

## User's Guide

# NHD-320240WG-BxFGH-VZ#

# LCM

(Liquid Crystal Display Graphic Module)

**RoHS Compliant**

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

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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 |
| <b>F</b> →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     |
| <b>G</b> →STN Positive, Gray |                 |
| Y→STN Positive, Yellow Green |                 |
| M→STN Negative, Blue         |                 |
| <b>F</b> →FSTN Positive      |                 |
- ⑧ LCD Polarize Type/  
Temperature range/  
View direction
- |                            |                                   |
|----------------------------|-----------------------------------|
| A→Reflective, N.T, 6:00    | <b>H</b> →Transflective, W.T,6:00 |
| D→Reflective, N.T, 12:00   | K→Transflective,<br>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,<br>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

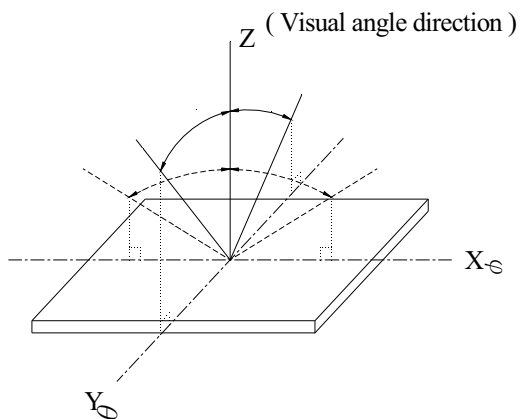
ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Logic Voltage	$V_{DD}-V_{SS}$	—	—	5.0	5.5	V
Supply Voltage For LCD	$V_{DD}-V_O$	$T_a=-20^{\circ}\text{C}$	—	—	26.0	V
		$T_a=25^{\circ}\text{C}$	—	24.0	—	V
		$T_a=+70^{\circ}\text{C}$	22.0	—	—	V
Input High Volt.	$V_{IH}$	—	$0.8V_{DD}$	—	$V_{DD}$	V
Input Low Volt.	$V_{IL}$	—	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

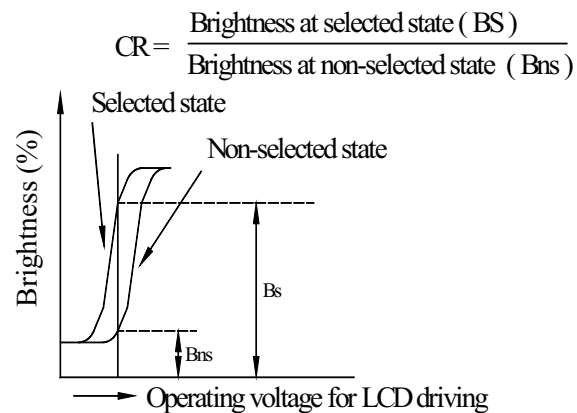
ITEM	SYMBOL	CONDITION	MIN	TYP	MAX	UNIT
View Angle	(V) $\theta$	$CR \geq 2$	10	—	105	deg.
	(H) $\varphi$	$CR \geq 2$	-30	—	30	deg.
Contrast Ratio	CR	—	—	3	—	—
Response Time	T rise	—	—	200	300	ms
	T fall	—	—	150	200	ms

