing/Part Number: NHD-240128WG-ATMI-VZ# | Revision: 1B |
| | Drawn By: Z.Palrang Drawn Date: 08/18/2021 | Approved By: Z.Palrang Approved Date: 08/18/2021 |
| Do Not Scale Drawing | | Sheet 1 of 1 |
| 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. | | |

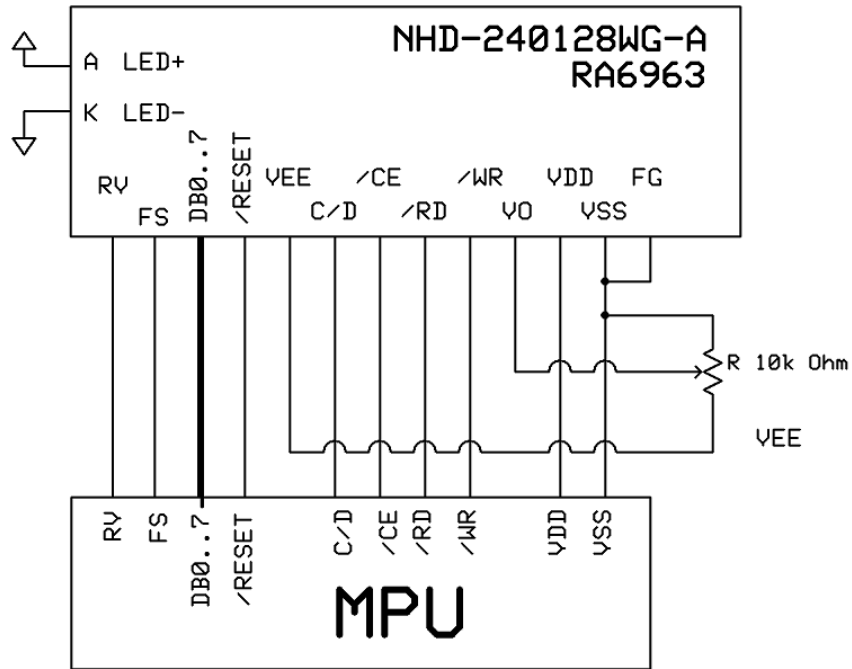
Pin Description

| Pin No. | Symbol | External Connection | Function Description |
|---------|-----------------|---------------------|---|
| 1 | FGND | Power Supply | Frame Ground |
| 2 | V _{SS} | Power Supply | Ground |
| 3 | V _{DD} | Power Supply | Supply Voltage for LCD and Logic (+5.0V) |
| 4 | V ₀ | Adj. Power Supply | Supply Voltage for Contrast (approx. -13.0V) |
| 5 | \overline{WR} | MPU | Active LOW Write signal |
| 6 | \overline{RD} | MPU | Active LOW Read signal |
| 7 | \overline{CE} | MPU | Active LOW Chip Enable signal |
| 8 | C/D | MPU | Command/Data selection: '1' = Command, '0' = Data |
| 9 | V _{EE} | Power Supply | Negative Voltage output (-16V) |
| 10 | RESET | MPU | Active LOW Reset signal |
| 11-18 | DB0~DB7 | MPU | 8-bit bi-directional data bus |
| 19 | FS | Power Supply | Font Selection: '1' = 6x8, '0' = 8x8 |
| 20 | RV | MPU | Reverse display signal: '1' = Reverse Display, '0' = Normal Display |

Recommended LCD connector: 20 Pin, 2.54mm pitch pins

Backlight connector: JST p/n: XHP-3 **Mates with:** JST p/n: 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 | 15 | 30 | 60 | mA |
| Supply for LCD (contrast) | V _{LCD} | T _{OP} = 25°C | 17.5 | 18.0 | 18.5 | 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} | - | 96 | 128 | 160 | mA |
| Backlight Supply Voltage | V _{LED} | I _{LED} = 128mA | 3.4 | 3.5 | 3.6 | V |

*Backlight is current driven; do not supply more than 160 mA. Luminance is directly related to Backlight Supply Current.

Optical Characteristics

| Item | | Symbol | Condition | Min. | Typ. | Max. | Unit |
|------------------------|--------|----------------|------------------------|------|------|------|------|
| Optimal Viewing Angles | Top | φY+ | CR ≥ 2 | 0 | - | 20 | ° |
| | Bottom | φY- | | 0 | - | 40 | ° |
| | Left | θX- | | 0 | - | 30 | ° |
| | Right | θX+ | | 0 | - | 30 | ° |
| Contrast Ratio | | CR | - | 2 | 3 | - | - |
| Response Time | Rise | T _R | T _{OP} = 25°C | - | 200 | 300 | ms |
| | Fall | T _F | | - | 250 | 350 | ms |

Controller Information

Built-in RA6963N1.

