

User's Guide

NHD-320240WG-BxFGH-VZ#

LCM

(Liquid Crystal Display Graphic Module)

RoHS Compliant

| | |
|----------------|--|
| NHD- | Newhaven Display |
| 320240- | 320 x 240 pixels |
| WG- | Display Type: Graphic |
| B x- | Model serial number: B, x: New IC rev. |
| F- | White CCFL B/L |
| G- | STN Gray |
| H- | Transflective, 6:00 View , Wide Temperature (-20 ~ +70c) |
| VZ#- | Built-in Negative voltage ; RoHS |

For product support, contact

Newhaven Display International
2511 Technology Drive, #101
Elgin, IL 60124

Tel: (847) 844-8795 Fax: (847) 844-8796

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1. Module Classification Information

NHD 320240 W G — BXFGH — VZ#

① ② ③ ④ ⑤ ⑥ ⑦ ⑧ 9

① Brand : Newhaven Display

② Display Font : 320 x 240 Dots

③ Factory Line: W

④ Display Type : H→Character Type, G→Graphic Type, C→ Color

⑤ Model / Serial number = **B, X** = SID13700 IC

⑥ Backlight Type :

| | |
|-----------------------|---------------|
| N→Without backlight | T→LED, White |
| B→EL, Blue green | A→LED, Amber |
| D→EL, Green | R→LED, Red |
| W→EL, White | O→LED, Orange |
| F →CCFL, White | G→LED, Green |
| Y→LED, Yellow Green | |

⑦ LCD Mode :

| | |
|------------------------------|-----------------|
| B→TN Positive, Gray | T→FSTN Negative |
| N→TN Negative, | C→STN Color |
| G →STN Positive, Gray | |
| Y→STN Positive, Yellow Green | |
| M→STN Negative, Blue | |
| F →FSTN Positive | |

⑧ LCD Polarize Type/
Temperature range/
View direction

| | |
|----------------------------|-----------------------------------|
| A→Reflective, N.T, 6:00 | H →Transflective, W.T,6:00 |
| D→Reflective, N.T, 12:00 | K→Transflective, W.T,12:00 |
| G→Reflective, W. T, 6:00 | C→Transmissive, N.T,6:00 |
| J→Reflective, W. T, 12:00 | F→Transmissive, N.T,12:00 |
| B→Transflective, N.T,6:00 | I→Transmissive, W. T, 6:00 |
| E→Transflective, N.T.12:00 | L→Transmissive, W.T,12:00 |

9 Special Code **VZ#** : Built-in Negative voltage ; RoHS

2. Precautions in Use of LCD Module

- (1) Avoid applying excessive shock to the module or making any alterations or modifications to it.
- (2) Don't make extra holes on the printed circuit board, modify its shape or change the components of LCD Module.
- (3) Don't disassemble the LCM.
- (4) Don't operate it above the absolute maximum rating.
- (5) Don't drop, bend or twist LCM.
- (6) Soldering: only to the I/O terminals.
- (7) Storage: please store in anti-static electricity container and clean environment.

3. General Specification for **NHD-320240WG-BXFGH-VZ#**

| ITEM | STANDARD VALUE | UNIT |
|-------------------|----------------------------------|------|
| Number of dots | 320x240 | dots |
| Outline dimension | 166.8(W) x 109.0(H) x 13.0max(T) | mm |
| View area | 122.0(W) x 92.0(H) | mm |
| Active area | 115.18(W) x 86.38(H) | mm |
| Dot size | 0.34(W) x 0.34(H) | mm |
| Dot pitch | 0.36(W) x 0.36(H) | mm |
| LCD type | STN Gay, Transflective | |
| View direction | 6 o'clock | |
| Backlight | CCFL, White | |

4. Absolute Maximum Ratings

| ITEM | SYMBOL | MIN. | TYP. | MAX. | UNIT |
|--------------------------|-----------------|------|------|----------|------|
| Operating Temperature | T_{OP} | -20 | — | +70 | °C |
| Storage Temperature | T_{ST} | -30 | — | +80 | °C |
| Input Voltage | V_I | 0 | — | V_{DD} | V |
| Supply Voltage For Logic | V_{DD} | 0 | — | 6.5 | V |
| Supply Voltage For LCD | $V_{DD}-V_{EE}$ | 0 | — | 32 | V |

