

NHD-24064WG-AYYH-VZ#

Graphic Liquid Crystal Display Module

| | |
|--------|--|
| NHD- | Newhaven Display |
| 24064- | 240 x 64 pixels |
| WG- | Display Type: Graphic |
| A- | Model |
| Y- | Yellow/Green LED Backlight |
| Y- | STN- Yellow/Green |
| H- | Transflective, 6:00 view, Wide Temperature (-20°C ~ +70°C) |
| VZ#- | With Built-in Negative Voltage Supply |
| | RoHS Compliant |

Newhaven Display International, Inc.

2511 Technology Drive, Suite 101

Elgin IL, 60124

Ph: 847-844-8795

Fax: 847-844-8796

www.newhavendisplay.com

nhtech@newhavendisplay.com

nhsales@newhavendisplay.com

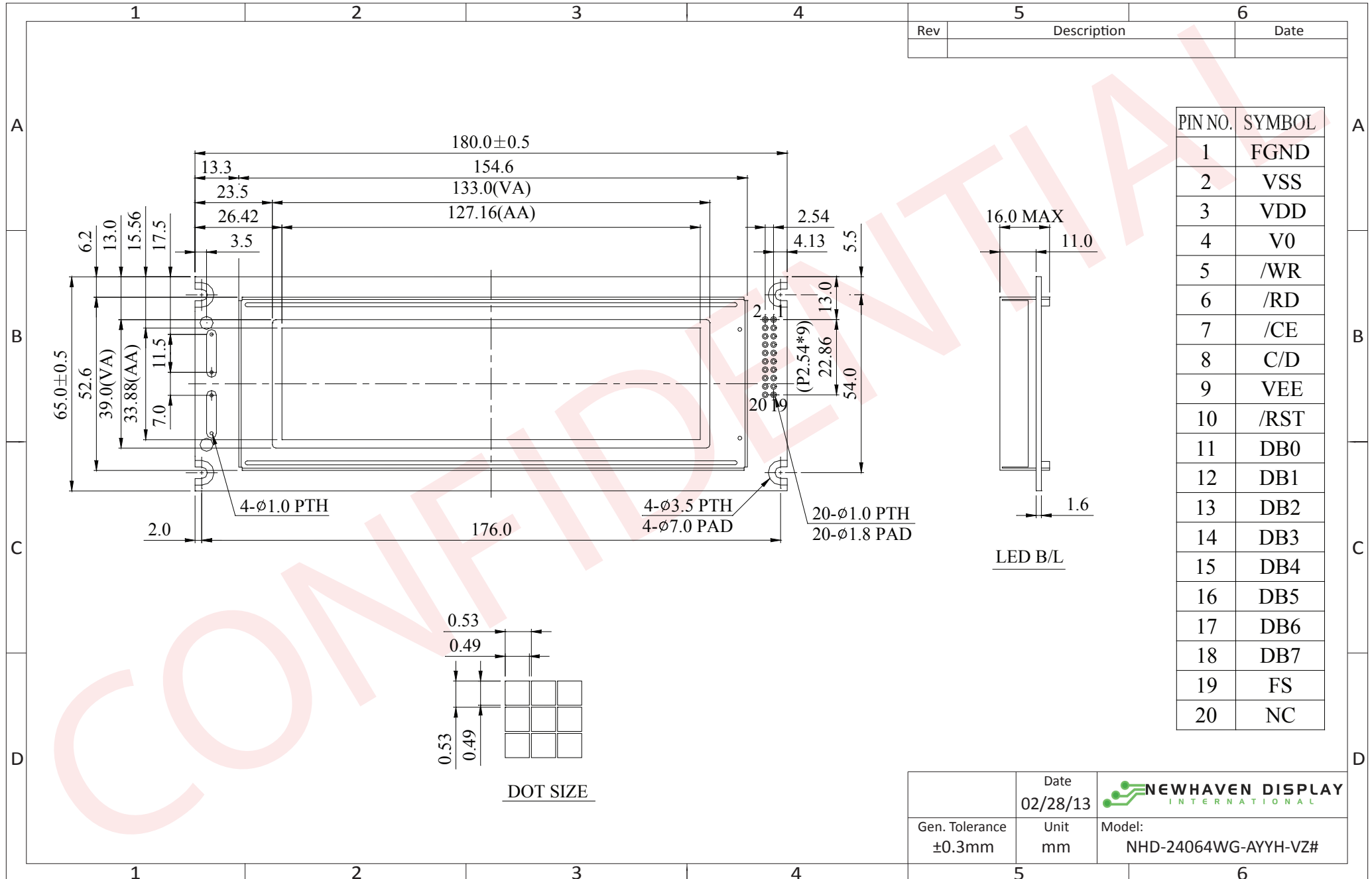
Document Revision History

| Revision | Date | Description | Changed by |
|----------|------------|---|------------|
| 0 | 2/28/2008 | Initial Release | - |
| 1 | 4/19/2010 | User guide reformat | BE |
| 2 | 5/13/2010 | Updated Backlight Current Min/Max- New Mechanical Drawing: Backlight Connector Cable is not on this display | MC |
| 3 | 5/14/2010 | Mechanical drawing update | MP |
| 4 | 5/14/2010 | Drawing update | MP |
| 5 | 11/16/2010 | Pin description update | AK |
| 6 | 9/20/2011 | Mechanical Drawing Updated | TJ |
| 7 | 5/16/2012 | Optical characteristics updated | AK |
| 8 | 2/28/2013 | Electrical characteristics updated | AK |

