

NHD-C12864A1Z-FS(RGB)-FBW-HT1

COG (Chip-On-Glass) Liquid Crystal Display Module

| | |
|---------|--|
| NHD- | Newhaven Display |
| C12864- | 128 x 64 pixels |
| A1Z- | Model |
| F- | Transflective |
| SRGB- | Side LED Backlight (Red, Green, Blue) |
| F- | FSTN (+) |
| B- | 6:00 view |
| W- | Wide Temp (-20°C ~ +70°C) |
| HT1- | Pin length 7.6mm; With built-in 12V Heater (-40°C ~ +70°C) |

RoHS Compliant

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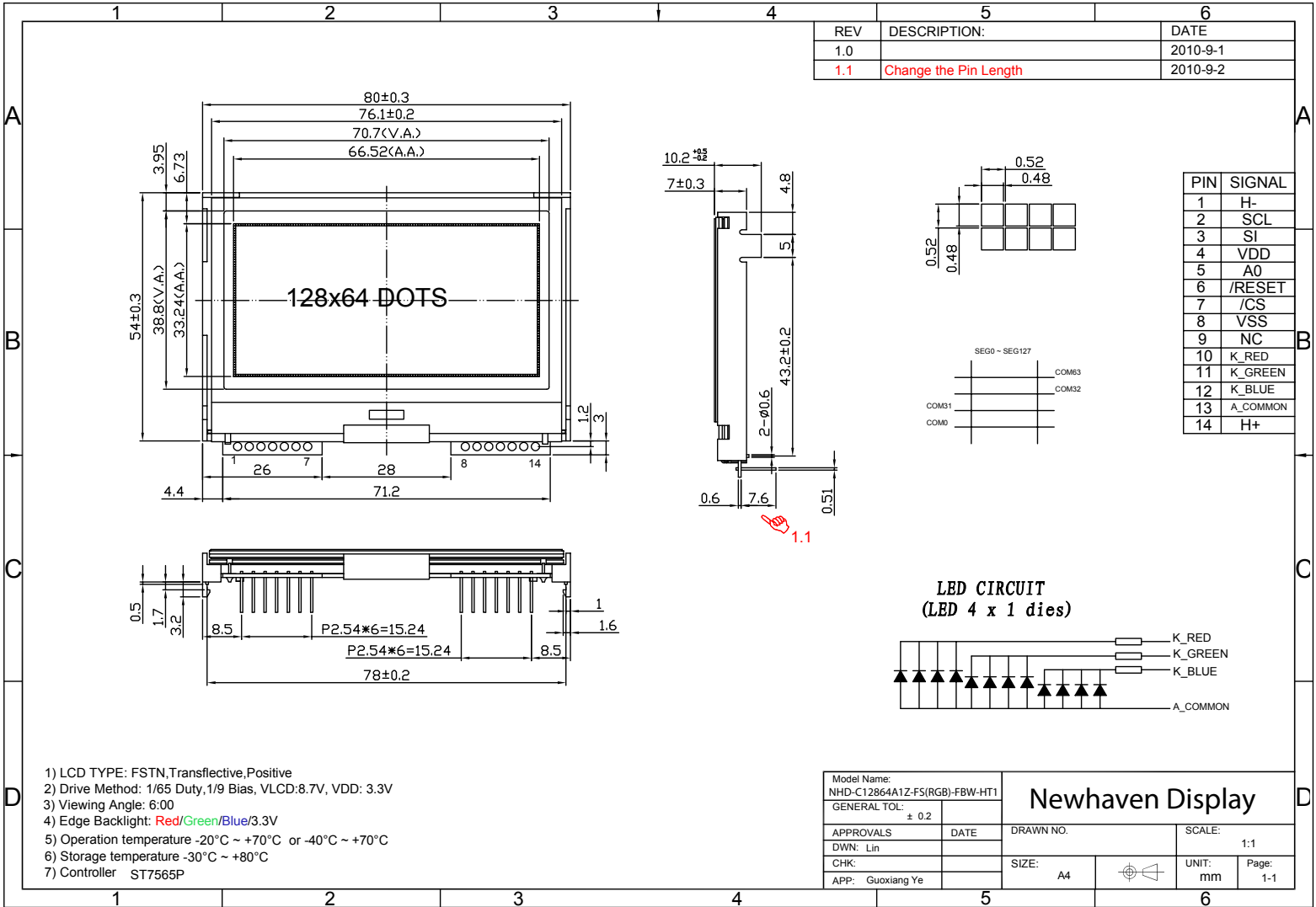
Document Revision History

| Revision | Date | Description | Changed by |
|----------|-----------|---------------------------|------------|
| 0 | 9/1/2010 | Initial Release | - |
| 1 | 12/1/2010 | User Guide Reformat | BE |
| 2 | 12/3/2010 | Backlight current updated | BE |
| | | | |

