

NHD-240128WG-ATFH-VZ#

Graphic Liquid Crystal Display Module

| | |
|---------|--|
| NHD- | Newhaven Display |
| 240128- | 240 x 128 Pixels |
| WG- | Display Type: Graphic |
| A- | Model |
| T- | White LED Backlight |
| F- | FSTN (+) |
| H- | Transflective, 6:00 Optimal View, Wide Temperature |
| VZ#- | Built-in Negative Voltage |
| | RoHS Compliant |

Newhaven Display International, Inc.

2661 Galvin Ct.

Elgin IL, 60124

Ph: 847-844-8795

Fax: 847-844-8796

www.newhavendisplay.com

nhtech@newhavendisplay.com

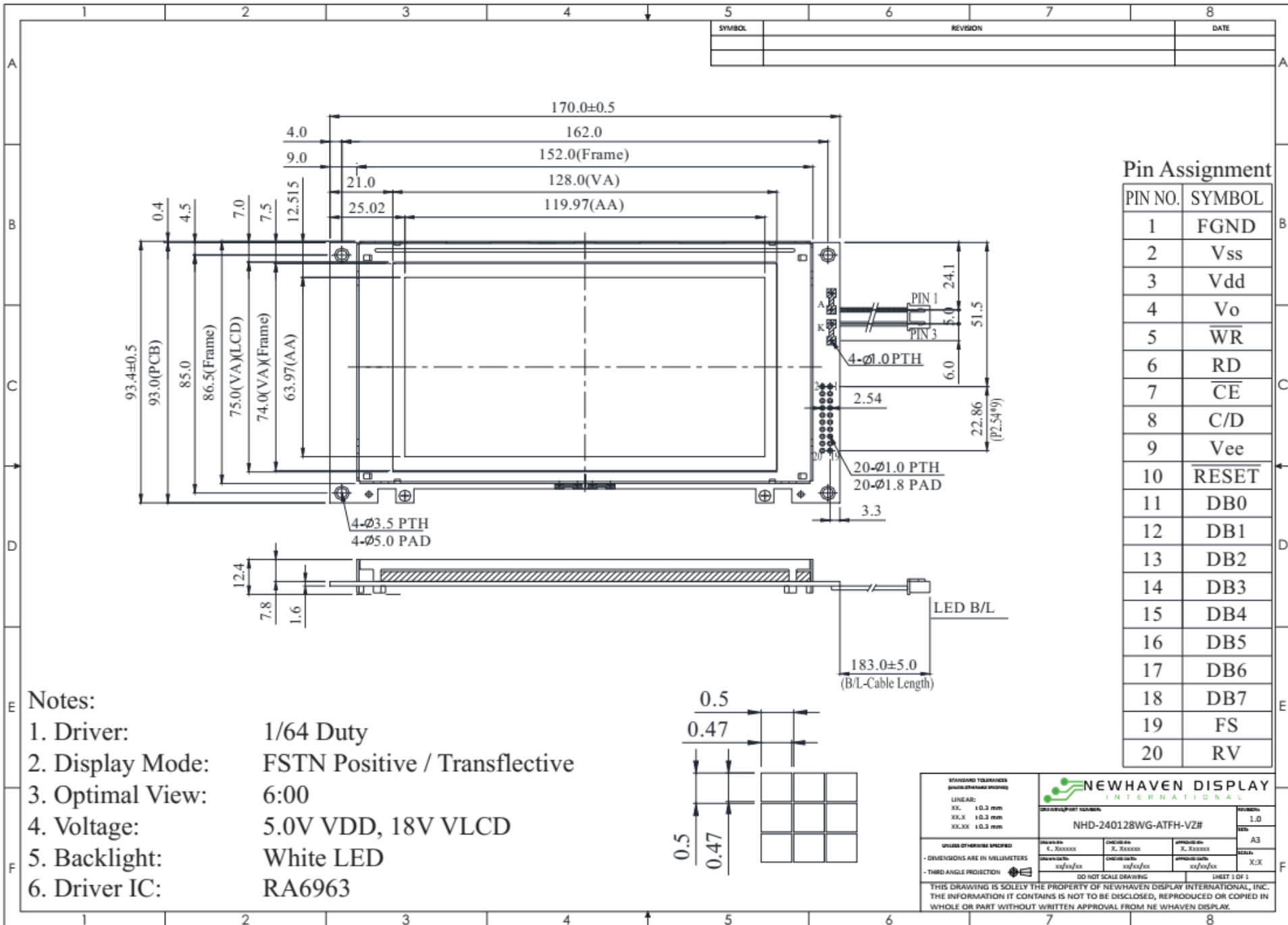
nhsales@newhavendisplay.com

Document Revision History

| Revision | Date | Description | Changed by |
|----------|----------|---|------------|
| 0 | 4/28/10 | User guide reformat | MC |
| 1 | 2/9/11 | Pin description updated | AK |
| 2 | 4/26/11 | Electrical characteristics updated | AK |
| 3 | 4/13/12 | Mechanical drawing updated | AK |
| 4 | 5/14/14 | Electrical characteristics, Mechanical drawing updated | ML |
| 5 | 12/22/14 | Electrical characteristics & Mechanical drawing updated | PB |
| 6 | 3/1/17 | Mechanical Drawing, Electrical Characteristics Updated | SB |
| 7 | 11/12/18 | Current Draw Note Updated, Drawing Reformat | SB |