5. Electrical Characteristics

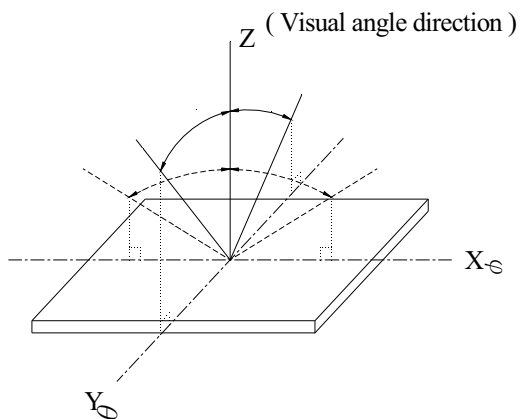
| ITEM | SYMBOL | CONDITION | MIN. | TYP. | MAX. | UNIT |
|------------------------|-----------------|---------------------------|--------------|-------|-------------|------|
| Logic Voltage | $V_{DD}-V_{SS}$ | — | — | 5.0 | 5.5 | V |
| Supply Voltage For LCD | $V_{DD}-V_O$ | $T_a=-20^{\circ}\text{C}$ | — | — | 26.0 | V |
| | | $T_a=25^{\circ}\text{C}$ | — | 24.0 | — | V |
| | | $T_a=+70^{\circ}\text{C}$ | 22.0 | — | — | V |
| Input High Volt. | V_{IH} | — | $0.8V_{DD}$ | — | V_{DD} | V |
| Input Low Volt. | V_{IL} | — | 0 | — | $0.2V_{DD}$ | V |
| Output High Volt. | V_{OH} | — | $V_{DD}-0.4$ | — | — | V |
| Output Low Volt. | V_{OL} | — | — | — | 0.4 | V |
| Supply Current | I_{DD} | — | 95.0 | 100.0 | 110.0 | mA |

6. Optical Characteristics

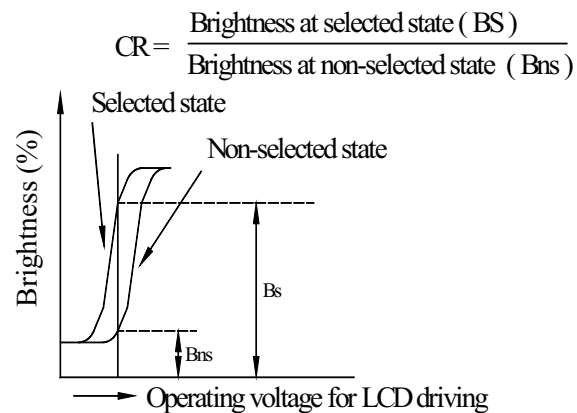
| ITEM | SYMBOL | CONDITION | MIN | TYP | MAX | UNIT |
|----------------|---------------|-------------|-----|-----|-----|------|
| View Angle | (V) θ | $CR \geq 2$ | 10 | — | 105 | deg. |
| | (H) φ | $CR \geq 2$ | -30 | — | 30 | deg. |
| Contrast Ratio | CR | — | — | 3 | — | — |
| Response Time | T rise | — | — | 200 | 300 | ms |
| | T fall | — | — | 150 | 200 | ms |