Functions and Features

- 128 x 64 pixels
- Built-in ST7565P controller
- +3.3V power supply
- 1/65 duty cycle; 1/9 bias
- Built-in Heater
- RoHS Compliant

Mechanical Drawing



- 1) LCD TYPE: FSTN, Transflective, Positive
- 2) Drive Method: 1/65 Duty, 1/9 Bias, VLCD: 8.7V, VDD: 3.3V
- 3) Viewing Angle: 6:00
- 4) Edge Backlight: Red/Green/Blue/3.3V
- 5) Operation temperature -20°C ~ +70°C or -40°C ~ +70°C
- 6) Storage temperature -30°C ~ +80°C
- 7) Controller ST7565P

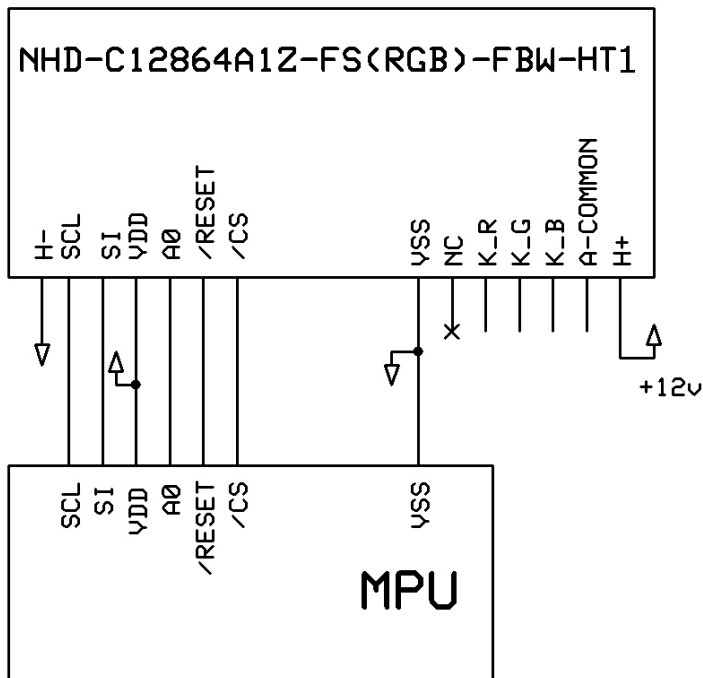
| | | | |
|--|------|-------------------------|------------|
| Model Name: NHD-C12864A1Z-FS(RGB)-FBW-HT1 | | Newhaven Display | |
| GENERAL TOL: ± 0.2 | | DRAWN NO. | SCALE: 1:1 |
| APPROVALS | DATE | | |
| DWN: Lin | | | |
| CHK: | | SIZE: A4 | UNIT: mm |
| APP: Guoxiang Ye | | | Page: 1-1 |

Pin Description and Wiring Diagram

| Pin No. | Symbol | External Connection | Function Description |
|---------|---------|---------------------|--|
| 1 | H- | Power Supply | Ground for Heater |
| 2 | SCL | MPU | Serial clock input |
| 3 | SI | MPU | Serial data input |
| 4 | VDD | Power Supply | Power supply for LCD and logic (+3.3V) |
| 5 | A0 | MPU | Register Select. 0: instruction; 1: data |
| 6 | /RESET | MPU | Operation Active LOW Reset signal |
| 7 | /CS | MPU | Active LOW Chip Select Signal |
| 8 | Vss | Power Supply | Ground |
| 9 | NC | - | No Connect |
| 10 | K-RED | Power Supply | Cathode Red |
| 11 | K-GREEN | Power Supply | Cathode Green |
| 12 | K-BLUE | Power Supply | Cathode Blue |
| 13 | LED + | Power Supply | Common Anode for LEDs (3.3V) |
| 14 | H+ | Power Supply | Power for Heater (+12V) |

Recommended LCD connector: 2.54mm Pitch pins.

