# NHD-7.0-800480WF-20 Controller Board

## TFT Controller Evaluation Board

| | |
|---|---|
| NHD- | Newhaven Display |
| 7.0- | 7.0” Diagonal |
| 800480- | 320xRGBx240 pixels |
| WF- | Model |
| 20- | 20-POS FFC interface (8-bit data)<br>SSD1963 Controller |


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## Document Revision History

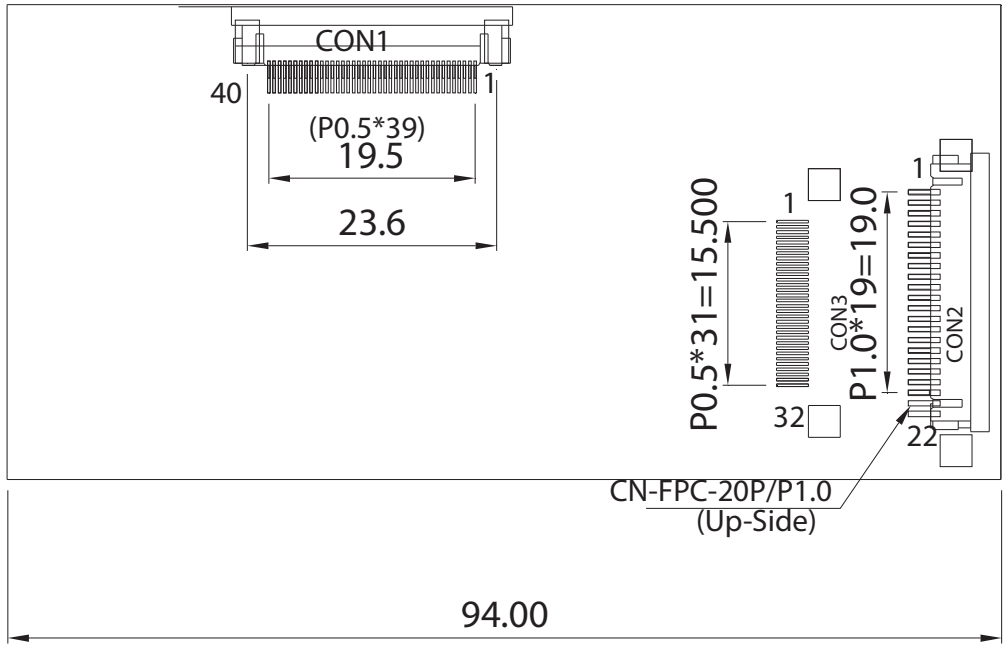
| Revision | Date | Description | Changed by |
|---|---|---|---|
| 0 | 6/1/2012 | Initial Release | AK |

## Functions and Features

- **To use for testing, evaluating, or in final production with NHD-7.0-800480WF-A displays.**

# Mechanical Drawing

| Rev | Description | Date |
|---|---|---|
| | | |




| | Date | |
|---|---|---|
| | 06/01/12 | NEWHAVEN DISPLAY INTERNATIONAL |
| Gen. Tolerance | Unit | Model: |
| ±0.3mm | mm | NHD-7.0-800480WF-20 |

# Pin Description

Note: CON2 has a 20-POS FFC connector assembled, pins 21, 22 not connected.

### CON2 (SSD1963 input from user's MPU):

| Pin No. | Symbol | Connection | Function Description |
|---|---|---|---|
| 1 | GND | Power Supply | Ground |
| 2 | VDD | Power Supply | Power supply for logic (+3.3V) |
| 3 | NC | - | No Connect |
| 4 | D/C# | MPU | Register Select signal: 1=Data, 0=Command |
| 5 | WR# | MPU | Active LOW Write signal (8080 mode)<br>Read/Write signal (6800 mode) |
| 6 | RD# | MPU | Active LOW Read signal (8080 mode)<br>Edge trigger Enable signal (6800 mode) |
| 7-14 | DB0~DB7 | MPU | 8-bit bi-directional data bus |
| 15 | CS# | MPU | Active LOW Chip Select signal |
| 16 | NC | - | No Connect |
| 17 | NC | - | No Connect |
| 18 | RST# | MPU | Active LOW Reset signal |
| 19 | NC | - | No Connect |
| 20 | NC | - | No Connect |

