

NHD-C0220AZ-FSW-FTW

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

NHD- Newhaven Display
C0220- COG, 2 lines x 20 characters
AZ- Model
F- Transflective
SW- Side White LED backlight
F- FSTN+
T- 12:00 View Angle
W- Wide Temp (-20 ~ +70C)
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

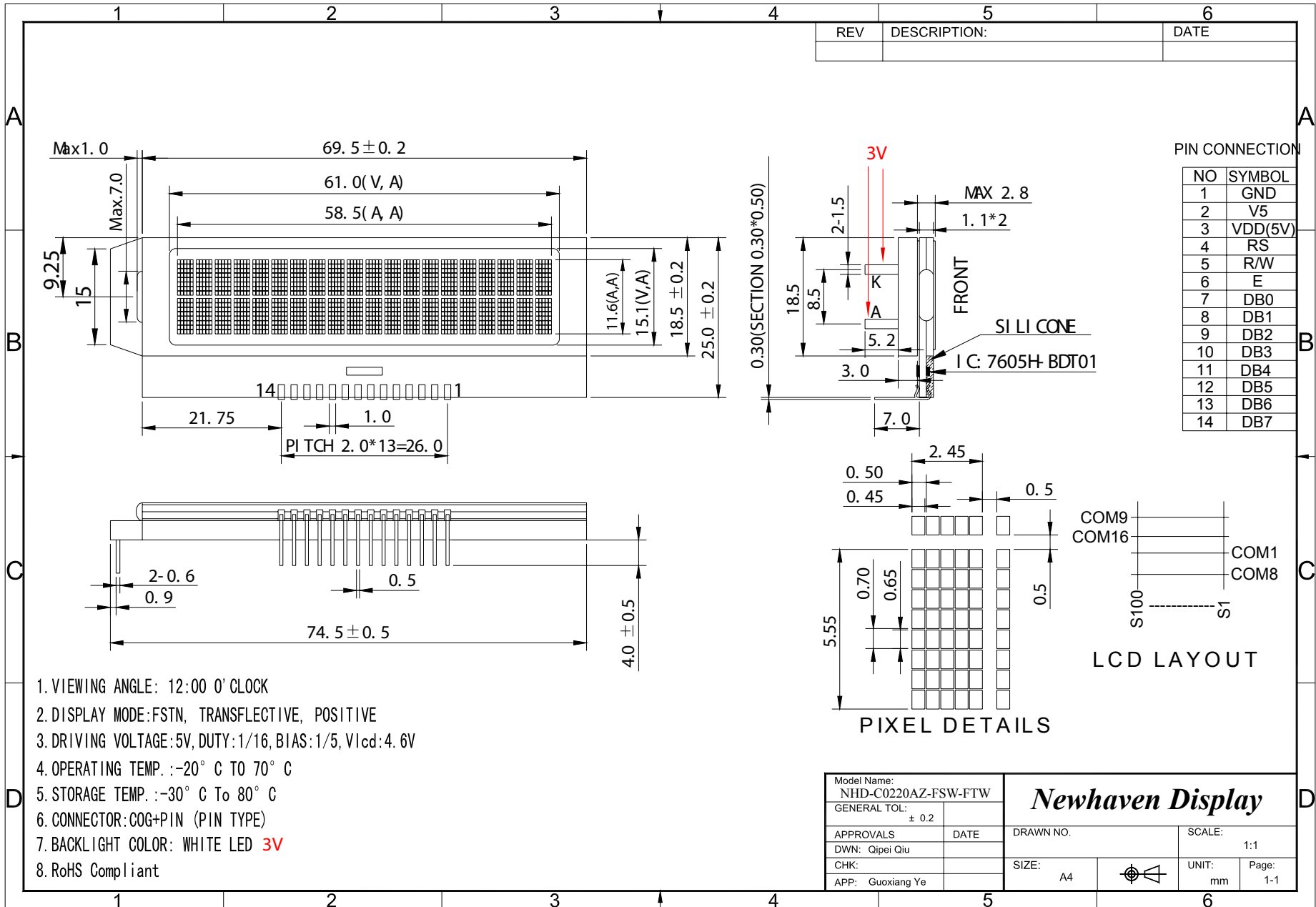
Document Revision History

| Revision | Date | Description | Changed by |
|----------|------------|--|------------|
| 0 | 7/20/2008 | Initial Release | |
| 1 | 6/29/2009 | User guide reformat | BE |
| 2 | 10/9/2009 | Updated Electrical Characteristics | MC |
| 3 | 11/16/2009 | Min Supply Voltage = 3.3V, Max VLCD = 5.0V | CL |
| 4 | 11/19/2009 | Updated backlight supply current | MC |
| 5 | 5/14/2010 | Controller Note | MP |

Functions and Features

- 2 lines x 20 characters
- Built-in NT7605 controller
- 5V power supply
- 1/16 duty, 1/5 bias

Mechanical Drawing