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



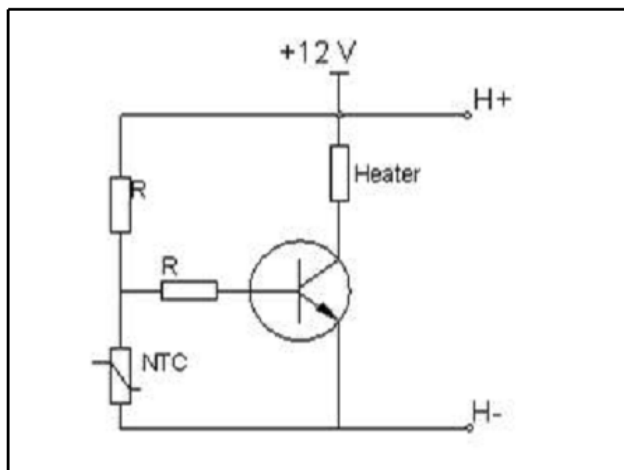
Electrical Characteristics

| Item | Symbol | Condition | Min. | Typ. | Max. | Unit |
|----------------------------------|--------|-------------------|------|-------|------|------|
| Operating Temperature Range | TOP | Absolute Max | -40 | - | +70 | °C |
| Storage Temperature Range | TST | Absolute Max | -30 | - | +80 | °C |
| Supply Voltage | VDD | | 2.4 | 3.3 | 3.3 | V |
| Supply Current | IDD | Ta=25°C, VDD=3.3V | - | 0.005 | - | mA |
| Supply for LCD (contrast) | VDD-V0 | Ta=25°C | 8.3 | 8.7 | 9.3 | V |
| "H" Level input | Vih | | 2.2 | - | VDD | V |
| "L" Level input | Vil | | 0 | - | 0.6 | V |
| "H" Level output | Voh | | 2.4 | - | - | V |
| "L" Level output | Vol | | - | - | 0.4 | V |
| Backlight Supply Voltage – RED | VLED | | - | 3.3 | - | V |
| Backlight Supply Current – RED | ILED | VLED=3.3V | 25 | 30 | 35 | mA |
| Backlight Supply Voltage – GREEN | VLED | | - | 3.3 | - | V |
| Backlight Supply Current – GREEN | ILED | VLED=3.3V | 20 | 25 | 30 | mA |
| Backlight Supply Voltage – BLUE | VLED | | - | 3.3 | - | V |
| Backlight Supply Current – BLUE | ILED | VLED=3.3V | 20 | 25 | 30 | mA |
| Heater panel resistance | RH+/- | | - | 20 | 25 | Ω |
| Heater Voltage Supply | VH | | - | 12V | - | V |
| Heater Current | IH | VH=12.0V | - | 1 | - | A |

Optical Characteristics

| Item | Symbol | Condition | Min. | Typ. | Max. | Unit |
|----------------------------|----------|-------------|------|------|------|------|
| Viewing Angle - Vertical | θ | CR ≥ 3 | -20 | - | +40 | ° |
| Viewing Angle - Horizontal | Φ | CR ≥ 3 | -35 | - | +35 | ° |
| Contrast Ratio | CR | | - | 10 | - | - |
| Response Time (rise) | Tr | | - | 200 | 250 | ms |
| Response Time (fall) | Tf | | - | 300 | 350 | ms |

Heater Circuit Example:

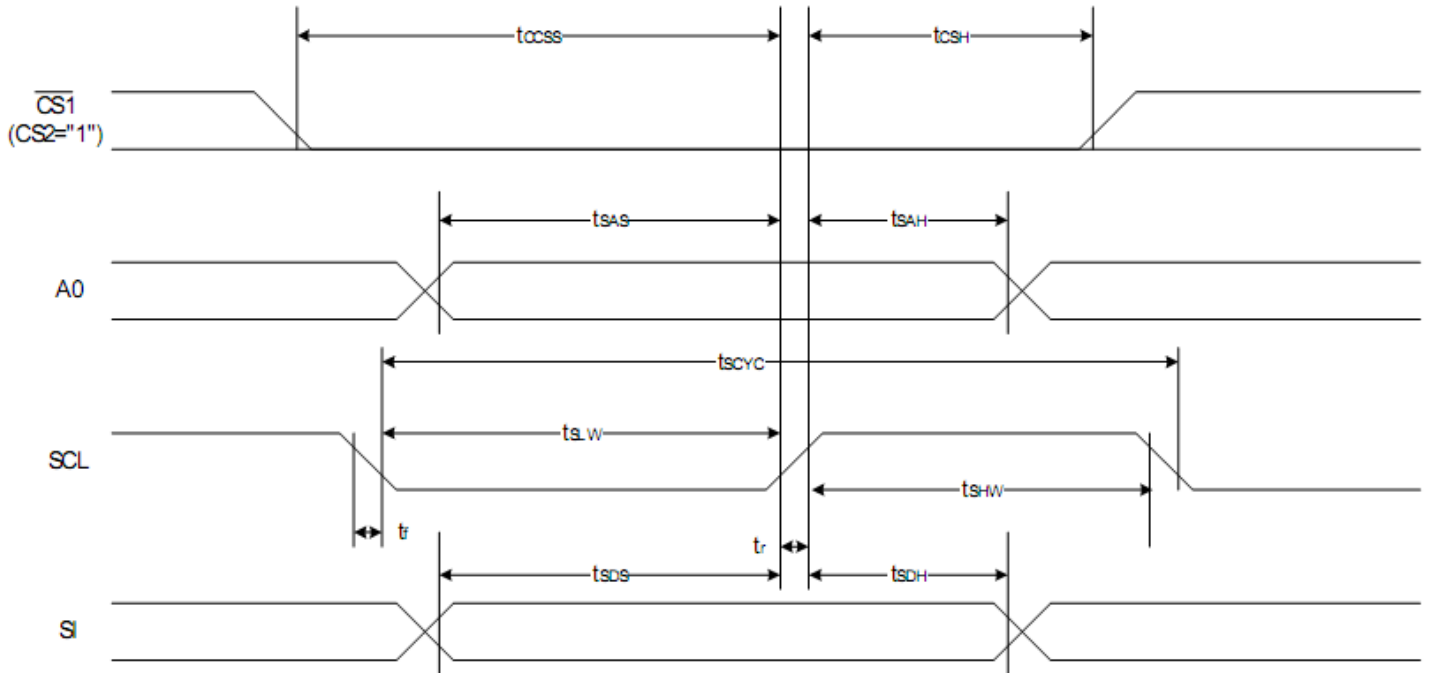


Controller Information

Built-in ST7565P. Download specification at http://www.newhavendisplay.com/app_notes/ST7565.pdf

Timing Characteristics

The Serial Interface



| Item | Signal | Symbol | Condition | Rating | | Units |
|---------------------|--------|------------|-----------|--------|------|-------|
| | | | | Min. | Max. | |
| Serial Clock Period | SCL | t_{SCYC} | | 400 | — | ns |
| SCL "H" pulse width | | t_{SHW} | | 120 | — | |
| SCL "L" pulse width | | t_{SLW} | | 120 | — | |
| Address setup time | A0 | t_{SAS} | | 50 | — | |
| Address hold time | | t_{SAH} | | 50 | — | |
| Data setup time | SI | t_{SDS} | | 50 | — | |
| Data hold time | | t_{SDH} | | 50 | — | |
| CS-SCL time | CS | t_{CSS} | | 50 | — | |
| CS-SCL time | | t_{CSH} | | 150 | — | |