6.1 Definitions

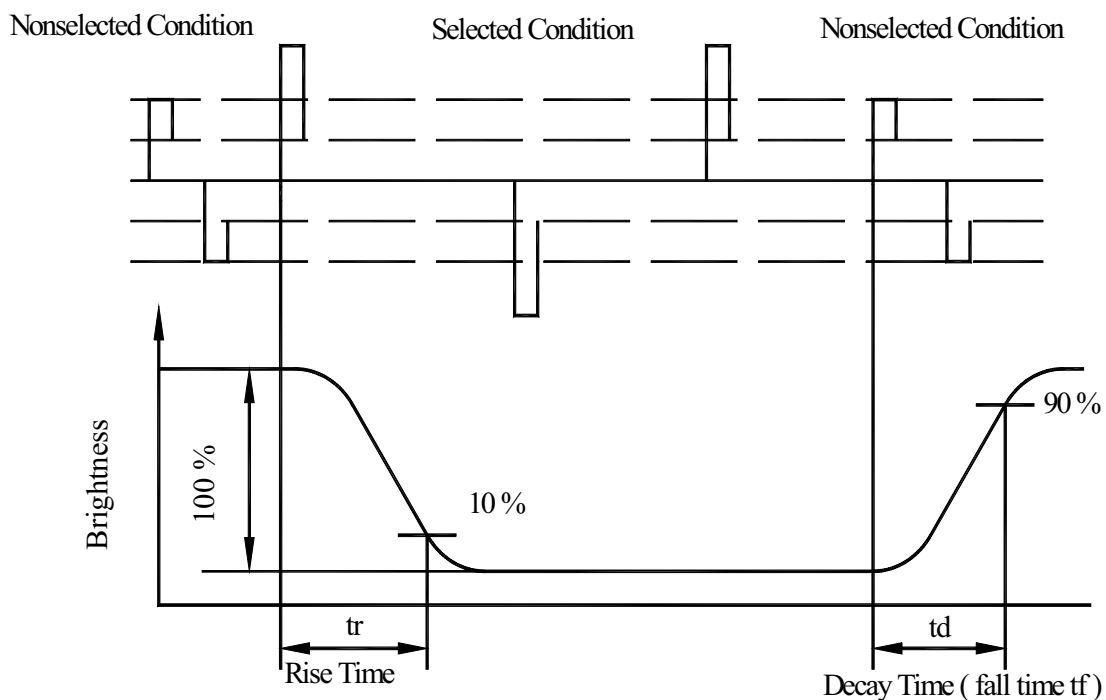
■ View Angles



■ Contrast Ratio



■ Response time

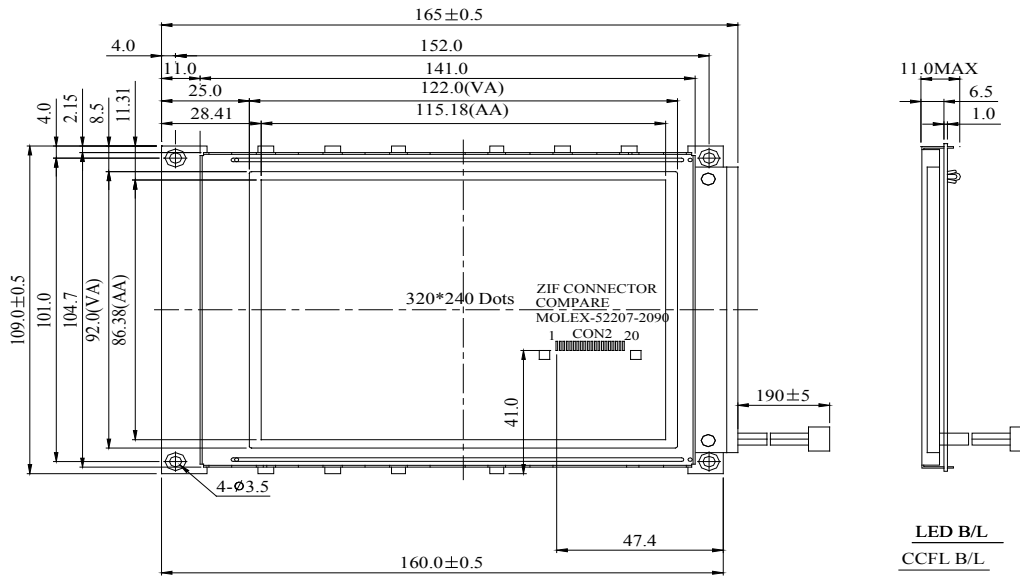


7. Interface Description

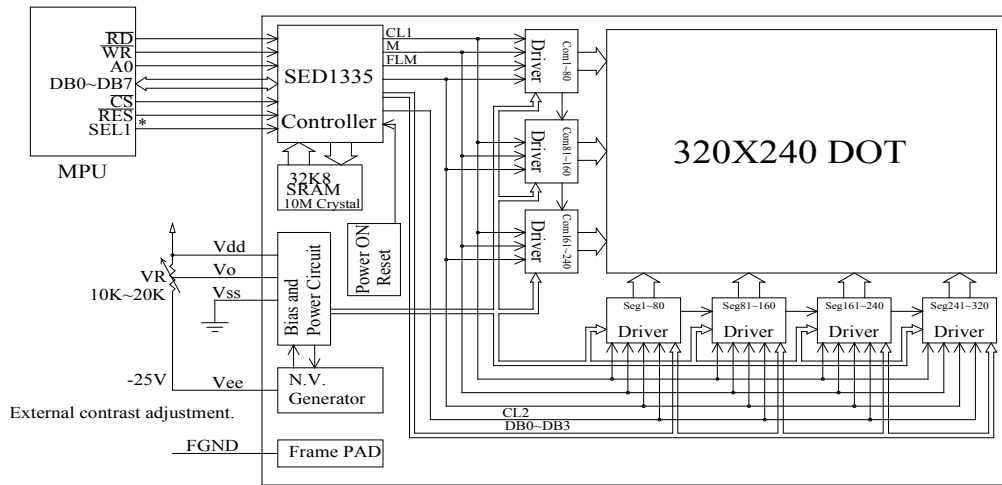
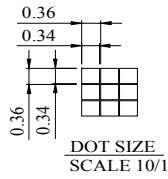
| Pin No. | Symbol | Level | Description |
|---------|-------------------------|------------|---|
| 1 | V _{SS} | 0V | Ground |
| 2 | V _{DD} | 5.0V | Power supply for Logic |
| 3 | V _O | (Variable) | Driving voltage for LCD |
| 4 | A0 | H/L | RD=L WR=H , A0=L :Data Read AO=H :Status read RD=H WR=L , A0=L :Data Write AO=H :Command write |
| 5 | $\overline{\text{WR}}$ | H/L | 8080 family MPU interface: Write signal |
| 6 | $\overline{\text{RD}}$ | H/L | 8080 family MPU interface: Read signal |
| 7~14 | DB0~DB7 | H/L | Data bus |
| 15 | $\overline{\text{CS}}$ | H/L | Chip select, Active L |
| 16 | $\overline{\text{RES}}$ | H/L | Controller reset signal, Active L |
| 17 | V _{EE} | -25V | Negative voltage output (Optional) |
| 18 | SEL1 | | NC (6800 series MPU interface option) *Note1 |
| 19 | (FGND) | | NC (Frame Ground option) |
| 20 | NC | | No connection |

Note1: Setup by hardware

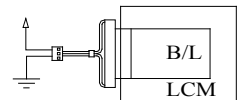
8. Contour Drawing & Block diagram



| PIN NO. | SYMBOL |
|---------|-----------------|
| 1 | V _{ss} |
| 2 | V _{dd} |
| 3 | V _o |
| 4 | A0 |
| 5 | WR |
| 6 | RD |
| 7 | DB0 |
| 8 | DB1 |
| 9 | DB2 |
| 10 | DB3 |
| 11 | DB4 |
| 12 | DB5 |
| 13 | DB6 |
| 14 | DB7 |
| 15 | CS |
| 16 | RES |
| 17 | V _{ee} |
| 18 | SEL1 |
| 19 | FGND |
| 20 | NC |



Led B/L drive directly from connector .



*:6800 family or 8080family interface selectable.