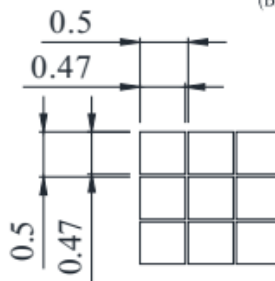
Functions and Features

- 240 x 128 pixels
- Built-in RA6963 controller
- +5.0V power supply
- RoHS compliant



Notes:

- 1. Driver: 1/64 Duty
- 2. Display Mode: FSTN Positive / Transflective
- 3. Optimal View: 6:00
- 4. Voltage: 5.0V VDD, 18V VLCD
- 5. Backlight: White LED
- 6. Driver IC: RA6963



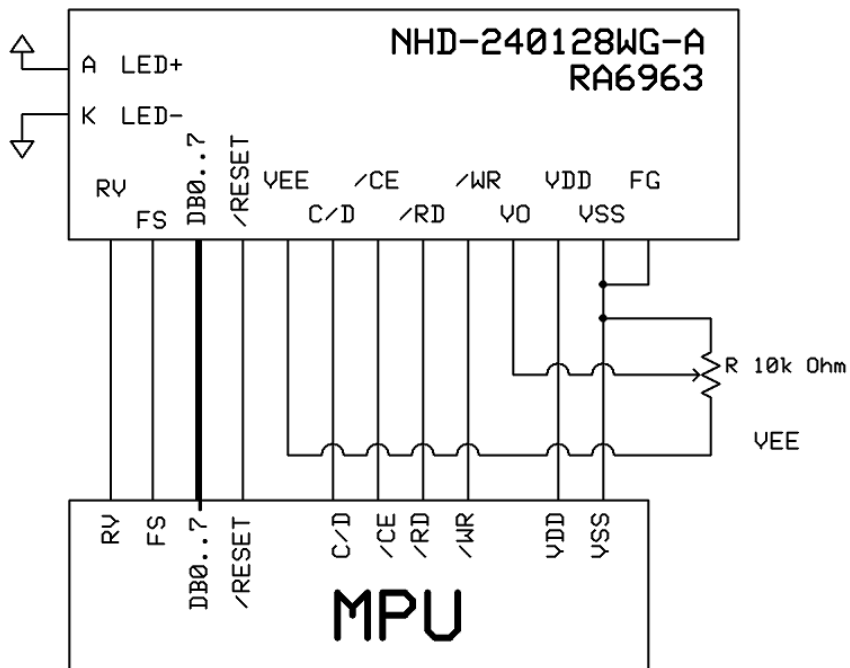
| | | | | |
|---|------------------------|-----------------------------------|--------------|---------------|
| STANDARD TOLERANCES (unless otherwise specified) | | NEWHAVEN DISPLAY INTERNATIONAL | | REVISION: 1.0 |
| LINEAR: XX 1.0.3 mm XX.X 1.0.3 mm XX.XX 1.0.3 mm | | NHD-240128WG-ATFH-VZ# | | DATE: A3 |
| DESIGNED BY: X.XXXXXX | CHECKED BY: X.XXXXXX | APPROVED BY: X.XXXXXX | SCALE: X:XX | |
| DRAWN DATE: xx/xx/xx | CHECKED DATE: xx/xx/xx | APPROVED DATE: xx/xx/xx | SHEET 1 OF 1 | |
| - DIMENSIONS ARE IN MILLIMETERS | | | | |
| - THIRD ANGLE PROJECTION | | | | |
| DO NOT SCALE DRAWING | | | | |
| 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 and Wiring Diagram

| 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



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} | - | 3.0 | 5.0 | 5.5 | V |
| Supply Current | I_{DD} | $V_{DD} = 5.0V$ $T_{OP} = 25^{\circ}C$ | 15 | 30 | 60 | mA |
| Supply for LCD (contrast) | $V_{DD} - V_0$ | | 17.5 | 18.0 | 18.5 | V |
| "H" Level input | V_{IH} | - | $V_{DD} - 2.2$ | - | V_{DD} | V |
| "L" Level input | V_{IL} | - | V_{SS} | - | 0.8 | 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} | - | - | 128 | 160 | mA |
| Backlight Supply Voltage | V_{LED} | $I_{LED} =$ | 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 | $CR \geq 2$ | - | 30 | - | ° |
| | Bottom | | - | 60 | - | ° |
| | Left | | - | 45 | - | ° |
| | Right | | - | 45 | - | ° |
| Contrast Ratio | CR | - | 2 | 5 | - | - |
| Response Time | Rise | $T_{OP} = 25^{\circ}C$ | - | 200 | 300 | ms |
| | Fall | | - | 250 | 350 | ms |