**LCD connector:** 1.0mm pitch, 20-Conductor FFC, top contact
**Recommended connection**: 1.0mm pitch, 20-conductor FFC cable

### CON1 (SSD1963 output to display panel):

| Pin No. | Symbol | Connection | Function Description |
|---|---|---|---|
| 1 | GND | Power Supply | Power Ground |
| 2 | GND | Power Supply | Power Ground |
| 3 | NC | - | No connect |
| 4-7 | VDD | Power Supply | Power Supply (+3.3V) |
| 8 | NC | - | No connect |
| 9 | DE | MPU | Data Enable |
| 10-12 | GND | Power Supply | Power Ground |
| 13-15 | B5-B3 | MPU | Blue B5 (MSB) to B3 |
| 16 | GND | Power Supply | Power Ground |
| 17-19 | B2-B0 | MPU | Blue B2 – B0(LSB) |
| 20 | GND | Power Supply | Power Ground |
| 21-23 | G5-G3 | MPU | Green B5 (MSB) to B3 |
| 24 | GND | Power Supply | Power Ground |
| 25-27 | G2-G0 | MPU | Green B2 – B0(LSB) |
| 28 | GND | Power Supply | Power Ground |
| 29-31 | R5-R3 | MPU | Red B5 (MSB) to B3 |
| 32 | GND | Power Supply | Power Ground |
| 33-35 | R2-R0 | MPU | Red B2 – B0(LSB) |
| 36-37 | GND | Power Supply | Power Ground |
| 38 | DCLK | MPU | Clock (Falling edge triggered) |
| 39-40 | GND | Power Supply | Power Ground |

**LCD connector:** 0.5mm pitch, 40-Conductor FFC, Bottom contact
**Recommended connection**: 0.5mm pitch, 40-conductor FFC cable

## 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 | | 3.0 | 3.3 | 3.5 | V |
| Supply Current | IDD | | - | 5 | 30 | mA |
| Input High Voltage | VIH | | 0.8*VDD | - | VDD+0.5 | V |
| Input Low Voltage | VIL | | 0 | - | 0.2*VDD | V |
| Output High Voltage | VOH | | 0.8*VDD | - | VDD | V |
| Output Low Voltage | VOL | | 0 | - | 0.2*VDD | V |

## Controller Information

**Built-in SSD1963. Download specification at [http://www.newhavendisplay.com/app_notes/SSD1963.pdf](http://www.newhavendisplay.com/app_notes/SSD1963.pdf)**

## Pixel Data Format

| | | D[7] | D[6] | D[5] | D[4] | D[3] | D[2] | D[1] | D[0] |
|---|---|---|---|---|---|---|---|---|---|
| 8 bits | 1st | R7 | R6 | R5 | R4 | R3 | R2 | R1 | R0 |
| | 2nd | G7 | G6 | G5 | G4 | G3 | G2 | G1 | G0 |
| | 3rd | B7 | B6 | B5 | B4 | B3 | B2 | B1 | B0 |