9. Quality Assurance

◆ Screen Cosmetic Criteria

| No. | Defect | Judgement Criteria | Partition | | | | | | | | | | | | | | | | | | | | |
|--------------------|-------------------------------|--|------------|-------------------------------|--------------|-----------|--------------------|---|--------------------|---|-----------|---|------------|-------------------------------|--------------|-----------|--------------------|---|--------------------|---|-----------|---|-------|
| 1 | Spots | <p>A) Clear</p> <table border="1"> <thead> <tr> <th>Size: d mm</th> <th>Acceptable Qty in active area</th> </tr> </thead> <tbody> <tr> <td>$d \leq 0.1$</td> <td>Disregard</td> </tr> <tr> <td>$0.1 < d \leq 0.2$</td> <td>6</td> </tr> <tr> <td>$0.2 < d \leq 0.3$</td> <td>2</td> </tr> <tr> <td>$0.3 < d$</td> <td>0</td> </tr> </tbody> </table> <p>Note: Including pin holes and defective dots which must be within one pixel size.</p> <p>B) Unclear</p> <table border="1"> <thead> <tr> <th>Size: d mm</th> <th>Acceptable Qty in active area</th> </tr> </thead> <tbody> <tr> <td>$d \leq 0.2$</td> <td>Disregard</td> </tr> <tr> <td>$0.2 < d \leq 0.5$</td> <td>6</td> </tr> <tr> <td>$0.5 < d \leq 0.7$</td> <td>2</td> </tr> <tr> <td>$0.7 < d$</td> <td>0</td> </tr> </tbody> </table> | Size: d mm | Acceptable Qty in active area | $d \leq 0.1$ | Disregard | $0.1 < d \leq 0.2$ | 6 | $0.2 < d \leq 0.3$ | 2 | $0.3 < d$ | 0 | Size: d mm | Acceptable Qty in active area | $d \leq 0.2$ | Disregard | $0.2 < d \leq 0.5$ | 6 | $0.5 < d \leq 0.7$ | 2 | $0.7 < d$ | 0 | Minor |
| Size: d mm | Acceptable Qty in active area | | | | | | | | | | | | | | | | | | | | | | |
| $d \leq 0.1$ | Disregard | | | | | | | | | | | | | | | | | | | | | | |
| $0.1 < d \leq 0.2$ | 6 | | | | | | | | | | | | | | | | | | | | | | |
| $0.2 < d \leq 0.3$ | 2 | | | | | | | | | | | | | | | | | | | | | | |
| $0.3 < d$ | 0 | | | | | | | | | | | | | | | | | | | | | | |
| Size: d mm | Acceptable Qty in active area | | | | | | | | | | | | | | | | | | | | | | |
| $d \leq 0.2$ | Disregard | | | | | | | | | | | | | | | | | | | | | | |
| $0.2 < d \leq 0.5$ | 6 | | | | | | | | | | | | | | | | | | | | | | |
| $0.5 < d \leq 0.7$ | 2 | | | | | | | | | | | | | | | | | | | | | | |
| $0.7 < d$ | 0 | | | | | | | | | | | | | | | | | | | | | | |
| 2 | Bubbles in Polarize | <table border="1"> <thead> <tr> <th>Size: d mm</th> <th>Acceptable Qty in active area</th> </tr> </thead> <tbody> <tr> <td>$d \leq 0.3$</td> <td>Disregard</td> </tr> <tr> <td>$0.3 < d \leq 1.0$</td> <td>3</td> </tr> <tr> <td>$1.0 < d \leq 1.5$</td> <td>1</td> </tr> <tr> <td>$1.5 < d$</td> <td>0</td> </tr> </tbody> </table> | Size: d mm | Acceptable Qty in active area | $d \leq 0.3$ | Disregard | $0.3 < d \leq 1.0$ | 3 | $1.0 < d \leq 1.5$ | 1 | $1.5 < d$ | 0 | Minor | | | | | | | | | | |
| Size: d mm | Acceptable Qty in active area | | | | | | | | | | | | | | | | | | | | | | |
| $d \leq 0.3$ | Disregard | | | | | | | | | | | | | | | | | | | | | | |
| $0.3 < d \leq 1.0$ | 3 | | | | | | | | | | | | | | | | | | | | | | |
| $1.0 < d \leq 1.5$ | 1 | | | | | | | | | | | | | | | | | | | | | | |
| $1.5 < d$ | 0 | | | | | | | | | | | | | | | | | | | | | | |
| 3 | Scratch | In accordance with spots cosmetic criteria. When the light reflects on the panel surface, the scratches are not to be remarkable. | Minor | | | | | | | | | | | | | | | | | | | | |
| 4 | Allowable Density | Above defects should be separated more than 30mm each other. | Minor | | | | | | | | | | | | | | | | | | | | |
| 5 | Coloration | Not to be noticeable coloration in the viewing area of the LCD panels. Back-light type should be judged with back-light on state only. | Minor | | | | | | | | | | | | | | | | | | | | |