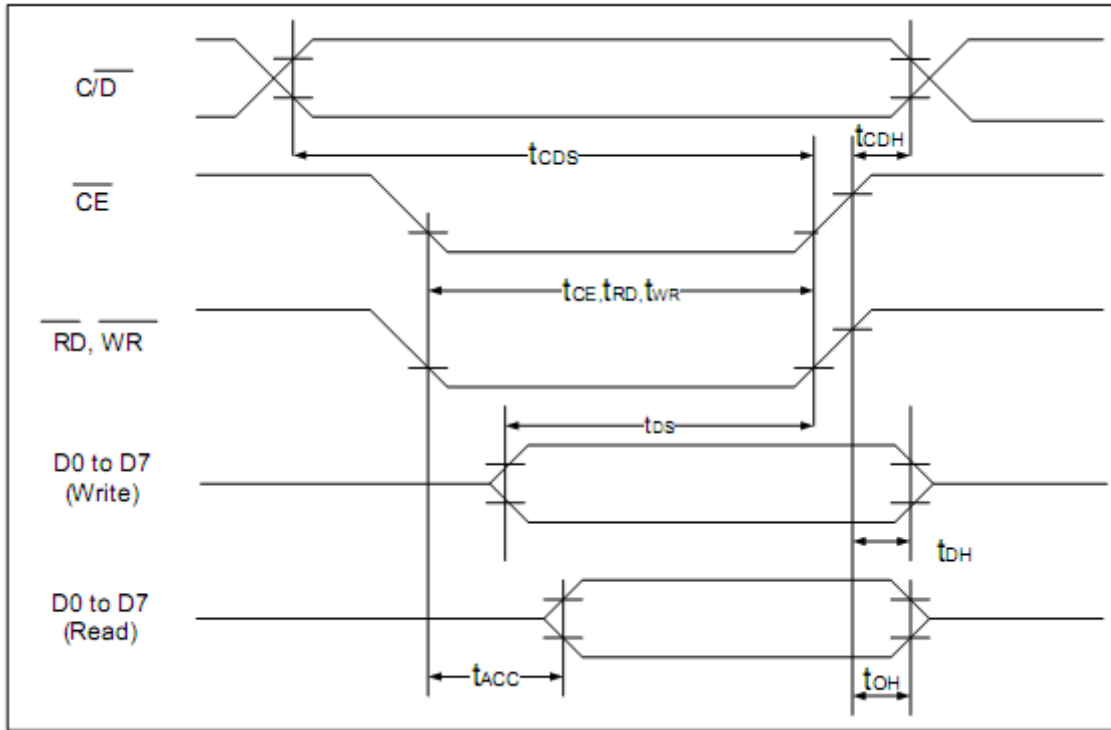
Please download specification at <https://support.newhavendisplay.com/hc/en-us/articles/4414786723479-RA6963>



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



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

| Item | Symbol | Test Conditions | Min. | Max. | Unit |
|---|--------------------------|-----------------|------|------|------|
| $\overline{C/D}$ Set Up Time | t_{CDS} | -- | 100 | -- | ns |
| $\overline{C/D}$ 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 | U | 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 | ç | ü | é | á | â | ã | ä | å | ø | ê | ë | è | ì | í | î | ä |
| 7 | é | æ | æ | ô | ö | ö | ö | ü | ü | ö | ü | ø | € | ¥ | £ | £ |

Example Program Code

```
//-----
Sub Writecom
P1 = A                'move data to port 1
Set P3.0              'set I/D for instruction
Reset P3.1            'reset /CS
Reset P3.4            'reset /WR
Set P3.1              'set /CS
Set P3.4              'set /WR
End Sub

Sub Writedata
P1 = A                'move data to port 1
Reset P3.0            'reset I/D for instruction
Reset P3.1
Reset P3.4            'toggle /CS and /WR
Set P3.1
Set P3.4
End Sub

//-----
Sub Init
Set P3.6
Set P3.7
Reset P3.3            'reset FS
A = &H00
Call Writedata
Call Writedata        'text address = 0000h
A = &H40
Call Writecom         'text home address set
A = &H00
Call Writedata
A = &H40              'graphic home address = 4000h
Call Writedata
A = &H42
Call Writecom         'graphic home address set
A = &H1E
Call Writedata
A = &H00              'text area address = 001Eh
Call Writedata
A = &H41
Call Writecom         'text area control set
A = &H1E
Call Writedata
A = &H00              'graphic area = 001Eh
Call Writedata
A = &H43
Call Writecom         'graphic area control set
A = &H80
Call Writecom         'set display mode
End Sub
```



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, 200hrs | 2 |
| Low Temperature storage | Endurance test applying the low storage temperature for a long time. | -30°C, 200hrs | 1,2 |
| High Temperature Operation | Endurance test applying the electric stress (voltage & current) and the high thermal stress for a long time. | +70°C, 200hrs | 2 |
| Low Temperature Operation | Endurance test applying the electric stress (voltage & current) and the low thermal stress for a long time. | -20°C, 200hrs | 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, 96hrs | 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. | Air: ±800V 150pF/330Ω, 10 Times | |
| | | Contact: ±600V 150pF/330Ω, 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.