

# User's Guide

# NHD-320240WG-BOSFK-VZ#

# LCM

(Liquid Crystal Display Graphic Module)

**RoHS Compliant**

<b>NHD-</b>	Newhaven Display
<b>320240-</b>	320 x 240 pixels
<b>WG-</b>	W= Factory Line G = Display Type:Graphic
<b>B O-</b>	Model / Serial number = BO Built-in RA8835 controller (Epson 1335 equiv.)
<b>S-</b>	Bright White LED B/L
<b>F-</b>	FSTN Positive
<b>K-</b>	Transflective, 12:00 View, Wide Temperature (-20 ~ +70c)
<b>VZ-</b>	Built-in Negative voltage

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For product support, contact

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# 1. Module Classification Information

NHD 320240 W G — BO S F K— 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 = **BO Built-in RA8835 controller (Epson 1335 equiv.)**
- ⑥ Backlight Type :
- |                     |                             |
|---------------------|-----------------------------|
| N→Without backlight | <b>S</b> →LED, Bright 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 | T→LED, White                |
- ⑦ LCD Mode :
- |                              |                         |
|------------------------------|-------------------------|
| B→TN Positive, Gray          | T→FSTN Negative         |
| N→TN Negative,               | C→STN Color             |
| G→STN Positive, Gray         | <b>F</b> →FSTN Positive |
| Y→STN Positive, Yellow Green |                         |
| M→STN Negative, Blue         |                         |
- 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   | <b>K</b> →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 | <b>L</b> →Transmissive,<br>W.T,12:00  |
- 9 Special Code                    **VZ** : Built-in Negative voltage  
   **#**: RoHS compliant

## 2. Precautions in Use of LCD Module

- (1) Avoid applying excessive shocks 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 storage in anti-static electricity container and clean environment.

## 3. General Specification:

## **NHD-320240WG-BOSFK-VZ**

ITEM	STANDARD VALUE	UNIT
Number of dots	320x240	dots
Outline dimension	166.8(W) x 109.0(H) x 11.0max(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	FSTN Positive, Transflective	
View direction	12 o'clock	
Backlight	LED, Bright 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

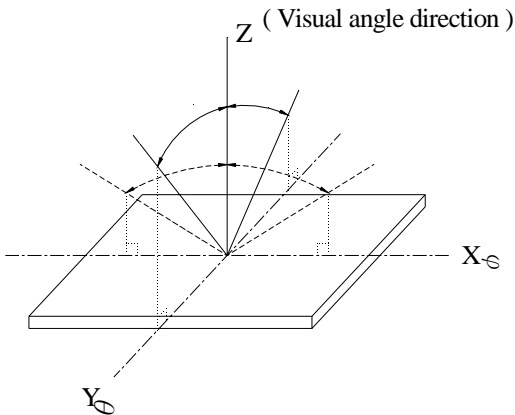
ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Logic Voltage	$V_{DD}-V_{SS}$	—	4.5	5.0	5.5	V
Supply Voltage For LCD	$V_{DD}-V_O$	$T_a=-20^{\circ}\text{C}$	—	—	26.0	V
		$T_a=25^{\circ}\text{C}$	—	24.0	—	V
		$T_a=+70^{\circ}\text{C}$	22.0	—	—	V
Input High Volt.	$V_{IH}$	—	$0.5V_{DD}$	—	$V_{DD}$	V
Input Low Volt.	$V_{IL}$	—	0	—	$0.2V_{DD}$	V
Output High Volt.	$V_{OH}$	—	2.4	—	—	V
Output Low Volt.	$V_{OL}$	—	—	—	0.4	V
Supply Current	$I_{DD}$	—	95.0	100.0	110.0	mA

## 6. Optical Characteristics

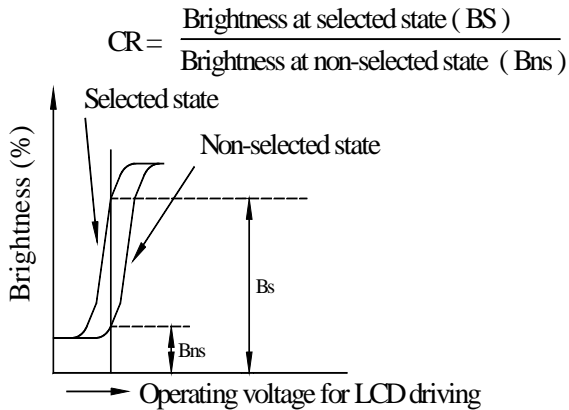
ITEM	SYMBAL	CONDITION	MIN	TYP	MAX	UNIT
View Angle	(V) $\theta$	$CR \geq 2$	20	—	40	deg.
	(H) $\varphi$	$CR \geq 2$	-30	—	30	deg.
Contrast Ratio	CR	—	—	3	—	—
Response Time	T rise	—	—	150	200	ms
	T fall	—	—	150	200	ms