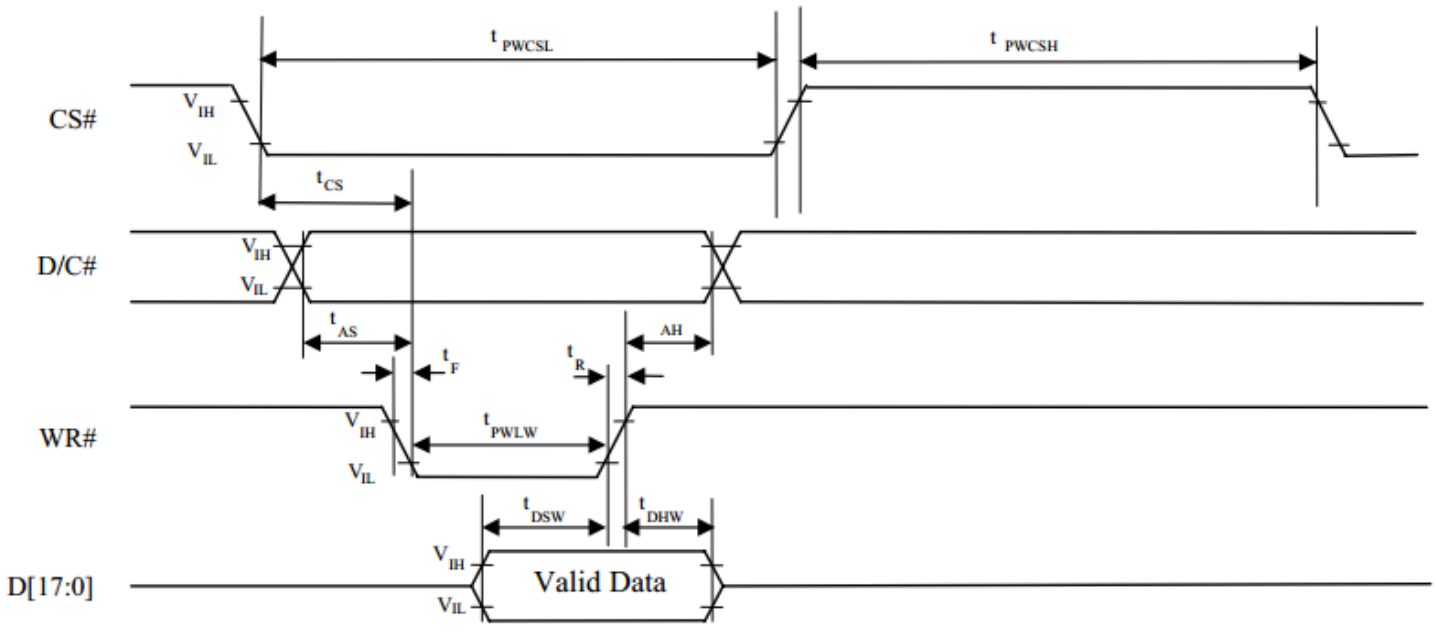
## Timing Characteristics

Parallel 8080-series interface timing:

