

# NHD-24064CZ-NSW-BBW

## Graphic Liquid Crystal Display Module

NHD- Newhaven Display  
24064- 240 x 64 Pixels  
CZ- Model  
N- Transmissive  
SW- Side White LED Backlight  
B- STN Blue (-)  
B- 6:00 View  
W- Wide Temperature  
**RoHS Compliant**

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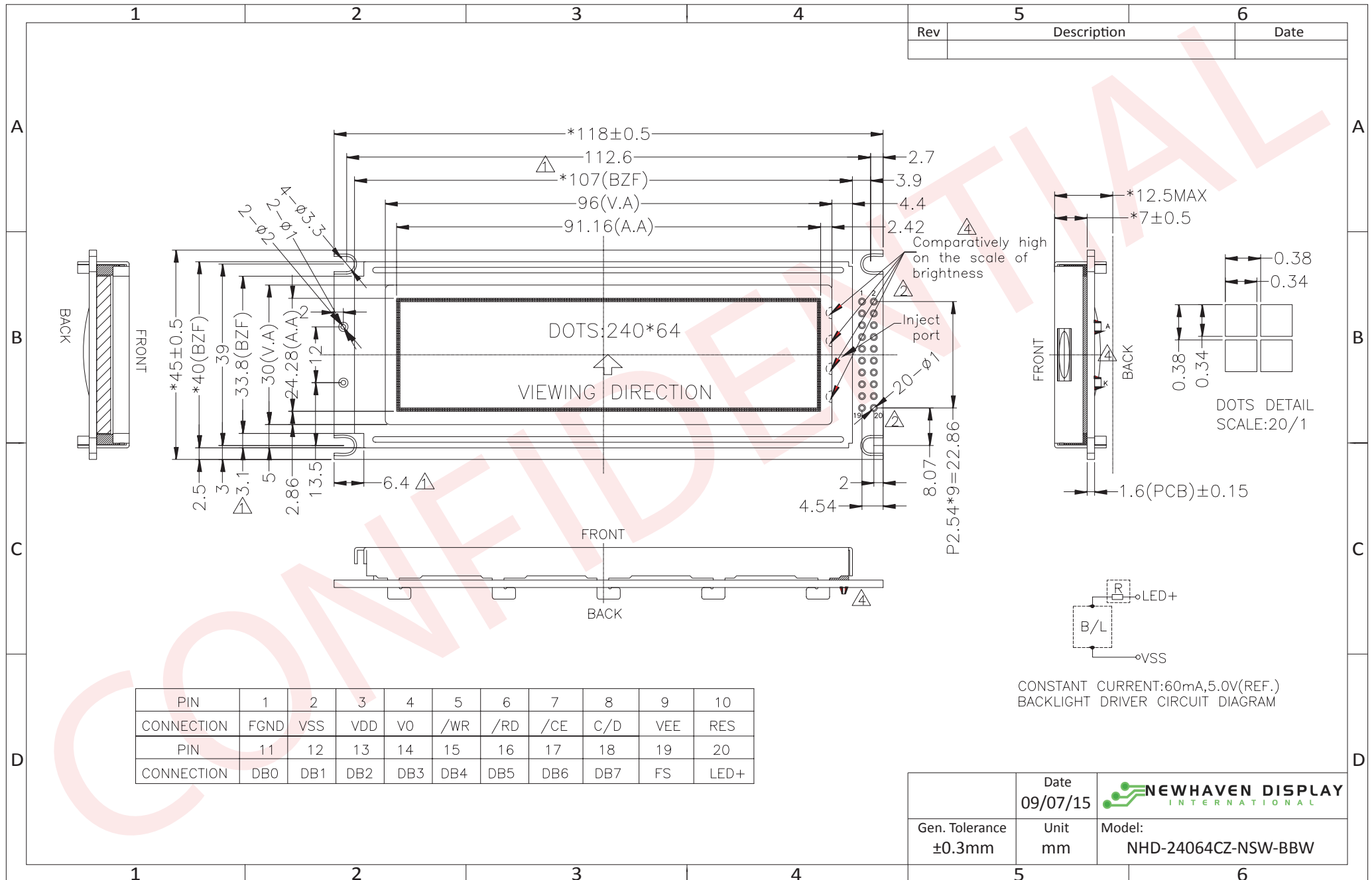
## Document Revision History

| Revision | Date      | Description  | Changed by |
|----------|-----------|--|------------|
| 0        | 2/29/2008 | Initial Release  | -          |
| 1        | 7/20/2009 | User guide reformat  | BE         |
| 2        | 12/4/2009 | Pin Description Revised  | BE         |
| 3        | 5/5/2010  | Drawing/ Controller updates                                    | BE         |
| 4        | 4/12/2013 | Drawing page and Electrical & Optical Characteristics updated. | JN         |
| 5        | 5/3/2013  | Added font table   | JN         |
| 6        | 9/7/15    | Module redesigned  | AK         |
| 7        | 9/20/19   | Updated Drawing, Controller Link                               | AS         |