10. RELIABILITY

Content of Reliability Test

| Environmental Test | | | | |
|--------------------|---|---|--|---------------------|
| No. | Test Item | Content of Test | Test Condition | Applicable Standard |
| 1 | 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 high storage temperature for a long time. | -30°C 200hrs | — |
| 3 | High Temperature Operation | Endurance test applying the electric stress (Voltage & Current) and the thermal stress to the element for a long time. | 70°C 200hrs | — |
| 4 | Low Temperature Operation | Endurance test applying the electric stress under low temperature for a long time. | -20°C 200hrs | — |
| 5 | High Temperature/ Humidity Storage | Endurance test applying the high temperature and high humidity storage for a long time. | 80°C, 90%RH 96hrs | — |
| 6 | High Temperature/ Humidity Operation | Endurance test applying the electric stress (Voltage & Current) and temperature / humidity stress to the element for a long time. | 70°C, 90%RH 96hrs | — |
| 7 | Temperature Cycle | Endurance test applying the low and high temperature cycle. $ \begin{array}{c} -30^{\circ}\text{C} \quad 25^{\circ}\text{C} \quad 80^{\circ}\text{C} \\ \longleftarrow \hspace{1cm} \longrightarrow \\ 30\text{min} \quad 5\text{min} \quad 30\text{min} \\ \hline 1 \text{ cycle} \end{array} $ | -30°C/80°C 10 cycles | — |
| Mechanical Test | | | | |
| 8 | Vibration test | Endurance test applying the vibration during transportation and using. | 10~22Hz→1.5mmp-p 22~500Hz→1.5G Total 0.5hrs | — |
| 9 | Shock test | Constructional and mechanical endurance test applying the shock during transportation. | 50G Half sign wave 11 msdc 3 times of each direction | — |
| 10 | Atmospheric pressure test | Endurance test applying the atmospheric pressure during transportation by air. | 115mbar 40hrs | — |
| Others | | | | |
| 11 | Static electricity test | Endurance test applying the electric stress to the terminal. | VS=800V, RS=1.5kΩ CS=100pF 1 time | — |

***Supply voltage for logic system=5V. Supply voltage for LCD system =Operating voltage at 25°C

11. Backlight Information

CCFL backlight Specification

(Ta=25°C)

| Item | Symbol | Specification | | | Unit | Condition |
|---|------------------|---------------|-------|-----|-------------------|---|
| | | Min | Typ | Max | | |
| Driving Voltage | V _{FL} | — | 278 | — | Vrms | — |
| Input current | I _{FL} | 3.0 | 5.0 | 6.0 | mArms | — |
| Power consumption | W | — | 1.35 | — | W | — |
| Starting Voltage | V _{FLS} | — | 530 | — | Vrms | — |
| Luminance | L | — | 550 | — | Cd/m ² | $\varphi, \theta = 0 \text{ deg}, I_{FL} = 5.0 \text{ mArms}$ |
| Chromaticity | x | — | 0.340 | — | — | — |
| | y | — | 0.370 | — | — | — |
| Luminance Uniformity (Testing 9 point) | — | 75% | — | — | % | $\varphi, \theta = 0 \text{ deg}, I_{FL} = 5.0 \text{ mArms}$ |
| Life time | — | 20,000 | — | — | hrs | |