| REV | DESCRIPTION: | DATE |
|-----|--------------|------|
| | | |

PIN CONNECTION

| NO | SYMBOL |
|----|---------|
| 1 | GND |
| 2 | V5 |
| 3 | VDD(5V) |
| 4 | RS |
| 5 | R/W |
| 6 | E |
| 7 | DB0 |
| 8 | DB1 |
| 9 | DB2 |
| 10 | DB3 |
| 11 | DB4 |
| 12 | DB5 |
| 13 | DB6 |
| 14 | DB7 |

- VIEWING ANGLE: 12:00 O' CLOCK
- DISPLAY MODE:FSTN, TRANSFLECTIVE, POSITIVE
- DRIVING VOLTAGE:5V, DUTY:1/16, BIAS:1/5, V_{lcd}:4.6V
- OPERATING TEMP. :-20° C TO 70° C
- STORAGE TEMP. :-30° C TO 80° C
- CONNECTOR:COG+PIN (PIN TYPE)
- BACKLIGHT COLOR: WHITE LED 3V
- RoHS Compliant

| | |
|------------------------------------|------|
| Model Name: NHD-C0220AZ-FSW-FTW | |
| GENERAL TOL: ± 0.2 | |
| APPROVALS | DATE |
| DWN: Qiwei Qiu | |
| CHK: | |
| APP: Guoxiang Ye | |

Newhaven Display

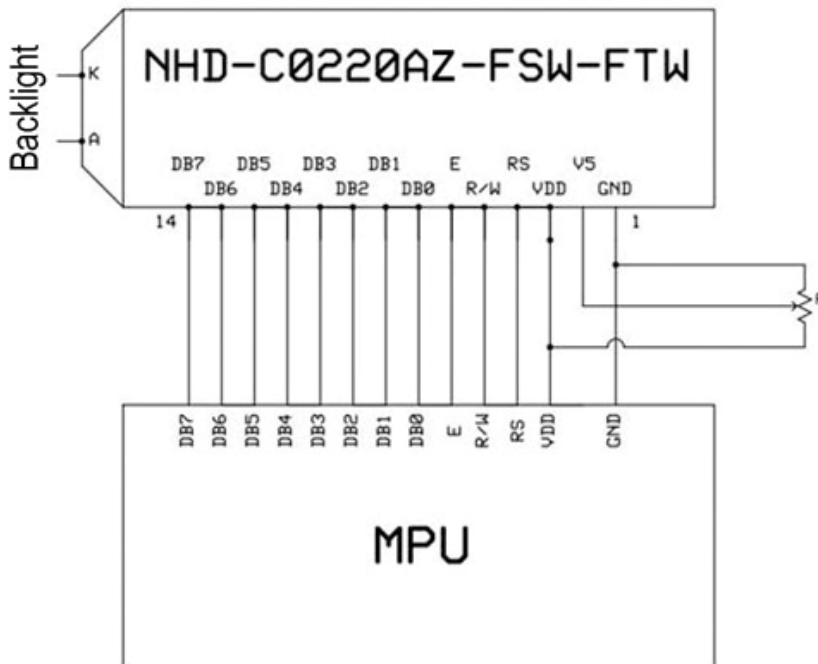
| | |
|-------------|---------------|
| DRAWN NO. | SCALE: 1:1 |
| SIZE: A4 | UNIT: mm |
| | Page: 1-1 |