## Functions and Features

- 240 x 64 pixels
- Built-in RA6963 controller
- +5.0V Power Supply
- 1/64 duty, 1/9 bias
- RoHS Compliant

# Mechanical Drawing



|            |      |     |     |     |     |     |     |     |     |      |
|------------|------|-----|-----|-----|-----|-----|-----|-----|-----|------|
| PIN        | 1    | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   | 10   |
| CONNECTION | FGND | VSS | VDD | VO  | /WR | /RD | /CE | C/D | VEE | RES  |
| PIN        | 11   | 12  | 13  | 14  | 15  | 16  | 17  | 18  | 19  | 20   |
| CONNECTION | DB0  | DB1 | DB2 | DB3 | DB4 | DB5 | DB6 | DB7 | FS  | LED+ |

|                |          |                     |
|----------------|----------|---------------------|
|                | Date     |                     |
|                | 09/07/15 |                     |
| Gen. Tolerance | Unit     | Model:              |
| ±0.3mm         | mm       | NHD-24064CZ-NSW-BBW |

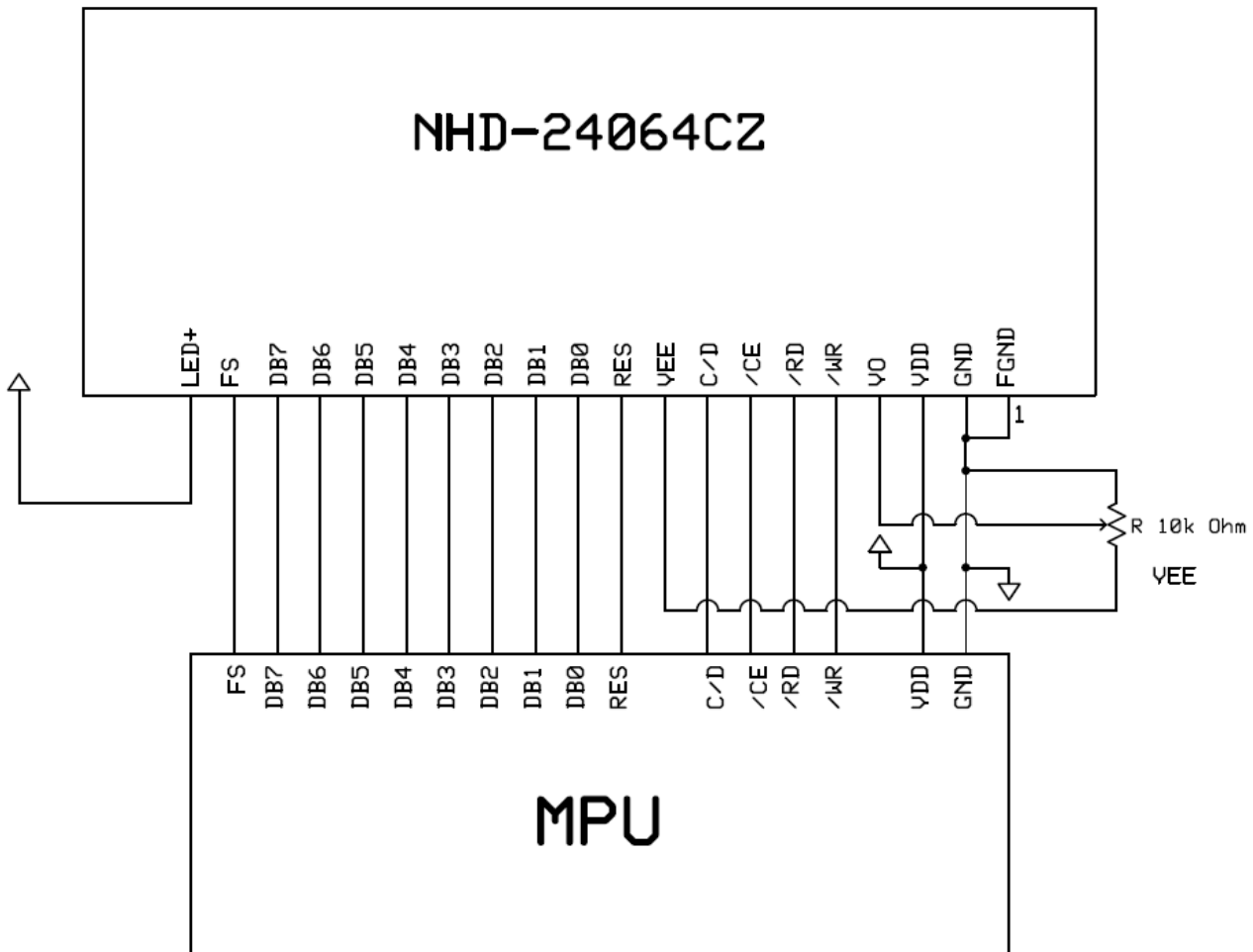
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## Pin Description and Wiring Diagram