Functions and Features

- 240 x 64 pixels
- Built-in RA6963 controller
- +5.0V Power Supply
- 1/64 duty
- RoHS Compliant

Mechanical Drawing



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Pin Description and Wiring Diagram

| Pin No. | Symbol | External Connection | Function Description |
|---------|---------|---------------------|---|
| 1 | FGND | Power Supply | Frame Ground |
| 2 | VSS | Power Supply | Ground |
| 3 | VDD | Power Supply | Power supply for logic (+5.0V) |
| 4 | VO | Adj. Power Supply | Power supply for contrast (approx. -7.5V) |
| 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 | VEE | Power Supply | Negative voltage output (-10V) |
| 10 | /RST | 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 | Power supply for LED Backlight (+4.2V) |
| K | LED- | Power Supply | Ground for Backlight |

Recommended LCD connector: 2.54mm pitch pins

Backlight connector: --- **Mates with:** ---



Electrical Characteristics

| Item | Symbol | Condition | Min. | Typ. | Max. | Unit |
|-----------------------------|--------|--------------|---------|------|------|------|
| Operating Temperature Range | Top | Absolute Max | -20 | - | +70 | °C |
| Storage Temperature Range | Tst | Absolute Max | -30 | - | +80 | °C |
| Supply Voltage | VDD | | 4.75 | 5.0 | 5.25 | V |
| Supply Current | IDD | VDD=5.0V | 12 | 16 | 20 | mA |
| Supply for LCD (contrast) | VDD-V0 | | 10.1 | 12.5 | 13.9 | V |
| "H" Level input | VIH | | VDD-2.2 | - | VDD | V |
| "L" Level input | VIL | | 0 | - | 0.8 | V |
| "H" Level output | VOH | | VDD-0.3 | - | VDD | V |
| "L" Level output | VOL | | 0 | - | 0.3 | V |
| | | | | | | |
| Backlight Supply Voltage | Vled | | 4.0 | 4.2 | 4.4 | V |
| Backlight Supply Current | Iled | | 528 | 660 | 990 | mA |

Optical Characteristics

| Item | Symbol | Condition | Min. | Typ. | Max. | Unit |
|-----------------------|--------|-----------|------|------|------|------|
| Viewing Angle – Top | | Cr ≥ 2 | - | 20 | - | ° |
| Viewing Angle- Bottom | | | - | 40 | - | ° |
| Viewing Angle- Left | | | - | 30 | - | ° |
| Viewing Angle – Right | | | - | 30 | - | ° |
| Contrast Ratio | Cr | | - | 3 | - | |
| Response Time (rise) | Tr | | - | 150 | 200 | ms |
| Response Time (fall) | Tf | | - | 150 | 200 | ms |

Controller Information

Built-in RA6963 controller.

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 Data Bit 0 0 : Normal 1 : Reverse |
| Blink Time | 01010000 | Data | Don't care (Note) | If Frame = 60Hz Data Bit 2:0 000 : 0.066s 001 : 0.25s 010 : 0.5s (Default) 011 : 0.75s 100 : 1s 101 : 1.25s 110 : 1.5s 111 : 2s |
| Cursor Auto Moving | 01100000 | Data | Don't care (Note) | Data Bit 0 0 : Disable.(Default) 1 : Enable. |
| CGROM Font Select | 01110000 | Data | Don't care (Note) | Data Bit 1:0 00 : Do not care.(Default) 01 : Do not care. 10 : CGROM Font-01. 11 : CGROM Font-02. |

Note : In these functions, it must be sent two data before sending the command, but the contents of the second datum (D2) can be any values.