Pin Description and Wiring Diagram

| Pin No. | Symbol | External Connection | Function Description |
|---------|-----------|---------------------|--|
| 1 | GND | Power Supply | Ground |
| 2 | V5 | Adj Power Supply | Contrast voltage adjustment (~0.4V) |
| 3 | VDD | Power Supply | Power supply for LCD and logic |
| 4 | RS | MPU | Register Select: 0=Instruction, 1=Data |
| 5 | R/W | MPU | Read / Write select: 0=Write, 1=Read |
| 6 | E | MPU | Read/Write start signal (Schmitt trigger input) |
| 7-10 | DB0 – DB3 | MPU | Low 4 tri-state bi-directional data bus lines. Not used in 4-bit mode. |
| 11-14 | DB4 – DB7 | MPU | High 4 tri-state bi-directional data bus lines. |

Recommended LCD connector: 2.0mm pitch, 14pins Soldered to PCB, or JST p/n: PHR-14

Backlight connector: A and K pins **Mates with:** Solder to wires or PCB



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 | Ta =25℃ | 3.3 | 5.0 | 5.5 | V |
| Supply Current | IDD | VDD=5.0V | | 1.0 | 1.5 | mA |
| Supply for LCD (contrast) | VDD-V5 | VLCD=VDD-V5 | 0 | 4.6 | 5.0 | 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 | VLED | | - | 3.0 | - | V |
| Backlight Supply Current | Iled | VLED=3.0V | - | 30 | 45 | mA |

Optical Characteristics

| Item | Symbol | Condition | Min. | Typ. | Max. | Unit |
|----------------------------|--------|-----------|------|------|------|------|
| Viewing Angle - Vertical | AV | Cr ≥ 2 | -60 | | +35 | ° |
| Viewing Angle - Horizontal | AH | Cr ≥ 2 | -40 | | +40 | ° |
| Contrast Ratio | Cr | | - | 6 | - | |
| Response Time (rise) | Tr | - | - | 150 | 250 | ms |
| Response Time (fall) | Tr | - | - | 150 | 250 | ms |

Controller Information

Built-in NT7605N-BDT01. Download specification at http://www.newhavendisplay.com/app_notes/NT7605.pdf

NOTE: The Busy Flag of the NT7605 controller may not always be responsive. Add sufficient delays and/or a time-out check routine to continue operation if busy flag is not cleared.

Note: during internal operation, busy flag (DB7) is read "High".
 Busy flag check must be preceded by the next instruction.