**6.1 Definitions**

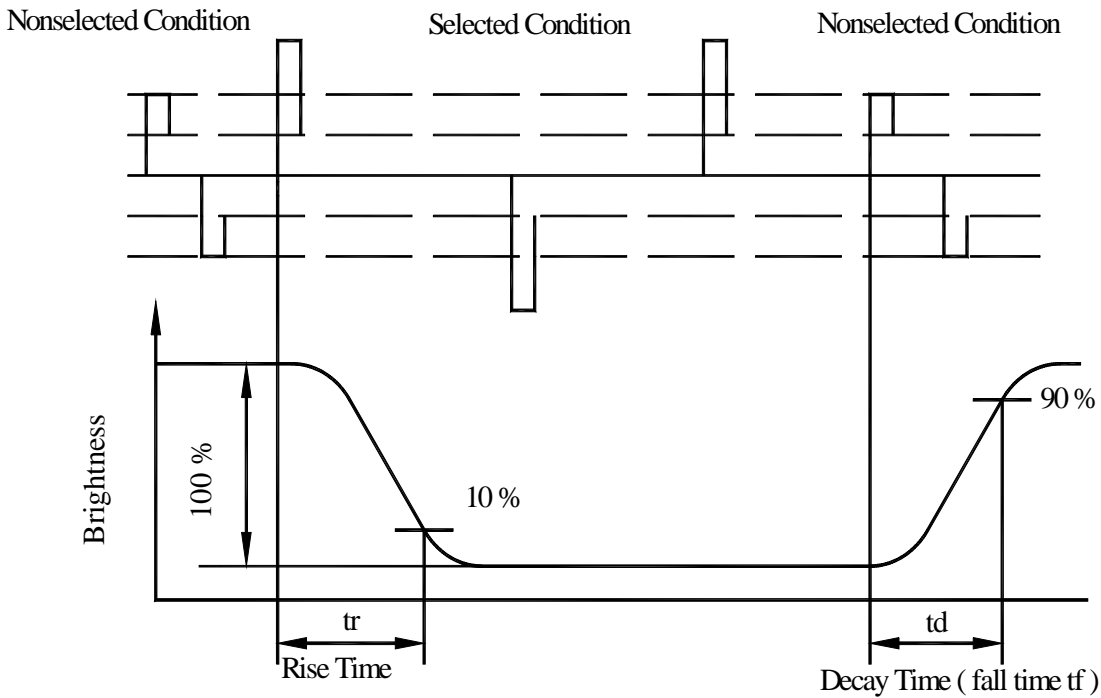
**View Angles**



**Contrast Ratio**

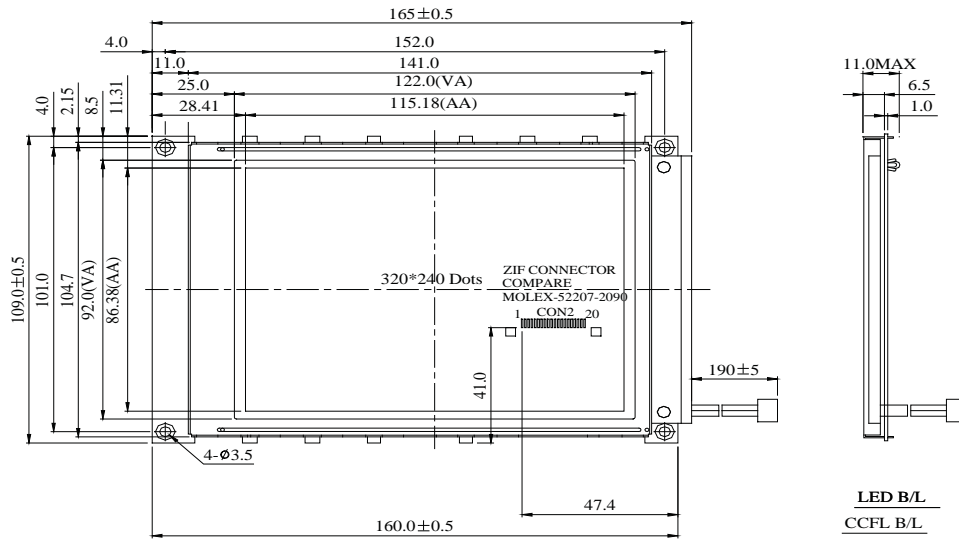


**Response time**

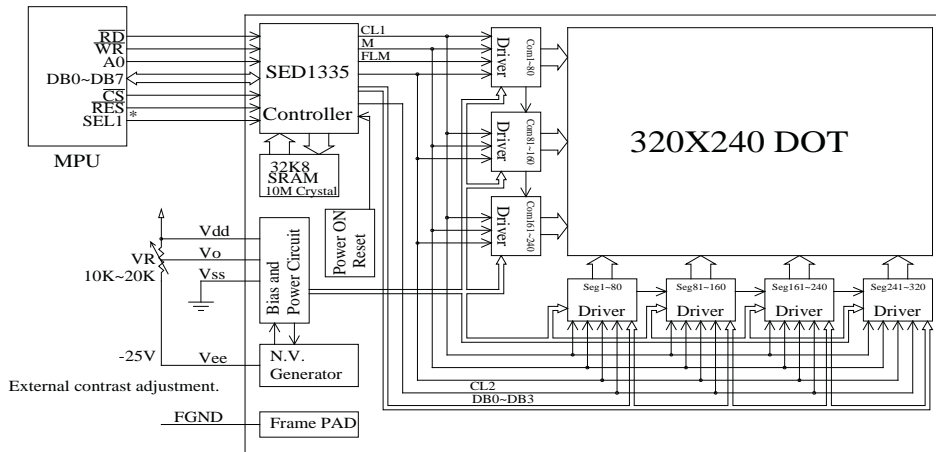
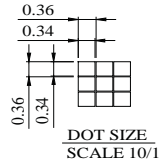


## 7. Interface Description

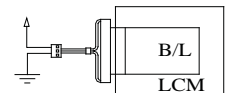
Pin No.	Symbol	Level	Description
1	V <sub>SS</sub>	0V	Ground
2	V <sub>DD</sub>	5.0V	Power supply for Logic
3	V <sub>O</sub>	(Variable)	Driving voltage for LCD
4	A0	H/L	RD=L WR=H, A0=L :Data Read AO=H :Status read RD=H WR=L, A0=L :Data Write AO=H :Command write
5	$\overline{\text{WR}}$	H/L	8080 family: Write signal, 6800 family: R/W signal
6	$\overline{\text{RD}}$	H/L	8080 family: Read signal, 6800 family: Enable clock
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



PIN NO.	SYMBOL
1	Vss
2	Vdd
3	Vo
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	Vee
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 Criterion	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																						