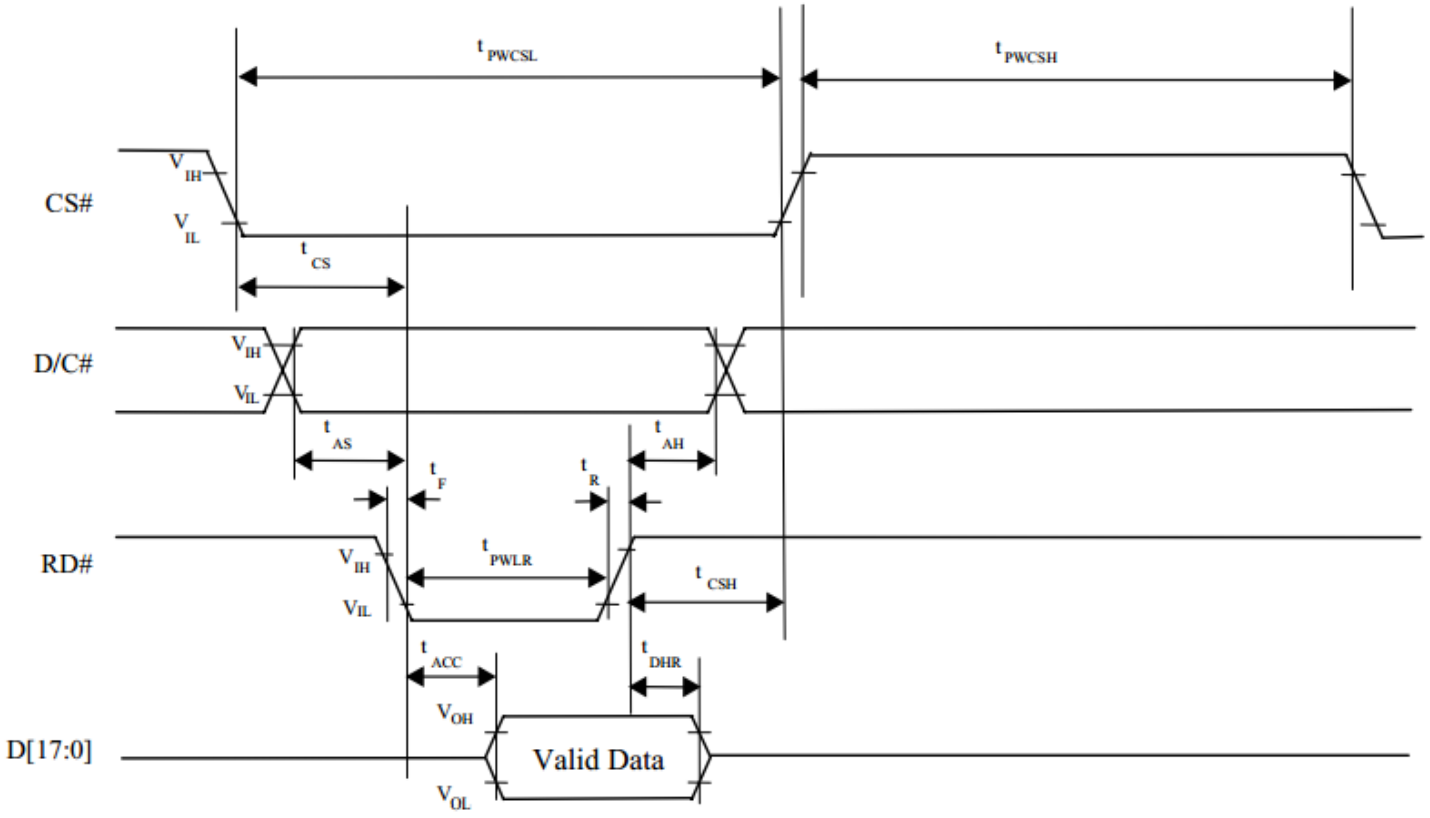
| Symbol | Parameter | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| $f_{MCLK}$ | System Clock Frequency* | | 1 | - | 110 | MHz |
| $t_{MCLK}$ | System Clock Period* | | 1/ $f_{MCLK}$ | - | - | ns |
| $t_{PWCSL}$ | Control Pulse High Width | Write<br>Read | 13<br>30 | 1.5* $t_{MCLK}$<br>3.5* $t_{MCLK}$ | - | ns |
| $t_{PWCSH}$ | Control Pulse Low Width | Write (next write cycle)<br>Write (next read cycle)<br>Read | 13<br>80<br>80 | 1.5* $t_{MCLK}$<br>9* $t_{MCLK}$<br>9* $t_{MCLK}$ | - | ns |
| $t_{AS}$ | Address Setup Time | | 1 | - | - | ns |
| $t_{AH}$ | Address Hold Time | | 2 | - | - | ns |
| $t_{DSW}$ | Write Data Setup Time | | 4 | - | - | ns |
| $t_{DHW}$ | Write Data Hold Time | | 1 | - | - | ns |
| $t_{PWLW}$ | Write Low Time | | 12 | - | - | ns |
| $t_{DHR}$ | Read Data Hold Time | | 1 | - | - | ns |
| $t_{ACC}$ | Access Time | | 32 | - | - | ns |
| $t_{PWLR}$ | Read Low Time | | 36 | - | - | ns |
| $t_R$ | Rise Time | | - | - | 0.5 | ns |
| $t_F$ | Fall Time | | - | - | 0.5 | ns |
| $t_{CS}$ | Chip select setup time | | 2 | - | - | ns |
| $t_{CSH}$ | Chip select hold time to read signal | | 3 | - | - | ns |

* System Clock denotes external input clock (PLL-bypass) or internal generated clock (PLL-enabled)