| 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 -8.5V)          |
| 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        | -10V output for contrast circuit                  |
| 10      | RES     | MPU                 | Active LOW reset signal                           |
| 11~18   | DB0~DB7 | MPU                 | Bi-directional three-state data bus lines.        |
| 19      | FS      | MPU                 | Font Select: 1=6x8 fonts, 0=8x8 fonts             |
| 20      | LED+    | Power Supply        | Power supply for (+5.0V via on-board resistor)    |

**Recommended LCD connector:** 2.54mm pitch pins

**Backlight connector:** Anode at Pin 20 of LCD 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    |                   | 4.8     | 5.0  | 5.3  | V    |
| Supply Current              | IDD    | VDD=5.0V, Ta=25°C | -       | 35   | 50   | mA   |
| Supply for LCD (contrast)   | VDD-V0 | Ta=25°C           | -       | 13.5 | -    | 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    |                   | -       | -    | 0.3  | V    |
|                             |        |                   |         |      |      |      |
| Backlight Supply Voltage    | Vled   | -                 | -       | 5.0  | -    | V    |
| Backlight Supply Current    | Iled   | Vled=5.0V         | -       | 60   | -    | mA   |

## Optical Characteristics

| Item                   | Symbol | Condition | Min. | Typ. | Max. | Unit |
|------------------------|--------|-----------|------|------|------|------|
| Viewing Angle - Top    |        | Cr ≥ 2    | -    | 35   | -    | °    |
| Viewing Angle - Bottom |        |           | -    | 40   | -    | °    |
| Viewing Angle – Left   |        |           | -    | 35   | -    | °    |
| Viewing Angle – Right  |        |           | -    | 35   | -    | °    |
| Contrast Ratio         | Cr     |           | -    | 6    | -    | -    |
| Response Time (rise)   | Tr     | -         | -    | 150  | 180  | ms   |
| Response Time (fall)   | Tf     | -         | -    | 110  | 140  | ms   |

## Controller Information

Built-in RA6963 controller.

Please download specification at <https://www.newhavendisplay.com/appnotes/datasheets/LCDs/RA6963.pdf>