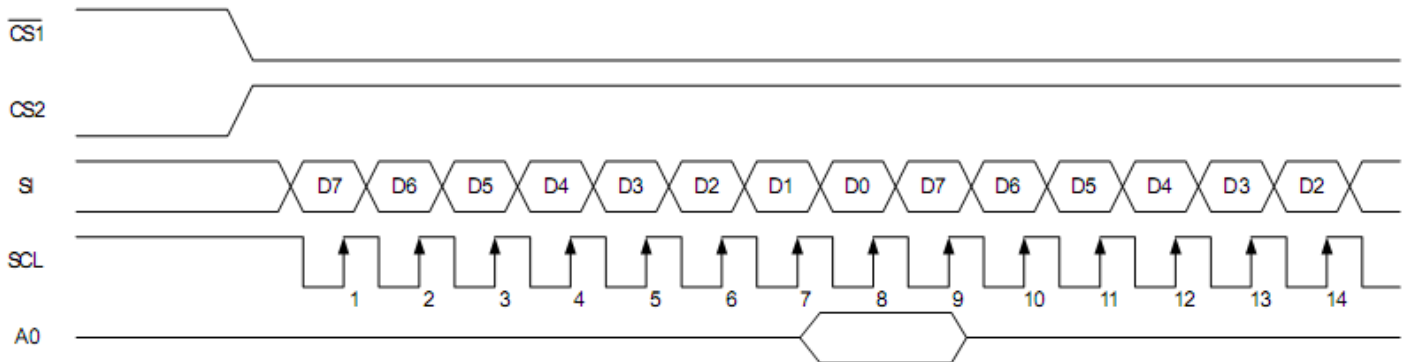


Table of Commands

| Command | Command Code | | | | | | | | Function | | | | |
|---|--------------|-----|-----|------------|----|-------------------------|----|----------------------------------|----------------|----|----|--|--|
| | A0 | /RD | /WR | D7 | D6 | D5 | D4 | D3 | | D2 | D1 | D0 | |
| (1) Display ON/OFF | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 1 | LCD display ON/OFF 0: OFF, 1: ON |
| (2) Display start line set | 0 | 1 | 0 | 0 | 1 | Display start address | | | | | | Sets the display RAM display start line address | |
| (3) Page address set | 0 | 1 | 0 | 1 | 0 | 1 | 1 | Page address | | | | Sets the display RAM page address | |
| (4) Column address set upper bit | 0 | 1 | 0 | 0 | 0 | 0 | 1 | Most significant column address | | | | Sets the most significant 4 bits of the display RAM column address. | |
| Column address set lower bit | 0 | 1 | 0 | 0 | 0 | 0 | 0 | Least significant column address | | | | Sets the least significant 4 bits of the display RAM column address. | |
| (5) Status read | 0 | 0 | 1 | Status | | | | 0 | 0 | 0 | 0 | 0 | Reads the status data |
| (6) Display data write | 1 | 1 | 0 | Write data | | | | | | | | Writes to the display RAM | |
| (7) Display data read | 1 | 0 | 1 | Read data | | | | | | | | Reads from the display RAM | |
| (8) ADC select | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | Sets the display RAM address SEG output correspondence 0: normal, 1: reverse |
| (9) Display normal/reverse | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 1 | Sets the LCD display normal/reverse 0: normal, 1: reverse |
| (10) Display all points ON/OFF | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | Display all points 0: normal display 1: all points ON |
| (11) LCD bias set | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | Sets the LCD drive voltage bias ratio 0: 1/9 bias, 1: 1/7 bias (ST7565) |
| (12) Read/modify/write | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | Column address increment At write: +1 At read: 0 |
| (13) End | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | Clear read/modify/write |
| (14) Reset | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | Internal reset |
| (15) Common output mode select | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | * | * | * | Select COM output scan direction 0: normal direction 1: reverse direction |
| (16) Power control set | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | Operating mode | | | Select internal power supply operating mode | |
| (17) Vs voltage regulator internal resistor ratio set | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | Resistor ratio | | | Select internal resistor ratio(Rb/Ra) mode | |
| (18) Electronic volume mode set | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | Set the Vs output voltage electronic volume register |
| Electronic volume register set | | | | 0 | 0 | Electronic volume value | | | | | | | |
| (19) Static indicator ON/OFF | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0: OFF, 1: ON |
| Static indicator register set | | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | Mode |
| (20) Power saver | | | | | | | | | | | | | Display OFF and display all points ON compound command |
| (21) NOP | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | Command for non-operation |
| (22) Test | 0 | 1 | 0 | 1 | 1 | 1 | 1 | * | * | * | * | * | Command for IC test. Do not use this command |

Example Initialization Program

```
.....  
Sub Command  
Reset P3.7  
Reset P3.4  
For Writecount = 1 To 8  
Rotate A , Left , 1  
Reset P3.1  
P1 = A  
Set P3.1  
Next Writecount  
Set P3.7  
End Sub  
.....
```

```
Sub Write  
Reset P3.7  
Set P3.4  
For Writecount = 1 To 8  
Rotate A , Left , 1  
Reset P3.1  
P1 = A  
Set P3.1  
Next Writecount  
Set P3.7  
End Sub  
.....
```

```
Sub Init  
Waitms 100  
A = &HA0  
Call Command  
A = &HAE  
Call Command  
A = &HC0  
Call Command  
A = &HA2  
Call Command  
A = &H2F  
Call Command  
A = &H26  
Call Command  
A = &H81  
Call Command  
A = &H11  
Call Command  
A = &HAF  
Call Command  
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 , 48hrs | 2 |
| Low Temperature storage | Endurance test applying the low storage temperature for a long time. | -30°C , 48hrs | 1,2 |
| High Temperature Operation | Endurance test applying the electric stress (voltage & current) and the high thermal stress for a long time. | +70°C 48hrs | 2 |
| Low Temperature Operation | Endurance test applying the electric stress (voltage & current) and the low thermal stress for a long time. | -20°C , 48hrs | 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. | +40°C , 90% RH , 48hrs | 1,2 |
| Thermal Shock resistance | Endurance test applying the electric stress (voltage & current) during a cycle of low and high thermal stress. | -0°C,30min -> 25°C,5min -> 50°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