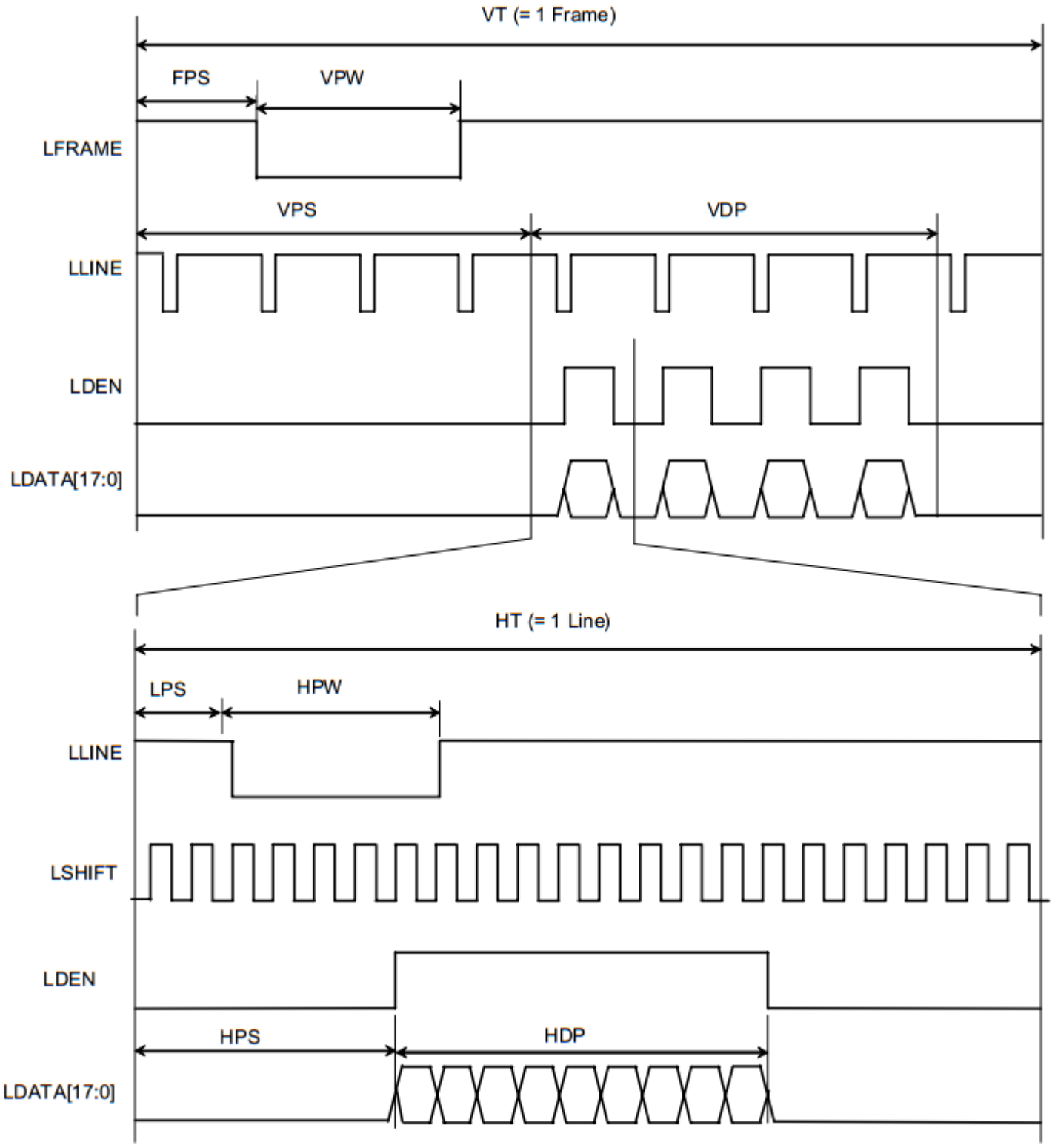
**Write Cycle:**



**Read Cycle:**


t PWCSL
t PWCSH
CS#
V IH
V IL
t CS
D/C#
V IH
V IL
t AS
t AH
t F
t R
RD#
V IH
V IL
t PWLR
t CSH
t ACC
t DHR
V OH
D[17:0]
Valid Data
V OL

**Parallel LCD Interface Timing:**



## 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

## Warranty Information and Terms & Conditions

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

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