Built-in Font Table

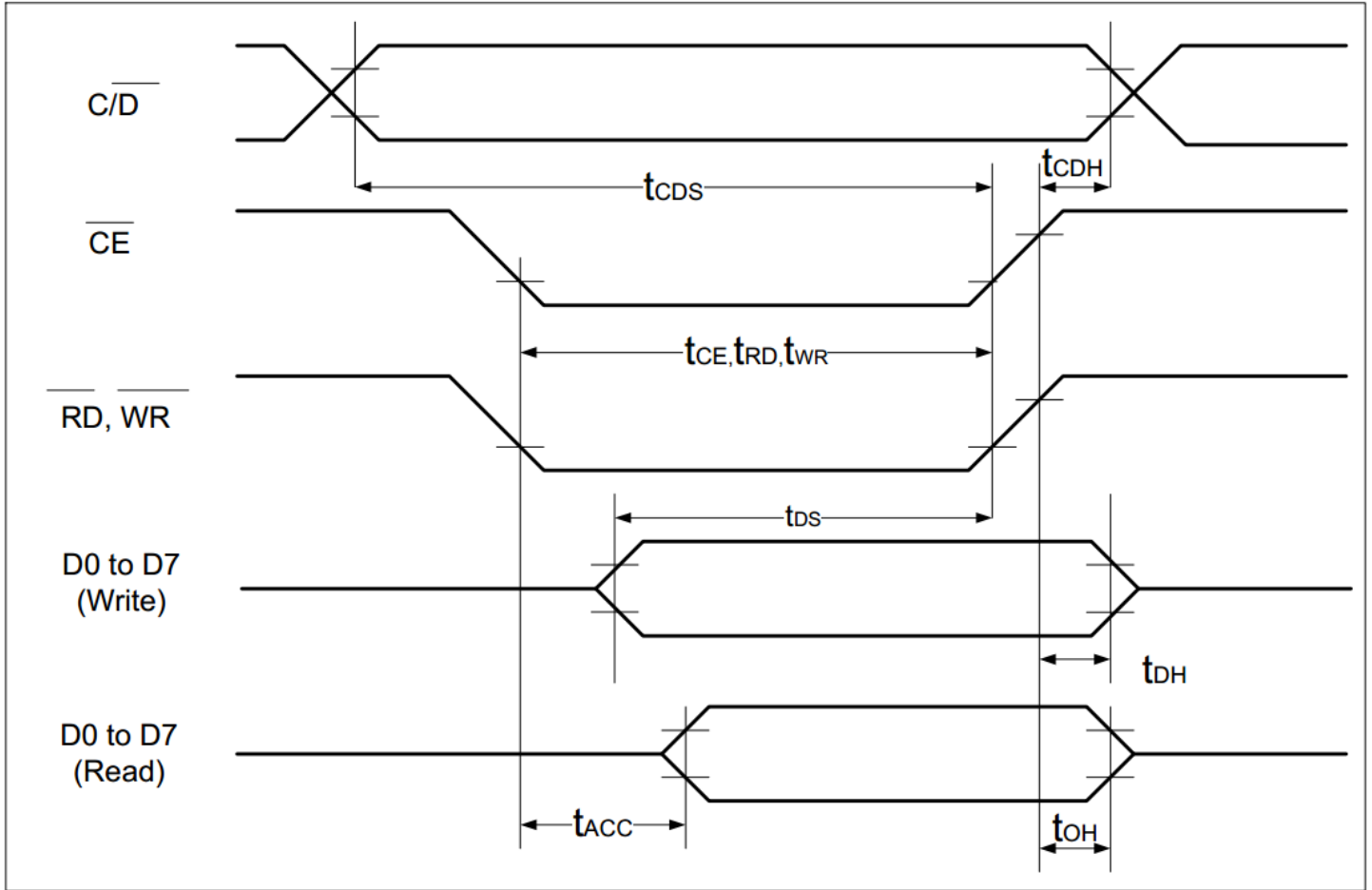
CGROM Font - 01

| 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 | u | w | x | y | z | { | | } | ~ | |
| 6 | Q | U | E | A | A | A | A | Q | E | E | E | i | i | i | A | A |
| 7 | E | E | E | E | E | E | Q | Q | Q | Q | Q | Q | E | E | E | E |

CGROM Font - 02

| 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 | 千 | 万 | 月 | キ | キ | ■ | マ | マ | イ | ウ | エ | オ | カ | ユ | ヨ | ウ |
| 5 | 一 | ア | イ | ウ | エ | オ | カ | キ | ク | ケ | コ | サ | シ | ス | セ | ソ |
| 6 | タ | チ | ツ | テ | ト | ナ | ニ | ヌ | ネ | ノ | ヒ | フ | ヘ | ホ | マ | メ |
| 7 | ミ | ム | メ | モ | カ | キ | ク | ケ | コ | サ | シ | ス | セ | ソ | マ | メ |

Timing Characteristics



| 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 |

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 , 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 , 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. | VS=800V, RS=1.5kΩ, CS=100pF One time | |

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 and Terms & Conditions

http://www.newhavendisplay.com/index.php?main_page=terms

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Телефон: 8 (812) 309-75-97 (многоканальный)

Факс: 8 (812) 320-03-32

Электронная почта: ocean@oceanchips.ru

Web: <http://oceanchips.ru/>

Адрес: 198099, г. Санкт-Петербург, ул. Калинина, д. 2, корп. 4, лит. А