### 6.1 Definitions

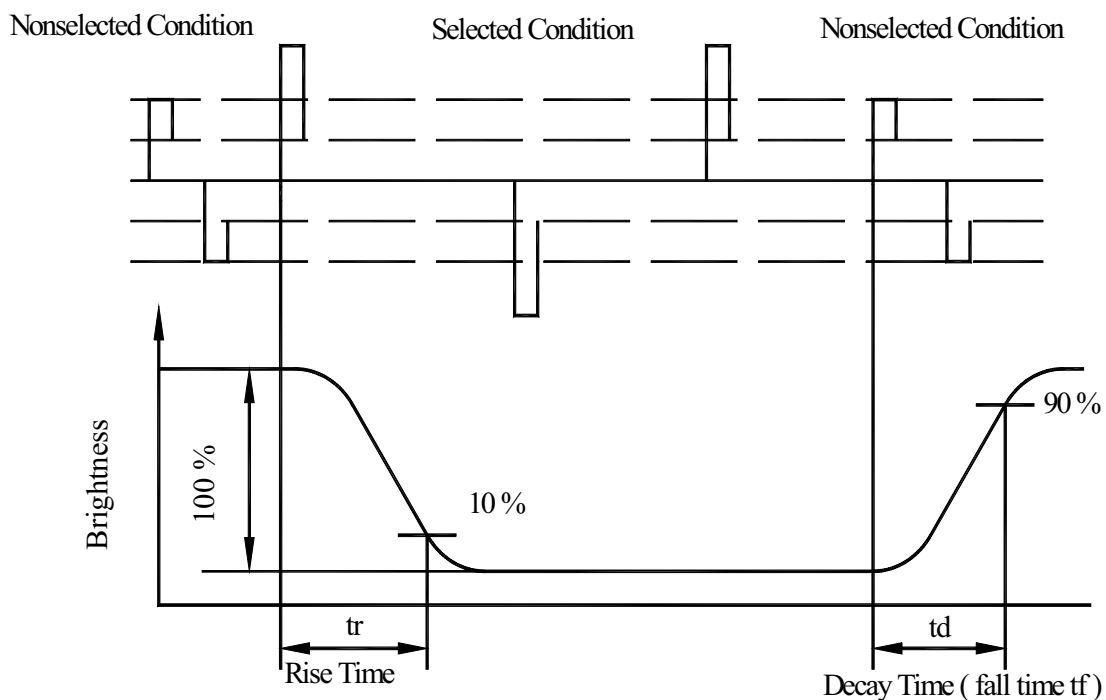
#### ■ View Angles



#### ■ Contrast Ratio



#### ■ Response time



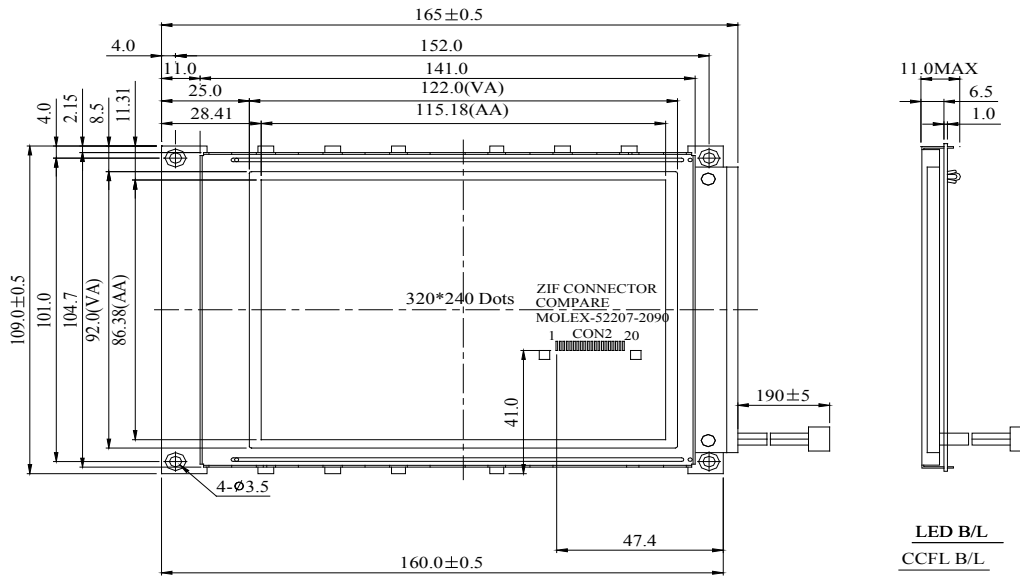
H-VZ#

## 7. Interface Description

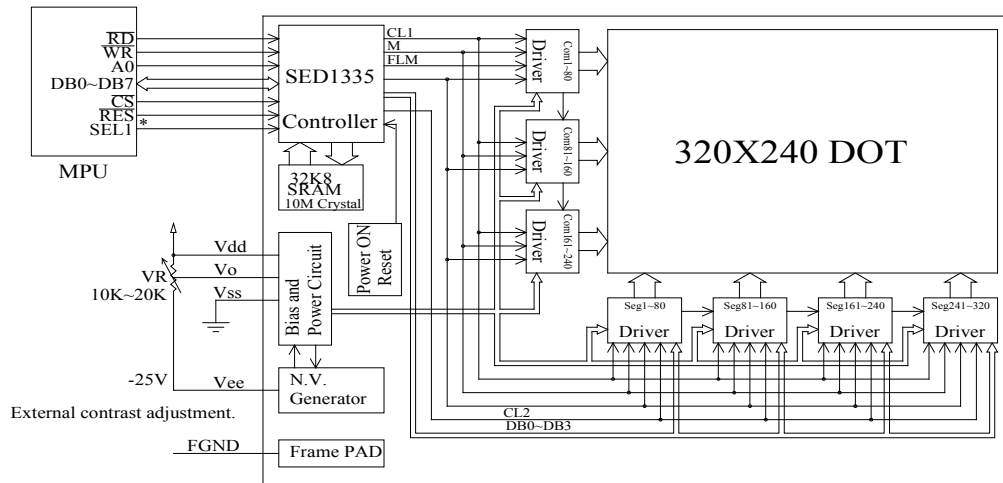
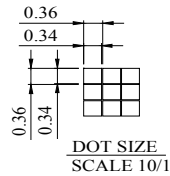
Pin No.	Symbol	Level	Description
1	V <sub>SS</sub>	0V	Ground
2	V <sub>DD</sub>	5.0V	Power supply for Logic
3	V <sub>O</sub>	(Variable)	Driving voltage for LCD
4	A0	H/L	RD=L WR=H , A0=L :Data Read AO=H :Status read RD=H WR=L , A0=L :Data Write AO=H :Command write
5	$\overline{\text{WR}}$	H/L	8080 family 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 <sub>EE</sub>	-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

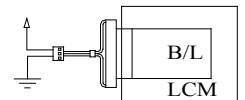


PIN NO.	SYMBOL
1	V <sub>ss</sub>
2	V <sub>dd</sub>
3	V <sub>o</sub>
4	A0
5	WR
6	RD
7	DB0
8	DB1
9	DB2
10	DB3
11	DB4
12	DB5
13	DB6
14	DB7
15	CS
16	RES
17	V <sub>ee</sub>
18	SEL1
19	FGND
20	NC



\*:6800 family or 8080family interface selectable.

Led B/L drive directly from connector .





## 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><math>d \leq 0.1</math></td> <td>Disregard</td> </tr> <tr> <td><math>0.1 &lt; d \leq 0.2</math></td> <td>6</td> </tr> <tr> <td><math>0.2 &lt; d \leq 0.3</math></td> <td>2</td> </tr> <tr> <td><math>0.3 &lt; d</math></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><math>d \leq 0.2</math></td> <td>Disregard</td> </tr> <tr> <td><math>0.2 &lt; d \leq 0.5</math></td> <td>6</td> </tr> <tr> <td><math>0.5 &lt; d \leq 0.7</math></td> <td>2</td> </tr> <tr> <td><math>0.7 &lt; d</math></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																						
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$0.2 < d \leq 0.5$	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><math>d \leq 0.3</math></td> <td>Disregard</td> </tr> <tr> <td><math>0.3 &lt; d \leq 1.0</math></td> <td>3</td> </tr> <tr> <td><math>1.0 &lt; d \leq 1.5</math></td> <td>1</td> </tr> <tr> <td><math>1.5 &lt; d</math></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. $\begin{array}{ccc} -30^{\circ}\text{C} & 25^{\circ}\text{C} & 80^{\circ}\text{C} \\ \longleftarrow & \longrightarrow & \\ 30\text{min} & 5\text{min} & 30\text{min} \\ \hline & & 1 \text{ cycle} \end{array}$	-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 <sub>FL</sub>	—	278	—	Vrms	—
Input current	I <sub>FL</sub>	3.0	5.0	6.0	mArms	—
Power consumption	W	—	1.35	—	W	—
Starting Voltage	V <sub>FLS</sub>	—	530	—	Vrms	—
Luminance	L	—	550	—	Cd/m <sup>2</sup>	$\varphi, \theta = 0 \text{ deg}, I_{FL} = 5.0 \text{ mArms}$
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	