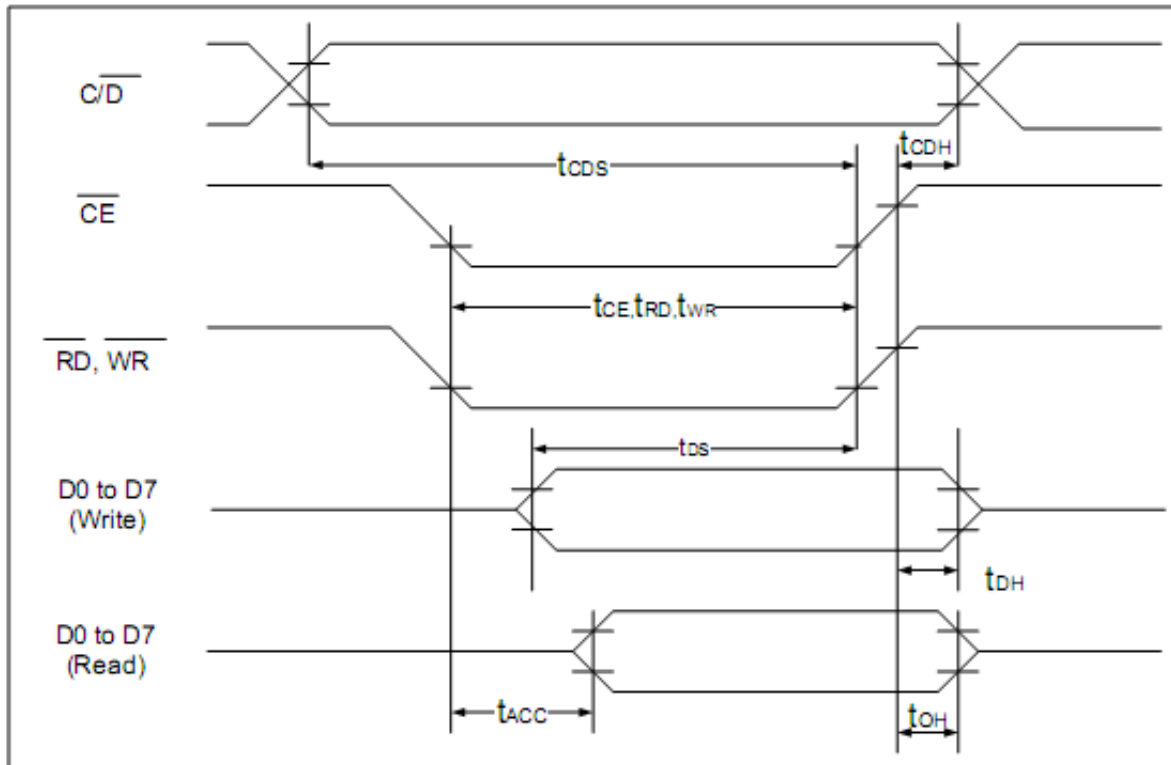
## Table of Commands

| Command                      | Code     | D1          | D2           | Function                        |
|------------------------------|----------|-------------|--------------|---------------------------------|
| <b>Registers Setting</b>     | 00100001 | X address   | Y address    | Set cursor pointer              |
|                              | 00100010 | Data        | 00h          | Set Offset Register             |
|                              | 00100100 | Low address | High address | Set Address pointer             |
| <b>Set Control Word</b>      | 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                |
| <b>Mode Set</b>              | 1000X000 | --          | --           | OR mode                         |
|                              | 1000X001 | --          | --           | EXOR mode                       |
|                              | 1000X011 | --          | --           | AND mode                        |
|                              | 1000X100 | --          | --           | Text Attribute mode             |
|                              | 10000XXX | --          | --           | Internal CG ROM mode            |
|                              | 10001XXX | --          | --           | External CG RAM mode            |
| <b>Display Mode</b>          | 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             |
| <b>Cursor Pattern Select</b> | 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                   |
| <b>Data Read/Write</b>       | 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  |
| <b>Data auto Read/Write</b>  | 10110000 | --          | --           | Set Data Auto Write             |
|                              | 10110001 | --          | --           | Set Data Auto Read              |
|                              | 10110010 | --          | --           | Auto Reset                      |
| <b>Screen Peek</b>           | 11100000 | --          | --           | Screen Peek                     |
| <b>Screen Copy</b>           | 11101000 |             |              | Screen Copy                     |
| <b>Bit Set/Reset</b>         | 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)                     |
| <b>Screen Reverse</b>        | 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 |
|---|--------------------------------|-----------------|------|------|------|
| $C/\bar{D}$ Set Up Time   | $t_{CDS}$                      | --              | 100  | --   | ns   |
| $C/\bar{D}$ 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 | 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 | U | E | A | A  | A | A | Q | E | E | E | i | i | i | A | A |
| 7         | E | E | E | ö | ö  | ö | ü | ü | ü | ö | ü | φ | £ | ¥ | ℞ | ƒ |



## 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 Areaa
    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<br>10 cycles                       |      |
| Vibration test                        | Endurance test applying vibration to simulate transportation and use.   | 10-55Hz , 15mm amplitude.<br>60 sec in each of 3 directions X,Y,Z<br>For 15 minutes | 3    |
| Static electricity test               | Endurance test applying electric static discharge.  | VS=800V, RS=1.5kΩ, CS=100pF<br>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](http://www.newhavendisplay.com/specs/precautions.pdf)

## Warranty Information and Terms & Conditions

[http://www.newhavendisplay.com/index.php?main\\_page=terms](http://www.newhavendisplay.com/index.php?main_page=terms)