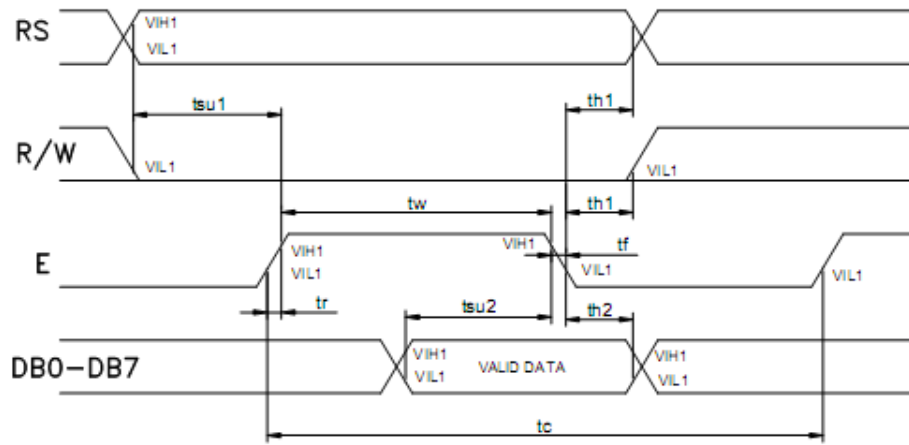
Table of Commands

| Instruction | Instruction code | | | | | | | | | | Description | Execution time (fosc= 270 KHZ) |
|----------------------------|------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|--------------------------------|
| | RS | R/W | DB7 | DB6 | DB5 | DB4 | DB3 | DB2 | DB1 | DB0 | | |
| Clear Display | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | Write "20H" to DDRA and set DDRAM address to "00H" from AC | 1.53ms |
| Return Home | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | - | Set DDRAM address to "00H" From AC and return cursor to its original position if shifted. The contents of DDRAM are not changed. | 1.53ms |
| Entry mode Set | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | I/D | SH | Assign cursor moving direction And blinking of entire display | 39us |
| Display ON/OFF control | 0 | 0 | 0 | 0 | 0 | 0 | 1 | D | C | B | Set display (D), cursor (C), and Blinking of cursor (B) on/off Control bit. | |
| Cursor or Display shift | 0 | 0 | 0 | 0 | 0 | 1 | S/C | R/L | - | - | Set cursor moving and display Shift control bit, and the Direction, without changing of DDRAM data. | 39us |
| Function set | 0 | 0 | 0 | 0 | 1 | DL | N | F | - | - | Set interface data length (DL: 8-Bit/4-bit), numbers of display Line (N: =2-line/1-line) and, Display font type (F: 5x11/5x8) | 39us |
| Set CGRAM Address | 0 | 0 | 0 | 1 | AC5 | AC4 | AC3 | AC2 | AC1 | AC0 | Set CGRAM address in address Counter. | 39us |
| Set DDRAM Address | 0 | 0 | 1 | AC6 | AC5 | AC4 | AC3 | AC2 | AC1 | AC0 | Set DDRAM address in address Counter. | 39us |
| Read busy Flag and Address | 0 | 1 | BF | AC6 | AC5 | AC4 | AC3 | AC2 | AC1 | AC0 | Whether during internal Operation or not can be known By reading BF. The contents of Address counter can also be read. | 0us |
| Write data to Address | 1 | 0 | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | Write data into internal RAM (DDRAM/CGRAM). | 43us |
| Read data From RAM | 1 | 1 | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | Read data from internal RAM (DDRAM/CGRAM). | 43us |

Display character address code:

| | | | | | | | | | | | | | | | |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
| 00 | 01 | 02 | 03 | 04 | 05 | 06 | 07 | 08 | 09 | 0A | 0B | 0C | 0D | 0E | 0F |
| 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 4A | 4B | 4C | 4D | 4E | 4F |

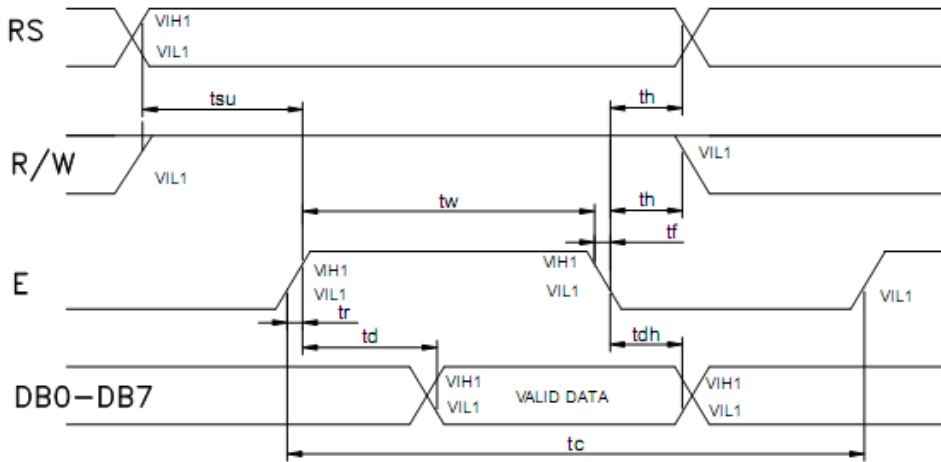
Write mode timing diagram



Write cycle (Ta=25°C, VDD=5.0V)