Controller Information

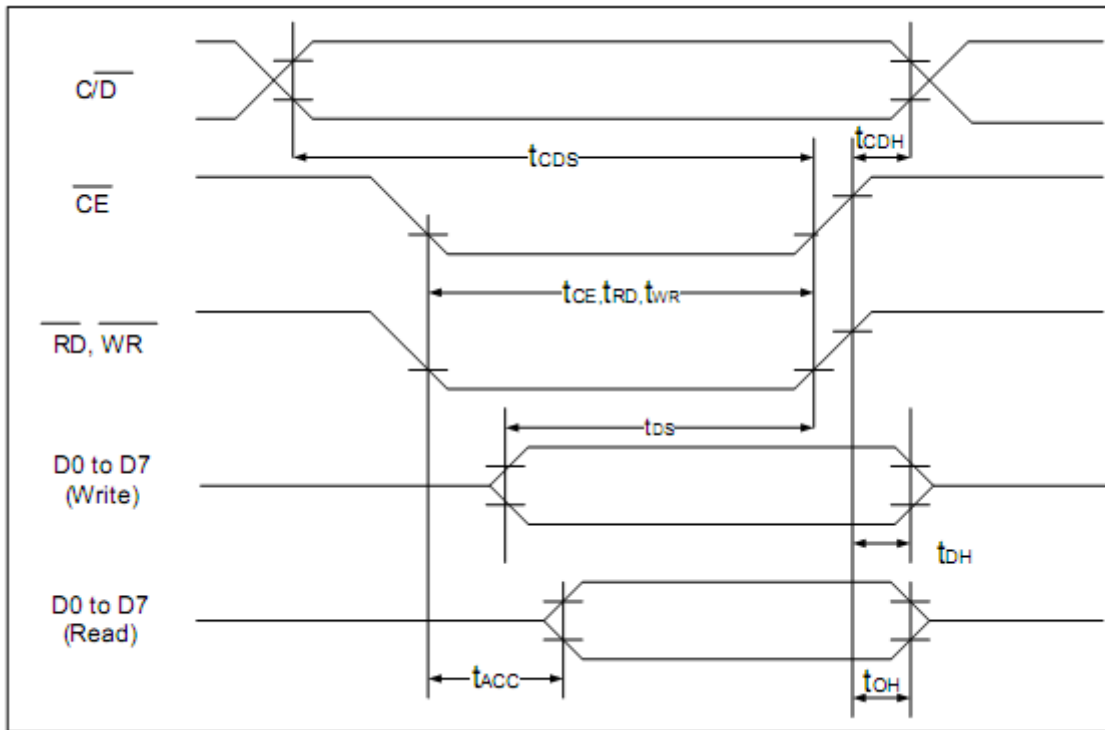
Built-in RA6963.

Please download specification at http://www.newhavendisplay.com/app_notes/RA6963.pdf

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 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 |
| Data auto Read/Write | 10110000 | -- | -- | Set Data Auto Write |
| | 10110001 | -- | -- | Set Data Auto Read |
| | 10110010 | -- | -- | Auto Reset |
| 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) | |
| Screen Reverse | 11010000 | Data | -- | Whole screen reverse |

Timing Characteristics



($V_{DD}=+5V\pm 5\%$, $GND=0V$, $T_a = -20$ 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 | 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 | Q | Ü | Š | š | À | á | Â | ç | È | É | Ê | Ë | Ì | Í | Î | Ï |
| 7 | Ë | æ | Æ | ö | ö | ö | ö | ö | ö | ö | ö | ö | ö | ö | ö | ö |

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            'toggle /CS and /WR  
Reset P3.4            'toggle /CS and /WR  
Set P3.1              'set /CS  
Set P3.4              'set /WR  
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, 200 Hrs. | 2 |
| Low Temperature storage | Endurance test applying the low storage temperature for a long time. | -30°C, 200 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, 200 Hrs. | 2 |
| Low Temperature Operation | Endurance test applying the electric stress (voltage & current) and the low thermal stress for a long time. | -20°C, 200 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, 15mm 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.

Precautions for using LCDs/LCMs

See Precautions at www.newhavendisplay.com/specs/precautions.pdf

Warranty Information

See Terms & Conditions at http://www.newhavendisplay.com/index.php?main_page=terms

Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

[Newhaven Display:](#)

[NHD-240128WG-ATFH-VZ#](#)