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$0.5 < d \leq 0.7$	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. <div style="text-align: center;"> <math display="block">\begin{array}{ccccc} -30^{\circ}\text{C} &amp; 25^{\circ}\text{C} &amp; 80^{\circ}\text{C} &amp; &amp; \\ &amp; \longleftarrow &amp; \longrightarrow &amp; &amp; \\ &amp; 30\text{min} &amp; 5\text{min} &amp; 30\text{min} &amp; \\ &amp; \hline &amp; &amp; &amp; \\ &amp; &amp; 1 \text{ cycle} &amp; &amp; \end{array}</math> </div>	-30°C/80°C 10 cycles	—
Mechanical Test				
8	Vibration test	Endurance test applying the vibration during transportation and using.	Total fixed amplitude : 15mm Vibration Frequency : 10~15Hz One cycle 60 seconds to 3 directions of X,Y,Zfor Each 15 minutes	—
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

(Ta=25°C)

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT	TEST CONDITION
Supply Current	I <sub>LED</sub>	120	160	180	mA	V=3.5V
Supply Voltage	V	3.4	3.5	3.6	V	—
Reverse Voltage	V <sub>R</sub>	—	—	5	V	—
Luminous Intensity	I <sub>V</sub>	220	250	—	CD/M <sup>2</sup>	I <sub>LED</sub> =160mA
Life Time	—	—	50K	—	Hr.	I <sub>LED</sub> =160mA
Color	WHITE					

**Note: The LED of B/L is driven by current only, drive voltage is for reference only.**

**Drive voltage can make driving current under safety area (current between minimum and maximum).**