| Parameter | Symbol | Test pin | Min. | Typ. | Max. | Unit |
|---------------------------|------------|--------------------|------|------|------|------|
| Enable cycle time | t_c | E | 500 | - | - | ns |
| Enable pulse width | t_w | | 300 | - | - | |
| Enable rise/fall time | t_r, t_f | | - | - | 25 | |
| RS; R/W setup time | t_{su1} | RS; R/W RS; R/W | 100 | - | - | |
| RS; R/W address hold time | t_{h1} | | 10 | - | - | |
| Read data output delay | t_{su2} | DB0~DB7 | 60 | - | - | |
| Read data hold time | t_{h2} | | 10 | - | - | |

Read mode timing diagram



Read cycle (Ta=25°C, VDD=5.0V)

| Parameter | Symbol | Test pin | Min. | Typ. | Max. | Unit |
|---------------------------|------------|--------------------|------|------|------|------|
| Enable cycle time | t_c | E | 500 | - | - | ns |
| Enable pulse width | t_w | | 300 | - | - | |
| Enable rise/fall time | t_r, t_f | | - | - | 25 | |
| RS; R/W setup time | t_{su} | RS; R/W RS; R/W | 100 | - | - | |
| RS; R/W address hold time | t_h | | 10 | - | - | |
| Read data output delay | t_d | DB0~DB7 | 60 | - | 90 | |
| Read data hold time | t_{dh} | | 20 | - | - | |

Built-in Font Table

| Lower 4 Bits \ Upper 4 Bits | 0000 | 0001 | 0010 | 0011 | 0100 | 0101 | 0110 | 0111 | 1000 | 1001 | 1010 | 1011 | 1100 | 1101 | 1110 | 1111 |
|-----------------------------|------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| xxxx0000 | CG RAM (1) | | 0 | a | P | ` | P | | | | - | 夕 | 三 | α | ρ | |
| xxxx0001 | (2) | | ! | 1 | A | Q | a | q | | | 。 | ア | チ | △ | ä | q |
| xxxx0010 | (3) | | " | 2 | B | R | b | r | | | 「 | イ | ツ | × | ß | θ |
| xxxx0011 | (4) | | # | 3 | C | S | c | s | | | 」 | ウ | テ | モ | € | ø |
| xxxx0100 | (5) | | \$ | 4 | D | T | d | t | | | 、 | エ | ト | ヲ | μ | Ω |
| xxxx0101 | (6) | | % | 5 | E | U | e | u | | | ・ | オ | ナ | 1 | € | ü |
| xxxx0110 | (7) | | & | 6 | F | V | f | v | | | ヲ | カ | ニ | ヨ | ρ | Σ |
| xxxx0111 | (8) | | ' | 7 | G | W | g | w | | | フ | キ | ヌ | ラ | g | π |
| xxxx1000 | (1) | | < | 8 | H | X | h | x | | | イ | ク | ネ | リ | √ | ∞ |
| xxxx1001 | (2) | | > | 9 | I | Y | i | y | | | ウ | ケ | ル | ル | ´ | y |
| xxxx1010 | (3) | | * | : | J | Z | j | z | | | エ | コ | ン | レ | j | ¥ |
| xxxx1011 | (4) | | + | ; | K | [| k | < | | | オ | サ | ヒ | ロ | × | 万 |
| xxxx1100 | (5) | | , | < | L | ¥ | l | l | | | カ | シ | フ | ワ | ¢ | 円 |
| xxxx1101 | (6) | | - | = | M |] | m | > | | | ユ | ス | ヘ | ン | € | ÷ |
| xxxx1110 | (7) | | . | > | N | ^ | n | → | | | ヨ | セ | ホ | ´ | ñ | |
| xxxx1111 | (8) | | / | ? | O | _ | o | ← | | | ッ | ソ | マ | ° | ö | ■ |

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 , 96hrs | 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